Experimental Investigation on Mechanical Properties of Concrete with Fly Ash Aggregate

P.Dhanabal[1] V.Parthiban[2]
[1,2]Assistant Professor
[1]Aksheyaa college of Engineering, Kanchipuram [2]Sri Ramakrishna Engineering College, Coimbatore.

Abstract— This study aims to utilization of Fly ash aggregate in concrete. The fine aggregate (sand) is partially replaced by Fly ash aggregate at various proportions from 10% to 100%.Trial mix of varied proportion shown above which compared to conventional concrete mix (M20) and find the optimum mix of Fly ash aggregate in concrete and to investigate the hardened concrete properties of concrete using Fly ash aggregate. Trial mix made of sand and Fly ash aggregate in the ratio of 40:60 achieved more strength, compared to other combinations hence utilization of Fly ash aggregate which enhanced the strength in the concrete.
Key words: Fly Ash Aggregate, M20, sand

I. INTRODUCTION

Fly ash aggregate is a type of artificial aggregate which is prepared by mixing of cement, Fly ash and water. Fly ash is a waste material which can be used as supplementary cementations materials to produce strengthen artificial Fly ash aggregate. Fly ash aggregate is an alternative material for natural aggregate because of scarcity of natural aggregate.

II. SOURCE OF FLYASH AGGREGATE

Fly ash is a preliminary source for Fly ash aggregate. The ash produced at thermal power stations by burning of coal is known as Fly ash. Fly ash which has different classes it mention in below
Two classes of Fly ash are defined by ASTM C618:
- Class F Fly ash
- Class C Fly ash

III. PREPARATION OF FLY ASH AGGREGATE:

A. Batching:

Batching is the process of proportioning of materials that are required for the Fly ash aggregate preparation. In this stage the cement and Fly ash are taken in the ratio 15:85.The W/C ratio is taken as 0.4. Adjust the angle of the mixer drum as 35 to 55° and to control for the rotate disc in vertically manner should varying speed as 35 to 55 rpm Initially some of water is added in the mixture for wetting and then remaining water is sprayed during the rotating period because while rotating without water in the disc the Fly ash powder tends to form lumps and does not increase the distribution of particle size. The pellets are formed approximately in duration of 20 min.

B. Pelletization:

The content (cement, fly ash, water) were thoroughly mixed in the drum until the complete formation of Fly ash aggregates. This method of formation of Fly ash aggregates is called pelletization. Fig 1 show Pellatization process.

Fig. 1: Pelletization

C. Sieving of aggregate:

In the next step, the aggregates are sieved through 4.75 mm. the aggregates that are passed through 4.75mm sieve are fine aggregates and those does not pass are coarse aggregates. Fig 2 show sieving of aggregates

Fig. 2: Sieving of aggregates

D. Curing of Fly ash aggregate:

Hardening the pellets is done by two processes namely cold bonding and sintering. Cold-bonded Fly ash aggregates are hardened by different curing process namely normal water curing, steam curing method. Normal water curing method can be adopted for normal strength of the aggregate. Steam curing adopted for high-early strength of the aggregate at 8 to 10 hr. In this cold bonded aggregates are used.

Sintering process can be defined as burning the cold bonded pellet in a muffle furnace at temperature range of 800 to 1200°C. The mineral particles in the binder fuse together to form the crystalline structure (CSH) and results in higher strength and good durability to the aggregate. In our project cold bonded aggregates are prepared and those aggregate cured in water tank for seven days (Fig 3) and dried for one day in open atmosphere before using the fly ash aggregate in the concrete. Fig 4 show curing of aggregates

Experimental Investigation on Fresh and Hardened Properties of Concrete with GGBS and Pond Ash

P. Dhanabal[1] R. Ajith Kumar[2]
[1]Assistant Professor [2]BE Student
[1,2]Department of Civil Engineering
[1,2]Mailam Engineering College, Mailam, India

Abstract— The purpose of this study is to find the extent of GGBS as a replacement material for cement and pond ash as a replacement material for fine aggregate in concrete without compromising the strength and durability of conventional concrete. The physical and chemical properties of GGBS and pond ash have been studied and it has been found that both the industrial wastes can replace the cement upto 50% and 30% respectively in concrete from literatures. Concrete mix design for M35 grade has been carried out with conventional ingredients. The specimens were tested for mechanical properties such as compressive strength, split tensile strength and flexural strength on 7, 28 days. After determining the properties of the concrete mixes, the optimum percentage replacement levels for GGBS and pond ash has been found and reinforced concrete beams were cast to study the flexural behaviour and cubes to study the durability properties of the optimized concrete mix. It has been found that the mechanical properties of the concrete are affected in short run but the same mechanical properties and durability found to be better than the conventional OPC based concrete.

Key words: Concrete, GGBS and Pond Ash

I. INTRODUCTION

Concrete is considered to be very durable material that requires little or no maintenance. Concrete is a mixture of cement, fine aggregate, coarse aggregate and water. Concrete plays a vital role in the development of infrastructure viz., buildings, industrial structures, bridges and highways etc., leading to utilization of large quantity of cement and fine aggregate. Portland cement, already being a very expensive material constitutes a substantial part of the total construction cost of any project and the situation has further been aggravated by the energy crisis, which has further increased the cost of production of Portland cement. Therefore, it is of current important for a country to explore and develop alternate cementing materials cheaper than the Portland cement.

Cement is the most important constituent of the concrete and occupies about 20% of the volume of concrete. The demand for concrete is an ever increasing scale, leading to higher cement production. But the production of cement releases equal amount of CO_2 in to the atmosphere leading to global warming.

The $Ca(0H)_2$ which appears due to the chemical reactions affect the quality of concrete adversely by forming cavities, as it is partly soluble in water and also lacks enough strength. The Ground Granulated Blast-Furnace Slag when used along with cement has positive effect on the $Ca(0H)_2$ compound. At the end of the secondary reaction between GGBS and $Ca(0H)_2$, hydration product such as C-S-H gel is formed.

A. Objective of the Study

- To study the properties of industrial wastes such as GGBS, pond ash and their suitability to partially replace cement and fine aggregate in concrete
- To study the behaviour as well as properties of concrete in fresh and hardened state.
- To study the effect of GGBS and Pond Ash on the workability of concrete.
- To study the structural behaviour of concrete made with industrial wastes.

B. Scope of the Study

Long term durability of concrete made with GGBS and pond ash will enhance the usage and boost the confidence of engineers in using this concrete. The permeability characteristics and soundness of concrete against sulphate and acid attack are essential to establish the durability of the concrete made with GGBS and pond ash

II. MATERIALS USED

A. Cement

Selection of type of cement mainly depends on the specific requirements of concrete. It determines the strength and properties of fresh and hardened concrete. The Cement used for all the specimens were ordinary Portland cement (53 grades) with a specific gravity of 3.12 and conforming to IS: 8112-2013.

B. Fine Aggregate

In the present investigation, normal river sand quarried from Cauvery river near Musiri town was used as a fine aggregate. The fine aggregate was screened to remove deleterious materials and tested as per procedure given in IS 2386 - 1963. The fineness modulus of sand is 2.69 and confirms to Zone II grading.

C. Coarse Aggregate

In the experimental work the coarse aggregates of nominal size 20mm and 12.5mm are blended in the ratio of 60% and 40% respectively and used so that the aggregates are well graded to give required workability, minimum paste content and maximum strength.

D. Pond Ash

The physical properties of pond ash were tested in the laboratory as per standard procedure. It has a specific gravity of 1.972 with fineness modulas of 2.39 . The chemical composition of the pond ash has been taken from the literatures

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Comparative Study of Flat Slabs and Conventional RC Slabs

G.Santhosh babu[1], M.Sri Priya[2]
B. Tech Student[1], M. Tech (Structural Engineering)[2]
Department of Civil Engineering
Jawaharlal Nehru Technological University, Ananatapur, A.P, India

Abstract:
Flat Slab is better understood as the slab without beams resting directly on supports like columns & or walls. By virtue of that large Bending Moment & Shear Forces are developed close to the columns. These stresses brings about the cracks in concrete & may provoke the failure of slab, thus there is a need to provide a larger area at the top of column recognized as column head/capital. Flat slab buildings are commonly used for the construction because use of flat slab building provides many advantages over conventional RC Frame building in terms of economical, use of space, easier formwork, architectural flexibility and importantly shorter construction time.

Key Words: Flat Slabs, RC Frame Building, Storey Drift, etc

I. INTRODUCTION

Non-destructive testing is defined to evaluating the continuity, integrity, security or some physical properties of materials, components or structures via a variety of physical principles without compromising performance of object to be tested. Purpose is to detect whether material or structure is flawed, or tests the defectives' shape, orientation, size, distribution, etc., and judges the contents of materials. Nowadays, widely used non-destructive testing methods of metal fatigue detection include ray inspection, ultrasonic and acoustic emission detection, electrical and electromagnetic detection. Modern NDT techniques also include computer data and image processing, image recognition and synthesis, etc. Some presently available NDT with drone quad copter techniques are introduced in this paper.

THE STRUCTURAL FRAME ELEMENTS

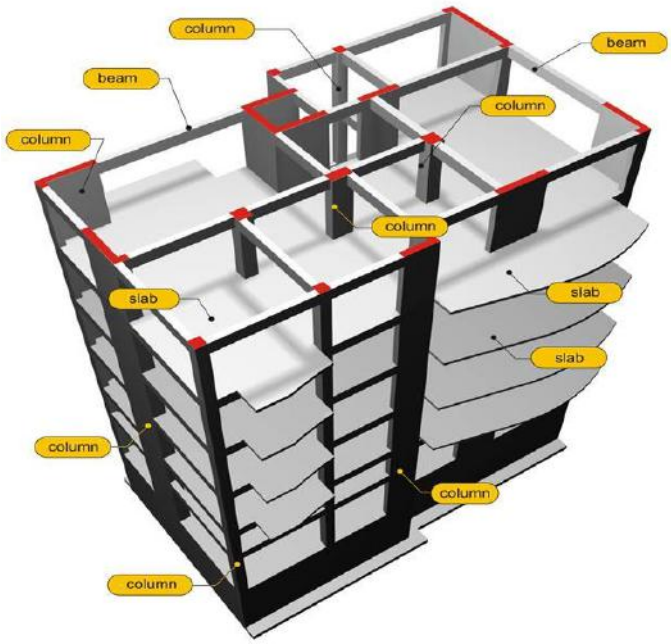

Figure.1.Structural Frame Elements

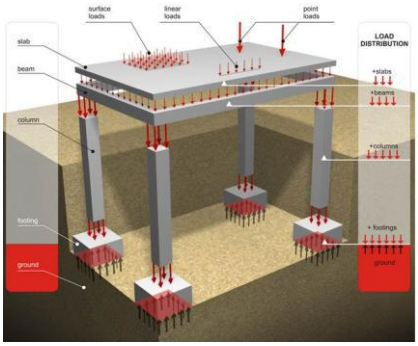

Figure.2.Load Path from the Structure Slab To the Ground

The structural frame must have enough strength to securely bear the gravity loads throughout the entire life span of the building. An adequate load bearing system is based on a continuous load path throughout the structure:

- The slabs carry the floor loads of each storey.
- The beams carry the loads transferred to them by the slabs as well as the weight of the walls seated on them.
- The columns carry the beam loads and they transmit them to the foundation.
- The footings (foundation) carry the column loads and transfer them to the ground.

2. METHODOLOGIES

1. SLABS

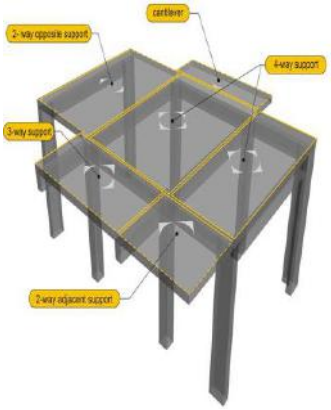

Figure.3. Slabs

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An Investigation in Non Destructive Testing using Drones on Existing Buildings

K.V.Ganesh[1], M.Sri Priya[2]
B. Tech Student[1], M. Tech, (Structural Engineering)[2]
Department of Civil Engineering
Jawaharlal Nehru technological university, Ananatapur, A.P, India

Abstract:
Non destructive testing has achieved an important place in the Quality Assurance of hardened concrete and the evaluation of existing concrete structure with regard to their strength & durability. Ultrasonic scanning is a recognized non-destructive evaluation test to qualitatively asses the homogeneity and integrity of concrete. This project entailed design and testing of an indoor quadrotor UAV capable of autonomous take-off, landing, and path finding for ultrasonic pulse velocity. The propulsion system produces 1500g of thrust at 46% throttle using 7" propellers, minimizing craft size, but allowing for sufficient payload to carry a LIDAR, a CMOS camera, and rangefinders and ultrasonic pulse velocity equipment. These sensors are interfaced to an Overo processor, which sends high-level commands to a low-level flight controller, the HoverflyPro. Flight tests were conducted which demonstrated flight control and sensor operation for ultra sonic pulse velocity testing .This simplifies the design and maintenance of the vehicle. This reduces the damage caused should the rotors hit anything.

Keywords: NDT, Drone, ultra sonic velocity, Quad Copter. Etc.,

I. INTRODUCTION

Non-destructive testing is defined to evaluating the continuity, integrity, security or some physical properties of materials, components or structures via a variety of physical principles without compromising performance of object to be tested. Purpose is to detect whether material or structure is flawed, or tests the defectives' shape, orientation, size, distribution, etc., and judges the contents of materials. Nowadays, widely used non-destructive testing methods of metal fatigue detection include ray inspection, ultrasonic and acoustic emission detection, electrical and electromagnetic detection. Modern NDT techniques also include computer data and image processing, image recognition and synthesis, etc. Some presently available NDT with drone quad copter techniques are introduced in this paper.

II. NON DESTRUCTIVE TESTING TECHNIQUES

Nondestructive testing techniques are used since the evolution of mankind and are continuously improvised with time and technology. These techniques are useful in quality control and maintenance. The nondestructive techniques that are applied at various manufacturing stages of a „low pressure heater "The strength tests, regardless of the type, are excellent for determining the criteria of quality & quality control during construction, but they leave a lot to be desired. The main disadvantage of such tests are delay in obtaining test results, the fact that the test specimen may not be truly representative of the concrete in a structure, the necessity of stressing the test specimen to failure, the lack of reproducibility in the test results and the relativity high cost of testing & wastage of concrete in form of cubes. Nondestructive methods of testing cannot be expected to yield absolute value of strength. These methods, therefore, attempt to measure some other property of concrete from which an estimate on its strength, its durability and its elastic parameters is obtained. Such properties of concrete are its hardness, rebound number and its ability to allow ultrasonic pulse velocity to propagate through it. The electrical properties of the concrete, allow us to estimate its moisture content, density, thickness and its cement content. Based on above, various nondestructive methods of testing concrete have been developed. Popular NDT Tests for Concrete Used in field are:

- Rebound Hammer Test- RH Test
- Ultrasonic Pulse Velocity- UPV Test
- Combined Method UPV & RH Test
- Core Extraction for Compressive Strength Test
- Ingredient Analysis of Concrete Core
- Concrete Cover Measurement by Laser Based Instrument

III. DRONE-QUAD COPTER

A quad copter is a flying vehicle possessing 4 identical rotors, evenly spaced around the central fuselage. First, quadrotors do not require mechanical linkages to vary the rotor blade pitch angle as they spin. Second, the use of four rotors allows each individual rotor to have a smaller diameter than the equivalent helicopter rotor, allowing them to possess less kinetic energy during flight.

Figure.1. Drone quad copter

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New Roller Barrier System for Safety Management and Efficiency on Highways

B.Mahendra Reddy[1], M.Sri Priya[2]
B. Tech Student[1], M.Tech Student[2]
Department of Civil Engineering[1], Department of Structural Engineering[2]
Jawaharlal Nehru technological university, Ananatapur, A.P, India

Abstract:
The transportation sector in India, has expanded rapidly especially after the onset of the new century. The Government of India is investing huge amounts of revenue in the infrastructure and transportation sector in order to link various cities and towns. This paper highlights on the need for cost effective road safety investments using 'rolling barrier' systems which can redirect the deviated automobiles onto the right path and also prevent the overturning of vehicles. The Road accidents are an outcome of the interplay of various factors, some of which are length of road networks, vehicle population, human population adherence/enforcement of road safety regulations etc. This study aims to evaluate the effectiveness of the Rolling Barrier and to understand the Rolling Barrier's characteristics of crash cushioning, how to correct the vehicles running direction and the required strength of barriers. The Rolling Barrier satisfied the ministry of construction and transportations, "Guidelines for Installation and management of road safety facilities". The Rolling Barrier can be effectively used in curved roads sections, ramps, medians and entrance or exit ramps in parking garages

Keywords: Accidents, Government, Highways, Life, Rolling Barrier, Safe Barrier, Urethane, Vehicles.Etc.

I. INTRODUCTION

'Safety Roller' is a safety fixture that prevents drivers and passengers from fatal accidents by not only absorbing shock energy but also converting shock energy into rotational energy. 'Safety Roller' needs to be installed at sites where vehicles are exposed to frequent accidents. 'Safety Roller' will safely lead a vehicle back to the road or stop the vehicle by absorbing shock energy. 'Safety Roller' will effectively function for drivers to properly control vehicles with its noticeable color and self-luminescence. One Korean company developed a product to reduce the harsh impacts of guardrails & hopefully save lives. Every year approximately 1.25 million people die as a result of a road traffic crash. According to Federal Highway Administration, the guardrail can operate to deflect a vehicle back to the roadway, slow the vehicle down to a complete stop or let it proceed past the guardrail. The guardrail can't completely protect against the situations drivers may find themselves. To minimize the no. of accidents a company called ETI (Evolution in Traffic Innovation) designed "Rolling Barrier System".

FEATURES

- LED guide lamp (solar energy).
- Two Pieces.
- Material is eco-friendly.
- It reduces the speed of vehicle.
- Reduces costs in repairing & maintenance due to Roller's resilience
- Made of special chemical compound like hard rubber.
- Easy to maintain due to separated barrels (recyclable).
- Stopper boards installed on the top and the lower part of the barrels to guide objects back to the road.
- Easy to adjust height, noticeable to drivers due to noticeable coloration and self-luminescence.
- Noticeable to drivers due to noticeable coloration and self-luminescence.
- Stopper boards installed on the top and the lower part of the barrels to guide objects back to the road.
- Easy to adjust height, noticeable to drivers due to noticeable coloration and self-luminescence.

II. BARRIER

Barriers or guard rails or longitudinal barriers or traffic barriers keep vehicles within their road way and prevent vehicles from colliding with dangerous obstacles such as boulders, sign supports, trees, bridge abutments, building walls and large storm drains.

TYPES OF BARRIER

Barriers are categorized in to two ways, by the function they serve and by how much they deflect when a vehicle crashes into them,

1. BARRIER FUNCTIONS:-

- Road side barriers are used to protect traffic from roadside obstacles or hazards.
- Median barriers are used to prevent vehicles from crossing over a median and striking an oncoming vehicle in a head on crash.
- Bridge barrier is designed to restrain vehicles from crashing of the side of a bridge and falling onto the roadway.
- Work zone barriers are used to protect traffic from hazards in work zones.

2. BARRIES STIFFNESS:-

- Flexible barriers include cable barriers and weak post corrugated guide rail systems. They will deflect 1.6 to

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An Investigation on Structural Stability for Aerospace Structures

Sudhanshu Raj[1], Sri Priya[2]

B.Tech, Department of Civil Engineering, JNTU Ananatapur, Andhra Pradesh, India[1]

M.Tech, Department of Structural Engineering, JNTU Ananatapur, Andhra Pradesh, India[2]

ABSTRACT: An aircraft is a device that is used for, or is intended to be used for, flight in the air. Major categories of aircraft are airplane, rotorcraft, glider, and lighter-than-air vehicles. The paper attempts a broad overview of the vast field of stability of structures, including elastic and an elastic structure, static and dynamic response, linear and non-linear behaviour, energy approach, thermodynamic aspects, creep stability and fracture or damage-induced instability. The principalaccomplishments are succinctly reviewed, and fruitful recent trends, particularly the stability analysis of damage localization and fracture, are emphasized.

KEYWORDS: fuselage, wings, stabilizers, Landinggear,etc

I. INTRODUCTION

The airframe of a fixed-wing aircraft consists of five principal units: the fuselage, wings, stabilizers, flight control surfaces, and landing gear. Helicopter airframes consist of the fuselage, main rotor and related gearbox, tail rotor, and the landing gear. Airframe structural components are constructed from a wide variety of materials. The earliest aircraft were constructed primarily of wood. Steel tubing and the most common material, aluminium, followed. Structural members of an aircraft's fuselage include stringers, lingering, ribs, bulkheads, and more. The main structural member in a wing is called the wing spar. The skin of aircraft can also be made from a variety of materials, ranging from impregnated fabric to plywood, aluminium, or composites. Under the skin and attached to the structural fuselage are the many components that support airframe function.

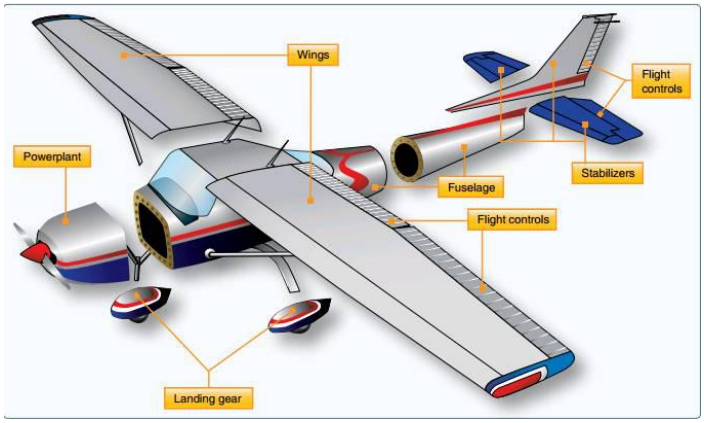

Fig.1. Aircraft Components

The airframe of a fixed-wing aircraft consists of thefollowing five major units:1. Fuselage2. Wings3. Stabilizers4. Flight controls surfaces5. Landing gearA rotary-wing aircraft consists of the followingfour major units:

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Design of an Auditorium Building

Sri Priya[1], Vineeth reddy[2], Diwakar reddy[3] ,Gopi[4] ,Soma Sekhar[5]

Assistant Professor, M.Tech, Department of Structural Engineering, KEC, JNTU Ananatapur, Andhra Pradesh, India[1]

B.Tech, Department of Civil Engineering, KEC, JNTU Ananatapur, Andhra Pradesh, India[2,3,4,5]

ABSTRACT: This project deals with the analysis and design of the Auditorium with special emphasis on Slabs, Beams, Columns, Footing and Staircase. Analysis is carried out using Substitute Frame Analysis and preliminary analysis of Beams is carried out using Moment Distribution method. Concrete mix used for the RCC members is M20 and steel used is high yield strength deformed bars of grade Fe415. Limit State Method is adopted for the design of all structural members in the building. Safe bearing capacity of soil is taken as 200kN/m2.Footing is designed as Isolated type. Plan and detailing of reinforcement are enclosed in this report. Area and other specifications are taken from IS 2526:1963 (Code of practice for acoustical design of Auditorium and conference halls) and NBC (National Building Code). The limit state method of collapse using IS: 456-2000, and SP16 have been adopted for the design of structural components like slabs, beams, columns and foundations. Design and analysis is done manually and the results are verified using STAAD Pro. We have used the AUTO CAD.

KEYWORDS: Acoustic, Beam, Column ,Footing ,Analysis, Slab, Auto Cad ,Staad Pro,etc

I. INTRODUCTION

An auditorium is a room built to enable an audience to hear and watch performances such as theatres. Auditorium, Conference hall, Library and Indoor Games are necessary for an Engineering college. In Kuppam College of Engineering, Library, Conference hall are located at different locations and also there is no special building for Auditorium. This project reports on the analysis and design of Auditorium, Library and Indoor Games hall in one separate block. All structural components for the building such as beams, columns, slabs, staircase etc are analysed and designed. Isolated footing is adopted for all columns. Safe bearing capacity is taken as 200kN/m^2. The structure is designed by using limit state method, adopting M20 concrete and Fe415 HYSD bars. Site plan, plan showing various floors, section of plan, elevation of plan and detailing of reinforcements for Beam, Column, Slab, Staircase and Footing are also enclosed

1.1. ACOUSTICAL REQUIREMENTS

- **Halls Used for Speech** -The clarity of speech is most important in this case. Optimum clarity depends on:
  1 correct reverberation time,
  2 absence of echo,
  3correct loudness level at all parts of hall.
- **Halls for music** - Adequate reverberation is important to lend proper blending and fullness of music. The reverberation time is required to be higher than for halls meant for speech only.
- **General Purpose Halls Used for Both speech and music**- The reverberation time should be in-between that provided for in halls for music and speech.
- **Cinemas (Sound Picture halls)** - In view of the fact that a certain amount of reverberation is already present in the recorded sound, the reverberation time required in this case is lower than that required.
- **Open-Air Auditoriums and Conference halls**- While the general acoustical requirements are similar to those specified for halls additional requirements which arise are dealt with in 10·

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STUDY OF MACRO LEVEL PROPERTIES OF SCC USING SILICA FUME AND FLY ASH BY USING ROBOSAND

V. Rahul
M.Tech, Structural Engineering, JNTUA College,
Anantapur, Andhra Pradesh, India

Dr. C. Sashidhar
Professor Department of Civil Engineering, JNTUA College,
Anantapur, Andhra Pradesh, India

Dr. J. Guru Jawahar
Associate Professor, Department of Civil Engineering,
AITS Tirupathi, Andhra Pradesh, India

D. Pavan Kumar
Research Scholar, Department of Civil Engineering, JNTUA College,
Anantapur, Andhra Pradesh, India

ABSTRACT

One of the major environmental concerns is the disposal of the waste materials and utilization of industrial by products. Many power plants and electro static precipitators will produce millions of tons waste powder every year. Having considerable high degree of fineness in comparison to cement this material may be utilized as a partial replacement to cement. For this purpose an experiment is conducted to investigate the possibility of using fly ash powder in the production of SCC with combined use SILICAFUME and how it affects the fresh and mechanical properties of SCC. First SCC is made by replacing cement with SILICA FUME in 10% and fly ash powder is blended to mix in percentage like 25% as a partial replacement to cement. Here we use manufacture sand as fine aggregate. By taking fineness modulus 2.5,2.7,2.9 .Test results shows that the SCC mix with combination of 10% SILICA FUME and 25% fly ash powder with fineness modulus 2.7 satisfies filling ability and passing ability and hardened properties are also in the limits prescribed by the EFNARC.

Key words: self compacting concrete, SILICA FUME, Fly ash.

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http://iaeme.com/Home/issue/IJCIET?Volume=8&Issue=2

Effect of artificial sand on fresh characteristics of self-compacting geopolymer concrete

C. Sashidhar, B. Radhamma, J. Guru Jawahar, C. Yedukondalu

Self-compacting geopolymer concrete (SCGC) is an advanced concrete that reduces both vibration and usage of cement. In this study, SCGC mixes were carried out with 50:50 proportions using class F fly ash (FA) and ground granulated blast furnace slag (GGBS) with artificial sand (ARS) as fine aggregate. By following EFNARC guidelines and carrying out trial mixes an optimum proportion is used for 8M, 10M and 12 M of NaOH. The present research is mainly concentrated on fresh properties of SCGC by varying the molarity of sodium hydroxide (NaOH) with 8M, 10M and 12M. The test methods such as Slump flow, T_{500} slump flow, V-funnel and L-box were conducted. Studies also exposed that the fresh properties were decreased when the NaOH molarity was increased.

Keywords: *Self-compacting geopolymer concrete, fly ash, ground granulated blast furnace slag, alkaline liquid, artificial sand.*

1. INTRODUCTION

Concrete is one of the mostly used construction material in the world [1]. In conventional concrete the prime ingredient is Ordinary Portland Cement. The manufacturing of OPC increases the CO_2 diffusion which effects pollution to the environment and also consumes vast quantity of natural resources [2]. So as to decrease the OPC which effects pollution alternate binders are introduced. Special types of concrete are being developed based on the purpose and constraints in the construction industry. Among special types of concrete being produced, SCC is proven to have excellent engineering properties with reduced CO_2 diffusion. It not only decreases the greenhouse gas diffuses but also utilizes a huge amount of industrial waste materials like fly ash and slag. Considering these positive attributes, it is becoming an increasing and popular construction material [3 & 4].

Davidovits introduced geo polymeric binders showing capable area of investigation in construction industry as alternate binders to OPC. The geopolymers are developed from the polymeric reaction of alkaline liquids with the Si and Al base materials of naturally achievable resources or industrial waste such as FA, GGBS, rice husk ash (RHA) etc.,[4]. The mixture of GGBS and Metakaolin and naturally obtained Si-Al minerals, low calcium FA, metakaolin have been considered as source materials. To get adequate strengths of geo polymer concrete (GPC), both FA and GGBS in definite proportions were establishing to be geopolymer source materials. Generally, in the geopolymer technology, the mixture of NaOH or KOH and Na_2SiO_3 or $KSiO_3$ solution can be studied as alkaline liquid [5-7].

Amount of sand in SCC should be more than half of the whole aggregate [8]. Sand can be artificial or natural but sand have to be of uniform grading and absorption characteristics should be intimately observed [9].

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Case study

Study and predicting the stress-strain characteristics of geopolymer concrete under compression

Sreenivasulu Chitrala[a,*], Guru Jawahar Jadaprolu[b], Sashidhar Chundupalli[a]

[a] Department of Civil Engineering, Jawaharlal Nehru Technological University, Anantapur, 515002, India
[b] Department of Civil Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, 517520, India

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Regression analysis

ABSTRACT

The present investigation is mainly focused on studying the complete stress-strain characteristics of geopolymer concrete (GPC) with different fine aggregate blending. In this study, granite fines (GF) were used as a partial replacement of fine aggregate. Sand and GF were used as fine aggregates blended in different proportions (100:0, 80:20, 60:40 and 40:60) (sand:GF) by weight. GPC cylindrical specimens were tested under compression and the results obtained from the tested data were analyzed to determine the compressive strength (f_{cm}), stress-strain relationship, peak strain (ε_p), linearity of the stress-strain curve, ultimate strain (ε_u), various modulus of elasticity (MOE) values, and Poisson's ratio (μ) of GPC after a period of 7, 28 and 90 days respectively. From the results, it is concluded that the increasing trend was observed in the properties till 40% (60:40) of GF replacement and then these values were decreased. So, optimum fine aggregate was blended at 60:40. Based on the test results, new models were developed for predicting the stress-strain characteristics of GPC under compression by using regression analysis. The results of proposed models were then compared with the experimental values and the predicted equations by various codes and past research.

1. Introduction

It is known that the global consumption of cement is approximately more than 2.2 billion tons per year [1] which leads to emission of equal quantity of carbon dioxide [2]. To minimize this effect, an alternative binder for the concrete technology was proposed in the year 1978 i.e., geopolymer technology by Davidovits [3]. Rangan [4] reported that fly ash based GPC showed excellent performance by activating the Si-Al minerals present in fly ash under alkaline activator solution (AAS). Supraja and Kanta Rao [5] studied on GPC incorporating ground granulated blast furnace slag (GGBS) with different molarities of NaOH for improving the strength of concrete, because it consists of Si-Al minerals present in the composition, which reacts with AAS to contribute additional formation of geopolymeric chain bonds (Si-O-Al-O) and depicted in Fig. 1. From Mustofa and Pintowantoro [6], the compressive strength of ferronickel Slag based GPC was mainly depended on Si-Al ratio and concluded that the strength was increased up to the ratio of 3.5. On the other hand, GPC also influenced by fine aggregate [7,8], super plasticizer [9] and temperature [10,11]. So, from the past research [4–8], it is concluded that the GPC mainly depends on Si-Al content present in the materials like fly ash, GGBS and fine aggregate also.

* Corresponding author.
E-mail addresses: sreenivas.ce.aitt@annamacharyagroup.org (S. Chitrala), gurujawahar.ce.aitt@annamacharyagroup.org (G.J. Jadaprolu), sashidhar.civil@jntua.ac.in (S. Chundupalli).

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ORIGINAL PAPER

Predicting compressive strength of geopolymer concrete using NDT techniques

C. Sreenivasulu[1] · J. Guru Jawahar[2] · C. Sashidhar[1]

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Abstract
The present investigation is mainly focused on predicting compressive strength of geopolymer concrete (GPC) using non-destructive testing (NDT) techniques viz., Schmidt rebound hammer (SRH), ultrasonic pulse velocity (UPV) and combined method. The NDT techniques were performed to compare the accuracy between the SRH, UPV and combined method in estimating the compressive strength of GPC. In this study, four mixes of GPC were prepared with different fine aggregate blending. Sand and granite slurry or granite fines (GF) are blended in different proportions (100:0, 80:20, 60:40 and 40:60). Coarse aggregates of size 20 and 10 mm are blended in proportions 60:40. Ground granulated blast furnace slag (GGBS) and fly ash (class F) were used at 50:50 ratio as geopolymer binders. Combination of sodium hydroxide (8M) and sodium silicate solution was used as an alkaline activator. Prior to compressive strength of test specimens, SRH, UPV and combined method were recorded after 7, 28 and 90 days of curing at ambient room temperature. From the results, it is revealed that the compressive strength, SRH, UPV and combined method results were increased up to fine aggregate blending of 60:40. Different equations were proposed correlating the compressive strength of concrete to SRH, UPV and combined method. Statistical analysis includes type of fit, sum of square residuals and standard errors were determined for the proposed equations. The measured compressive strength of all mixes was compared with predicted equations developed by past researchers.

Keywords Geopolymer concrete · Compression strength · Non-destructive testing · Schmidt rebound hammer · Ultrasonic pulse velocity · Combined method

Introduction

Approximately, it is estimated that the global consumption of cement is more than 2.2 billion tons per year (Malhotra 1999), so it releases equal quantity of carbon dioxide (Hardjito & Wallah 2002). To minimize this affect, an alternative binder for the concrete technology was proposed in the year 1978, i.e., geopolymer technology (Abhishek et al. 2015). GPC is mainly influenced by fly ash (Rangan 2008), ground granulated blast furnace slag, molarities of NaOH (Supraja & Kanta Rao 2011), superplasticizer (Aminul & Rajan 2012), and temperature (Kong & Sanjayan 2012). Heat-cured low calcium fly ash-based geopolymer concrete has excellent compressive strength, suffers very little drying shrinkage and low creep, excellent resistance to sulfate attack, and good acid resistance compared to water curing (Sumajouw & Rangan 2006).

The chemical composition of the geopolymer material is similar to natural zeolitic materials, but the microstructure is amorphous instead of crystalline (Xu & Van Deventer 2000). The polymerisation process involves a substantially fast chemical reaction under alkaline condition on Si–Al minerals, which results in a three dimensional polymeric chain and ring structure consisting of Si–O–Al–O bonds, as follows (Davidovits 1999).

$$\mathrm{Mn}\ [-(\mathrm{SiO_2})\,z-\mathrm{AlO_2}]\,n.\,w\mathrm{H_2O}$$

✉ C. Sreenivasulu
chitralasreenivas@gmail.com

[1] Department of Civil Engineering, Jawaharlal Nehru Technological University, Anantapur, India

[2] Department of Civil Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, India

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ORIGINAL PAPER

Evolution of 112-day drying shrinkage equation of fly ash blended self-compacting concrete

J. Guru Jawahar[1] · B. Yakshareddy[1] · C. Sashidhar[2] · C. Sreenivasulu[2] · I. V. Ramana Reddy[3]

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Abstract
This investigation is mainly focused on the prediction of 112-day drying shrinkage of self-compacting concrete (SCC) and conventional concrete (CC) blended with or without class F fly ash using symbolic regression. Two logical parameters, namely additive factor (AF) and coarse aggregate points (CAP), have been included in the preparation of input parameters to address the influence of fly ash and coarse aggregate on the drying shrinkage of concrete. The experimental data provided by literature and this investigation have been used for symbolic regression. It is evidently revealed that the evolved equation (AF_CAP_Equation) was able to predict the 112-day drying shrinkage of SCC and CC reasonably. Effect of AF and CAP on the drying shrinkage of concrete mixes has also been discussed.

Keywords Drying shrinkage · Self-compacting concrete · Conventional concrete · Admixture factor · Coarse aggregate points · Symbolic regression

Introduction

Drying shrinkage of concrete is normally defined as the volumetric change that is caused by the loss of water held in gel pores and capillary pores under drying conditions (Neville 1996). Drying shrinkage can be a reason for the deterioration of concrete structures. The contraction of the material is normally hindered by either internal or external restraints so that tensile stresses are induced. These stresses may exceed the tensile strength of concrete and cause concrete to crack (Saleh and Rajeh 2006; Ayano and Wittman 2002). Drying shrinkage of self-compacting concrete (SCC) is high due to its higher paste volume and lower coarse aggregate content as compared to that of conventional concrete (CC) (Ghoddousi and Monir Abbasi 2008; Loser and Leemann 2009). The volume of paste of a concrete mixture is usually defined as the sum of the volumes of cement, water, mineral addition and chemical admixtures. Increasing the volume of paste improves the flowability but it may have unexpected effects on mechanical properties and time-dependent deformations. For example, drying shrinkage is known to increase with the volume of paste (Bissonnette et al. 1999; Leemann et al. 2011).

Shrinkage is a paste property and the aggregate is the most influential restraint on the change in volume (Neville 1996; Mindess et al. 2003). The magnitude of drying shrinkage is influenced by both internal and external factors. Internal factors include water content, cement content, quality and quantity of paste, aggregate size and its content, mineral admixture characteristics and its content. External factors include size and shape of concrete mass, curing conditions, ambient relative humidity and length of drying period (Campbell-Allen and Roper 1991). At a constant water–cement ratio (*w/c*), the increase in both cement and water contents increases the shrinkage due to the increased volume of both gel pores and capillary pores (Neville 1996). If the water content is held constant and the cement content is increased, the decrease in water–cement ratio (*w/c*) decreases the amount of gel pores and capillary pores and, thereby, the amount of shrinkage can be reduced

✉ J. Guru Jawahar
gurujawaharj@yahoo.co.in

[1] Department of Civil Engineering, Annamacharya Institute of Technology and Sciences, Tirupati 517 520, India

[2] Department of Civil Engineering, Jawaharlal Nehru Technological University, Anantapuramu 515 002, India

[3] Department of Civil Engineering, Sri Venkateswara University, Tirupati 517 502, India

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Flexural Studies on Fly Ash and GGBS Blended Reinforced Geopolymer Concrete Beams

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Analytical Study on Fly Ash and GGBS Blended Reinforced Geopolymer Concrete Beams by using ANSYS

B. Sri Kalyan[1] Dr.J. Guru Jawahar[2] C. Sreenivasulu[3]
[1,2]PG student
[1,2,3]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Tirupati, India [3]Jawaharlal Nehru Technological University Anantapur, Anantapuram, India

Abstract— The present study mainly focuses on analytical study of fly ash and GGBS blended reinforced geo polymer concrete beams. The beams were analyzed by using Ansys R15.0. The reinforced geo polymer beams analyzed were cured for 28days in an ambient room temperature itself. The conventional reinforced concrete beam analyzed were cured for 28 days in water. The proportions of source materials for geo polymer concrete used are fly ash(FA) 50- Ground Granulated Blast Furnace Slag (GGBS) 50, FA0-GGBS100. The grade of Conventional Concrete (CC) was fixed equivalent to that of Geopolymer concrete with the earlier specified proportions. The grade of geo polymer concrete was fixed to be M45 by doing trial and error method. The beams were analyzed for two- point loading. The parameters such as Max.Equivalent stresses (Von-Misses stress), Max.Normal Stress, Max. Normal Elastic Strain, Max.Shear Stress, Max.Shear strain and Max.central deflection were found. The present study has given a final conclusion that the performance of reinforced geo polymer concrete (RGPC) beams was better than that of equivalent grade of reinforced conventional concrete beams.

Key words: Reinforced Geopolymer concrete beams; Ansys R15.0; Max.Equivalent stresses (Von-Misses stress); Max. Normal Elastic Strain; Max.Shear Stress; Max.central deflection

I. INTRODUCTION

Concrete is the most widely used construction material after water in the world and ordinary Portland cement (OPC) is the major ingredient used in concrete. The production of cement releases large amount of carbon dioxide (CO2) to the atmosphere that significantly contributes to greenhouse gas emissions. It is estimated that one ton of CO2 is released into the atmosphere for every ton of OPC produced [1].The mechanical properties of Geo-polymer concrete(GPC) mixes with different aggregates blending and also combination of sodium hydroxide and sodium silicate solution was used as alkaline activator and conclude that optimum fine aggregate blending and also all Splitting Tensile Strength (STS) and Flexural Strength(FS) of all mixes were compared with ACI 363R, CEB-FIP and ACI 318R predicted equations [2]. The mechanical properties of Geo-polymer concrete(GPC) using granite slurry(GS) as sand replacement at different levels and cured at room temperature and concluded that optimum replacement level of GS used in place of sand and can solve the natural resources [3]. The load deflection relationships, crack pattern, ultimate load was obtained and compared with the experimental results available in literature and obtained results shows good agreement with the experimental results for comparative study of experimental and analytical results of FRP strengthened beams in flexure [2]. A study on the unretrofitted RC beam designated as control beam, RC beams retrofitted with CFRP composites in uncracked and precracked beams were studied in Ansys and The results obtained was in good agreement with the experimental plots [3]. The dynamic analysis of the composite beam was studied and values of Young Modulus, Poisson's ratio and shear modulus were determined by using Ansys [4]. Beams strengthened with Carbon Fiber Reinforced Polymer and the beams were modelled using ANSYS and the obtained results were compared with the experimental one and was found to be in good agreement [5]. The load deflection relationship, crack pattern and ultimate load were obtained and also comparison were done for the CFRP and GFRP and reported that the performance of beams with retrofitting with CFRP was better than the beams with retrofitting with GFRP by using Ansys[6]. An Analytical Investigation of Bonded Glass Fiber Reinforced Polymer Sheets with Reinforced Concrete Beam Using Ansys which has been used to study the strengthened behavior of the beam and gave the conclusion as the Deflections in the beams retrofitted with GFRP are less than RCC beam and for the same load the RCC beam with GFRP have the less stresses and strains. In the comparison cases both experimental and analytical results are coinciding [7]. The models which are analyzed has shown the same structural response and failure modes as found in the experimental investigation [8]. The modelling of RC beams with and without openings by using Ansys and were investigated on beam strength, stiffness, deformed shape, and cracked patterns by the experimental and theoretical results were concluded that the both results were showed satisfactory [9]. A theoretical and experimental study on mechanical properties and flexural strength of fly ash-geo polymer concrete using young's modulus, Poisson's ratio stress-strain relation and indirect tensile strength with four-point loading and as FEM and concluded after the results there were approximate values by comparing both the theoretical and experimental study [10].

II. EXPERIMENTAL STUDY

Our objective was to determine the parameters such as Max.Equivalent stresses (Von-Misses stress), Max.Normal Stress, Max. Normal Elastic Strain, Max.Shear Stress, Max.Shear strain and Max.central deflection for reinforced beams of M45 grade of conventional concrete (CC) and geo polymer concrete having proportions of FA 50- GGBS 50and FA0-GGBS100 were FA is fly ash and GGBS is Ground Granulated Blast Furnace Slag.

A. Materials

The source materials for silica and aluminum were taken as Fly Ash and GGBS. Class F fly ash has been taken as it has

Structural Investigations on Cost Effective Roofing Technology

B.Saikumar[1] N.G.Bhagavan[2] Guru Jawahar[3]
[1]P.G.Student [2]Senior Principal Scientist [3]Professor
[1,2,3]Department of Civil Engineering
[1,3]Annamachrya Institute of Science and Technology, Tirupati. Andhra Pradesh, India [2]CSIR - Structural Engineering Research Centre(CSIR-SERC), Chennai

Abstract— Development of cost effective roofing system built with precast ferrocement elements is discussed. This roofing technology is exclusively designed for innovative / affordable / rapid-built / disaster-resistant SERCular Housing Technology developed by CSIR-SERC. This type of rural house is built of a 2-roomed unit, proposed for Pradhan Mantri Awas Yojana – Garmin (PMAY-G), consisting of each room as a standard 4-meter diameter circular module. For this type of housing, the proposed roofing system is designed to cover over the 4-m. diameter (spanning across the circular walls), with the precast rectangular ferrocement joists reinforced by chicken-wire mesh plus welded mesh and 8-mm rods. The ferrocement planks are used for lateral spanning on the two parallel joists placed at 0.4m spacing. Each of the precast ferrocement elements are designed to weigh less than 200kg, for the ease of manual handling, with-out the necessity of machines / cranes. In-situ screed concrete of 40mm thickness was laid on this roofing system made of precast ferrocement joists and planks, to enable them to act monolithically and for structurally connecting different precast elements. The full-scale / prototype roofing system for 4-m. span with overhang of 0.3m on either end for a total length of 4.6m and 0.8m width, is constructed for load testing. The structural investigations are carried-out on this roofing system by flexure testing, with gradually increasing UDL in the structural testing laboratory of CSIR-SERC. The test procedure is illustrated. Test results are tabulated and the conclusions are drawn. The advantages of this type of precast ferrocement roofing system are described.

Key words: Ferrocement roofing elements; Flexure test; Precast ferrocement joists; Ferrocement planks; Screed; concrete

I. INTRODUCTION

Pradhan Mantri Awas Yojana - Gramin (PMAY-G) is the housing scheme launched by the Government of India, towards the objective of providing affordable housing to rural poor masses. As per PMAY-G minimum plinth area of a rural house should be 25-sq.m. Under the PMAY-G, the monetary assistance offered from government is Rs.1.20 lakhs. The government of India has set the target of building one-crore rural houses within a period of 3-years. Towards the requirements and specifications of PMAY-G, the CSIR-SERC has developed an innovative technology to be adopted in building rural dwelling units with rapid / fast and economical construction technology. This is called as "SERCular Housing Technology". This two roomed house design consists of standard 4-meter diameter circular shaped rooms, built with innovative interlocking earth blocks for walling. These blocks have a special interlocking tongue and groove mechanism. These earth blocks are made of soil-cement mixture. The blocks are curved in shape to the radius of 2 meters. SERCular technology has got fast construction advantages because of its special interlocking mechanism. By mere assemblage, these blocks form a circular shape by itself, maintaining verticality and no skilled labour is needed for masonry works.

Fig. 1: SERCular housing developed for PMAY-G

The circular geometry has got inherent economic and structural advantages. This is because circle needs minimum circumference to cover the given plinth area, when compared to any other shape. It means the circular housing requires minimum walling for given plinth area and hence these houses are economical and affordable. Circular shape of the house being a better aero-dynamic shape, SERCular houses are naturally cyclone resistant. As the circular walling do not contain any seismically failing corners (unlike rectangle wall corners), they are earthquake resistant too.

In all the precast components and in the experimental constructions, the Portland Pozzolona Cement (PPC) is utilized. PPC is a kind of blended cement which is produced by inter-grinding of OPC clinker along with gypsum and pozzolonic materials in certain proportions. PPC may also be produced by grinding the OPC clinker, gypsum and pozzolonic materials separately, and mixed thoroughly. Pozzolona is a natural or artificial material containing silica in a reactive form. It may be further discussed as siliceous or siliceous and aluminous material which in itself possesses little, or no cementitious properties but will be in very finely divided form. In the presence of moisture, the pozzolona will chemically react with calcium hydroxide at ordinary temperature to form compounds possessing cementitious properties. It is essential that pozzolana be in a finely divided state as it is only then that silica can combine with calcium hydroxide in the presence of water to form stable calcium silicate which have cementitious properties. The cement used in this experimental investigation is PPC conforming to IS 1489

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EFFECT OF ARTIFICIAL SAND ON MECHANICAL PROPERTIES OF SELF COMPACTING GEOPOLYMER CONCRETE

Prof C. Sashidhar[1], B. Radhamma[2], J. Guru Jawahar[3], D. Pavan kumar[4]

[1]*Professor, Department of Civil Engineering, JNTU, Anantapur, India*
[2]*PG scholar in structural engineering, JNTU, Anantapur, India*
[3]*Professor, Department of Civil Engineering, AITS, Tirupati, India*
[4]*Research scholar in Civil engineering, JNTU, Anantapur, India*

ABSTRACT

Self compacting geopolymer concrete (SCGC) is an advanced concrete that doesn't require both cement and compaction. In this research, SCGC mixes were prepared using class F fly ash (FA) and ground granulated blast furnace slag (GGBS) in 50:50 proportions with artificial sand (ARS) as fine aggregate. According to EFNARC guidelines mix design was prepared with 8M, 10M and 12M of NaOH. After successful evaluation of various fresh properties like slump flow, T_{50cm} slump flow, V-funnel, L-box, the present experimental investigation was carried out on mechanical properties like compressive strength and flexural strength after 28 and 56 days of ambient room temperature curing. Performance aspects such as first crack load, ultimate load, ultimate deflection, crack patterns and failure mode of reinforced SCGC (RSCGC) beams were studied. The mechanical properties are evaluated and get a conclusion that curing time gives better strength in all molarities and also found that the increase in NaOH molarity decreased the fresh properties, however it increased the compressive and flexural strength of SCGC.

Key words: Self compacting geopolymer concrete, class F fly ash, ground granulated blast furnace slag, artificial sand, compressive strength, and flexural strength.

INTRODUCTION

Concrete is the resolution of all the construction and development activities around the world. The prime ingredient of conventional concrete is OPC. From environment point of observation, making of OPC is not environmental friendly view as it takes huge quantity of natural resources and releases a major quantity of green house gases [1]. So as to decrease the manufacture of OPC which effect the pollution to the environment alternate binders are introduced. Special types of concrete are being developed based on the purpose in the construction industry. Among special types of concrete being produced, SCGC is proven to have excellent engineering properties with reduced green house gases diffusion. It not only decreases the greenhouse gas diffuses but also utilizes a huge amount of industrial waste materials like fly ash and slag. Considering these positive attributes, it is becoming an increasing and popular construction material. Davidovits introduced geo polymeric binders showing promising region of study in construction industry as alternate binders to OPC. A polymeric reaction of alkaline liquids with the Si and Al source materials of naturally existing resources or industrial by-products such FA, GGBS, rice husk ash (RHA) etc., develops these geopolymers [2].

In SCC amount of sand should be more than half of the whole aggregate [3]. Sand can be artificial or natural sand has to be of uniform grading and absorption characteristics should be intimately observed [4]. Therefore amount of sand required for SCGC is higher than that of CC. If natural sand is used in huge quantity, it not only affects environmental problems but also lack of natural resources and usage of artificial sand is the solution for this problem. Researchers have shown that use of artificial sand gives the superior strength than with river sand [5&6].

GuruJawahar and Mounika observed that at room temperature FA and GGBS blended GPC mixes attained enhances mechanical properties [7]. Sujatha et al. concluded that stiffness, ductility and high load carrying capacity and exhibited by geopolymer concrete columns until failure [8]. Anuradha et al. pointed that tensile strength of GPC manufactured with artificial sand is lower than that of GPC manufactured with river sand [9].

Palmo et al. concluded that mechanical properties of the fly ash based GPC significantly affected by the curing temperature. However, current studies declared that GPC mixes can be improved for ambient room temperature [10]. Hardjito et al. [11] noticed that SP was create to be used to attain sufficient workability as fresh GPC was extremely viscous with low workability. Generally, in the geopolymer technology, the mixture of sodium hydroxide or potassium hydroxide and

Studies on Mechanical and Durability Properties of Geo Polymer Concrete with Fly ash and Slag for Different Molarities

Santhosh P[1] Abhilash P[2] Guru Jawahar J[3]
[1]P.G. Student [2,3]Assistant Professor
[1,2,3]Department of Civil Engineering
[1,2,3]Annamacharya Institute of Technology and Sciences, Andhra Pradesh, India

Abstract— The objective of this project is to study the effect of class F fly ash (FA) on the mechanical and durability properties of Geo Polymer concrete (GPC). Sodium silicate (Na2SiO3) and sodium hydroxide (NaOH) solution has been used as alkaline activator with different molarities like 4 molarity, 6 molarity, 8 molarity and 10 molarity. In the present investigation it is proposed to study the mechanical properties viz. compressive strength after 7, 14, 28, 56 and 112 days and split tensile strength after 28, 56 and 112 days ambient room temperature curing and durability properties viz. loss of unit weight and compressive strength in acid curing for 28 and 56 days.

Key words: Geo Polymer concrete; Fly ash; Compressive strength; splitting tensile strength; Flexure strength

I. INTRODUCTION

Concrete is one of the most widely used construction material and it is usually associated with Portland cement as the main component for making concrete. Geo Polymer can be considered as the key factor which does not utilize Portland cement, nor releases greenhouse gases. The Geo Polymer technology proposed by Davidovits [1-2] shows considerable promise for application in concrete industry as an alternative binder to Portland cement. Davidovits proposed that the binders could be produced by a polymeric action of alkaline liquids with the silicon and the aluminum in source materials of geological origin or by-product material such as fly ash and slag. He termed these binders as Geo Polymers. Among the waste or by-product materials, fly ash and slag are the most potential source of Geo Polymers.

II. GEO POLYMERS

In general the source materials and alkaline liquids are treated as major materials in the Geo-polymers. By mixing the two solutions, named sodium hydroxide *(NaOH)* and sodium silicate *(Na_2So_3)* we can prepare an alkaline liquid which is used in geo-polymers. The reaction takes place by sodium hydroxide and sodium silicate solutions is treated as the geo-polymerization process for our convenience. And also we have to consider that Silica *(Si)* and Aluminum *(Al)* are key elements in geo-polymers. The percentage of aluminum and silicon are to be taken into account in the materials which are used. The source materials like Fly ash, silica fume, slag, rice husk-ash etc are to be used. The source material selection is also economical.

A. Applications of Geo polymers

The various applications of Geo polymers include Industrial floor repairs, Airfield repairs *(in war zones)*, Fireproof composite panels, External repair and structural retrofit for aging infrastructure, For storage of toxic and radioactive wastes, Potential utilizations in Art and Decoration, *LTGS* Brick, Railways sleepers, Electric power poles, Marine structures, Waste containments etc. [3]

III. INVESTIGATIONS

This study involves the details of development of the process of making low calcium *(ASTM Class F)* fly ash based geo polymer concrete. The physical and chemical properties of fly ash, aggregate and water used in the investigation were analyzed based on standard experimental procedures laid down in *IS*, *ASTM* and *BS* codes. The experiments conducted on coarse aggregate are specific gravity and water absorption, Bulk density & Sieve analysis by using respective codes [4-9]. The experiments conducted on fine aggregates are specific gravity, moisture content, sieve analysis and bulking of fine aggregate using volume method.

The tests conducted on geo polymer concrete are Compressive strength [10-12], Split Tensile strength [13-14], Flexural strength [10, 15-16] are as per the respective *IS*, *BS* and *ASTM* codes.

A. Materials used

1) Fly ash

According to *ASTM C 618* [17] the fly ash can be divided into two types based on amount of calcium present in the Fly ash. The classified Fly ashes are Class F (low-calcium) and Class C (high-calcium). In the Present investigation Class F fly ash [18] produced from Rayalaseema Thermal Power Plant *(RTPP)*, Muddanur, Andhra Pradesh was used.

2) Coarse Aggregate

Coarse aggregate of size 20 mm and 10 mm are used here. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20 mm and 10mm as per *IS* code [7] were 2.58 and 0.3% respectively. The gradation of the coarse aggregate was determined by sieve analysis as per *IS* code [8]. The grading curves of the coarse aggregates as per *IS* code are shown in Chart 1& 2. *(Quantity taken=5 Kg)*

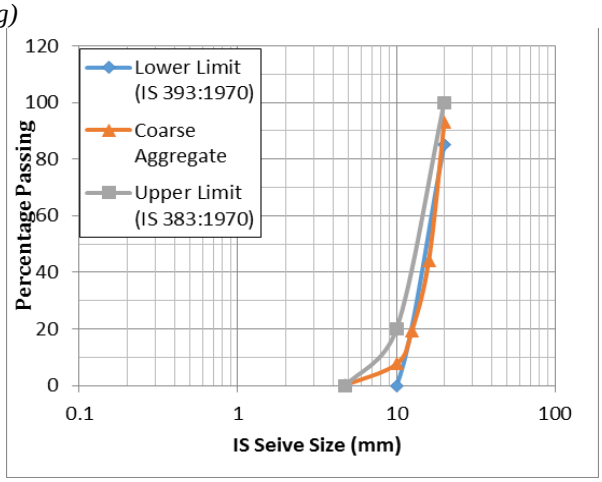

Fig. 1: Grading curve of 20 mm Coarse aggregate

Effect of Molarity on Strength Properties of Flyash and GGBS Blended Geopolymer Concrete

V. R. Gnanaprasunamba[1] J. Guru Jawahar[2] P. Ukesh Praveen[3]
[1]PG Student [2]Head of Dept. [3]Assistant Professor
[1,2,3]Department of Civil Engineering
[1,2,3]Annamacharya Institute of Technology and Sciences, Andhra Pradesh, India

Abstract— The objective of this project is to study the effect of molarity (8M, 10M and 12M) on strength properties of class F fly ash (FA) and ground granulated blast furnace slag (GGBS) blended geopolymer concrete (GPC) at the 50% replacement level (FA50-GGBS50). Sodium silicate (Na2SiO3) and sodium hydroxide (NaOH) solution has been used as alkaline activator. In the present investigation it is proposed to study the mechanical properties viz. compressive strength, split tensile strength and ultrasonic pulse velocity after 7, 14, 28, 56 and 112 days of ambient room temperature curing.

Key words: Fly Ash, Ground Granulated Blast Furnace Slag (GGBS)

I. INTRODUCTION

It is widely known that concrete is the most widely used constructing material and Portland cement is one of the ingredient used in the concrete. Mainly the production of Portland cement takes considerable energy, due to that it releases large volume of carbon dioxide (CO_2) into the atmosphere. The climate change is mainly concerned with the global warming. Generally the various greenhouse gases, such as carbon dioxide (CO_2), methane, nitrous oxide are releasing into the atmosphere due to various human activities. These gases are mainly responsible for global warming. Many industries are releasing CO_2 into the atmosphere, in those cement industry also playing one of the role. Generally the one ton of CO_2 is approximately releasing due to the production of one ton of Portland cement. However in concrete construction, Portland cement is one of the main binders. So, we have to search for more environmental friendly materials. There are many attempts are under research for the replacement of Portland cement with other cementitious materials such as fly ash, ground granulated blast furnace slag (GGBS), rice-husk, in order to reduce global warming issues. Fly ash is the by-product of burning coal that is accessible at worldwide. It is being used for replacement of Portland cement in concrete. High calcium fly ash or ASTM class C ash possess the self-binding properties. Low calcium fly ash or class F fly ash possesses pozzolanic properties. Davidovits (1978), had developed alternative binder "geopolymer" that contains cementing properties. So, it can be used as replacement of cement. A geopolymer will be created by the combining of aluminosilicate material with high alkalic liquids. Usually geopolymer will be made up of the materials that contain Al (Al) and oxide (Si) content. Fly ash and ground granulated blast furnace slag (GGBS) are rich in Al and oxide content. So, these can be used for replacing the cement in concrete.

II. GPC MIX DESIGN

Rangan and Hardjito (2005) have noted that unlike conventional cement concretes GPCs are a new class of construction materials and therefore no standard mix design approaches are yet available for GPCs. While GPC involves more constituents in its binder (viz., FA, GGBS, sodium silicate, sodium hydroxide and water), whose interactions and final structure and chemical composition are under intense research whereas the chemistry of Portland cement and its structure and chemical composition (before and after hydration) are well established due to extensive research carried out over more than century. While the strength of cement concrete is known to be well related to its water-cement ratio, such a simplistic formulation may not hold good for GPCs. Therefore, the formulation of the GPC has to be done by trial and error basis. The role and the influence of aggregates are considered to be the same as in the case of Portland cement concrete. The mass of combined aggregates may be taken to be between 75% and 80% of the mass of geopolymer concrete. The performance criteria of a geopolymer concrete mixture depend on the application. For simplicity, the compressive strength of hardened concrete and the workability of fresh concrete are selected as the performance criteria. In order to meet these performance criteria, the alkaline liquid-to-fly ash ratio by mass, water-to-geopolymer solids ratio by mass, the wet-mixing time, the heat-curing temperature, and the heat-curing time are selected as parameters. With regard to alkaline liquid-to-fly ash ratio by mass, values in the range of 0.30 and 0.45 are recommended. Sodium silicate solution is cheaper than sodium hydroxide solids. Commercially available sodium silicate solution A53 with SiO_2-to-Na_2O ratio by mass of approximately 2, i.e., Na_2O = 14.7%, SiO_2 = 29.4%, and water = 55.9% by mass, and sodium hydroxide solids (NaOH) with 97-98% purity are recommended. Laboratory experience suggests that the ratio of sodium silicate solution-to-sodium hydroxide solution by mass may be taken approximately as 2.5 (Hardjito and Rangan, 2005).

Mixture proportion of heat-cured low-calcium fly ash-based geopolymer concrete with design compressive strength of 45 MPa is needed for precast concrete products as follows: Assume that normal-density aggregates in SSD condition are to be used and the unit-weight of concrete is 2400 kg/m^3. Take the mass of combined aggregates as 77% of the mass of concrete, i.e. 0.77x2400 = 1848 kg/m^3. The combined aggregates may be selected to match the standard grading curves used in the design of Portland cement concrete mixtures. For instance, the aggregates may comprise 277 kg/m^3 (15%) of 20 mm aggregates, 370 kg/m^3 (20%) of 14 mm aggregates, 647 kg/m^3 (35%) of 7 mm aggregates, and 554 kg/m^3 (30%) of fine sand to meet the requirements of

Mechanical Properties of Geopolymer Concrete Incorporating Copper Slag as Fine Aggregate

B. Mounika[1] C. Sreenivasulu[2] J. Guru Jawahar[3] K. Narasimhulu[4]
[1]PG Student [2]Assistant Professor [3,4]Professor
[1,2,3,4]Department of Civil Engineering
[1,2,3,4]Annamacharya Institute of Technology & Sciences, Andhra Pradesh India

Abstract— The present paper mainly focused on mechanical properties of geopolymer concrete (GPC) incorporating copper slag (CS) as fine aggregate. In this study, CS was replaced at different replacement levels (0%, 10%, 20%, 30% and 40%). Fly ash and ground granulated blast furnace slag were used as geopolymer binders. Combination of NaOH and Na2Sio3 solution were used as activating solution. Mechanical properties viz., compressive strength, split tensile strength and modulus of elasticity were found after 7, 28 and 90 days respectively. From the results, it is concluded that the improvement in mechanical properties up to 40% CS replacement was observed.

Key words: Geopolymer Concrete, Copper Slag, Compressive Strength, Split Tensile Strength, Modulus of Elasticity

I. INTRODUCTION

Concrete is the most widely used material in construction worldwide in terms of volume and has a large impact on the environment. Manufacturing of Portland cement is one of the most important materials of construction and is responsible for significant amount of emissions of co2 which is the main greenhouse gas, causing global warming. Efforts are being made in the construction industry to address these by utilizing alternative materials and developing supplementary binders in concrete. The application of geo polymer concrete is one such alternative. The geo polymer technology is proposed by Davidovits and gives considerable propose for application in concrete industry as an alternative binder to the Portland cement. This process results in two benefits. i.e. reducing CO2 releases from production of OPC and effective utilization of industrial waste by-products such as fly ash, slag etc. By minimizing the use of OPC. In terms of reducing the global warming, the geo polymer technology can reduce the CO2 emission in to the atmosphere, caused by cement and aggregate industries is about 80%. In this geo polymer technology, the source material is rich in silicon (Si) and Aluminium (Al) is reacted with a highly alkaline solution through the process of geo polymerization to produce the binding material. The polymerization process involves a substantially fast chemical reaction under high alkaline condition on Si-Al minerals that result in a three-dimensional polymeric chain and ring structure consisting of Si-O-Al-O bonds. Depending on the raw materials and the processing conditions, geo polymers can exhibit a wide variety of properties and characteristics, including high compressive strength, adequate flexural strength, acid resistance, fire resistance and also provides low thermal conductivity. This paper presents the compressive strength, split tensile strength and modulus of elasticity of geo polymer concrete (GPC) incorporating fly Ash and GGBS at equal ratio for M45 grade, cured at ambient temperature.

II. EXPERIMENTAL STUDY

The experimental investigation was focused on the effect of various proportions of copper slag on GPC. Mix proportion was designed using Rangans method. Fly ash and GGBS are used as the replacement of cement. Sand and CS were used as fine aggregate and CS chemical composition are listed in

Composition	% by mass
SiO_2	43.20
Al_2O_3	12.60
Fe_2O_3	1.30
CaO	40.20
Na_2O_3	0.90
K_2O	0.60
TiO_2	-
MgO	1.45
GNO_3	-

Table 1: Super plasticizer of SP-430 was used to improve the workability of mixtures.

Crushed granite stones of the size 20 mm and 10 mm were used as coarse aggregate and the river sand was used as fine aggregate. The bulk specific gravity in oven dry condition and the water absorption of the coarse aggregate 20 mm and 10mm were 2.58 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the sand were 2.62 and 1% respectively and also the fineness modulus is 2.59.

III. MIX DESIGN

In this study, mechanical properties of geopolymer concrete (GPC) incorporating copper slag(CS) as fine aggregate with the replacement levels of 0%, 10%, 20%, 30% and 40% of copper slag was studied. The design mix proportions of GPC values are shown in Table 2.

Constituents	Content of concrete per m^3
GGBS	242
Fly ash	242
20 mm aggregate	914
10mm aggregate	610
SS Solution	121
SH Solution	48
Super plasticizer	3.386

Table 2: GPC mix proportions per m^3

The changing values of sand and copper slag according to different proportions are shown in Table 3.

Constituents	Proportions per m^3				
	0%	10%	20%	30%	40%
Sand	648.5	583.6	518.8	453.95	390
Copper slag	0	64.85	129.7	194.55	260

Table 3: Mix proportions of sand and CS

Preliminary Study on Geopolymer Concrete using Copper Slag and Vermiculite

Burri Yakshareddy[1*], J. Guru Jawahar[1], C. Sreenivasulu[1], C. Sashidhar[2]
[1]*Department of Civil Engineering, Annamacharya Institute of Technology & Sciences, Tirupati, India*
[2]*Department of Civil Engineering, Jawaharlal Nehru Technological University Anantapuram, India*

Abstract: **Geopolymer concrete (GPC) is becoming a sustainable concrete when comparing to ordinary Portland cement (OPC) concrete. This investigation is mainly focused on the preliminary study on fly ash (FA) and ground granulated blast furnace slag (GGBS) based GPC using copper slag (CS) and vermiculite (VM) as fine aggregate replacement at different levels (0%, 20% and 40%). The compressive strength and ultrasonic pulse velocity (UPV) values of GPC mixes (FA50-GGBS50) were determined after 7 and 28 days of ambient room temperature curing. In this study, sodium silicate (Na_2SiO_3) and sodium hydroxide (NaOH) solution is used as alkaline activator. Test results revealed that the increased replacement level of copper slag increased the GPC properties. Whereas, the increased replacement level of vermiculite decreased the GPC properties.**

Keywords: **Geopolymer concrete; fly ash, GGBS; compressive strength; ultrasonic pulse velocity; copper slag; vermiculite.**

I. INTRODUCTION

Concrete is the most widely used construction material after water in the world and ordinary Portland cement (OPC) is the major ingredient used in concrete. The production of cement releases large amount of carbon dioxide (CO_2) to the atmosphere that significantly contributes to greenhouse gas emissions. It is estimated that one ton of CO_2 is released into the atmosphere for every ton of OPC produced [1]. Several efforts are in progress to supplement the use of Portland cement in concrete in order to address the global warming issues. In view of this, Davidovits proposed that geopolymer binders could be produced by a polymeric reaction of alkaline liquids with the silicon and the aluminium in source materials of geological origin or by-product materials such as fly ash, GGBS, rice husk ash etc [1]. The most common industrial by-products used as binder materials are fly ash (FA) and ground granulated blast furnace slag (GGBS) [2-4]. Geopolymers are made from source materials with silicon (Si) and Aluminium (Al) content and thus cement can be completely replaced by the materials such as fly ash and ground granulated blast furnace slag which are rich in silica and alumina [5-7]. Fly ash and GGBS reacts with alkaline solutions to form a cementitious material which does not emit carbon dioxide into the atmosphere and enhances the mechanical and durability properties of the geopolymer concrete. Palomo and Grutzeck reported that type of alkaline liquid affects the mechanical properties of GPC [7]. Palomo and Femandez-Jimenez [8] concluded that both curing temperature and curing time affects the compressive strength of GPC mixes. Gourley [9] stated that low calcium class F fly ash is more preferable thatn high calcium class C fly ash in the manufacturing of GPC. Guru Jawahar concluded that GGBS and FA blended GPC mixes attained enhanced mechanical and durability properties at ambient room temperature itself [10-13]. Sujatha et al. [14] observed that geopolymer concrete columns exhibited high load carrying capacity, stiffness and ductility until failure. Anuradha et al. [15] noted that tensile strength of GPC made with river sand is higher than that of GPC made with manufactured sand. Research is being carried out to develop the GPC using different materials as fine aggregate replacement to save the natural resources. Sreenivasulu et al. observed that there was a significant increase in compressive strength with the increased granite slurry powder (GS) from 0% to 40% as sand replacement in all curing periods [16-19].

II. EXPERIMENTAL STUDY

Our objective was to determine the compressive strength and ultrasonic pulse velocity (UPV) of fly ash and GGBS based GPC using copper slag and vermiculite as replacement of sand at different levels (0%, 20% and 40%).

Materials

In this respect, FA and GGBS were used as binders whose chemical and physical properties are tabulated in Table 1. According to ASTM C 618 [20], class F fly ash produced from Rayalaseema Thermal Power Plant (RTPP), Muddanur, A.P, GGBS, copper slag (CS) and vermiculite (VM) obtained from the local suppliers were used in the manufacturing of GPC.

The alkaline liquid used was a combination of sodium silicate solution and sodium hydroxide solution. The sodium silicate solution (Na_2O= 13.7%, SiO2=29.4%, and water=55.9% by mass) was purchased from a local supplier. The sodium hydroxide (NaOH) in flakes or pellets from with 97%-98% purity was also purchased from a local supplier. The sodium hydroxide (NaOH) solution was prepared with a concentration of 8 M. The sodium silicate solution and the sodium hydroxide solution were mixed together one day before prior to use. Crushed granite stones of size 20 mm and 10 mm were used as coarse aggregate and river sand was used as fine aggregate. Copper slag and vermiculite were used as fine aggregate replacements. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20 mm

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FLEXURAL PROPERTIES OF M 25 GRADE SELF COMPACTING CONCRETE USING MANUFACTURED SAND AND RECYCLED COARSE AGGREGATE

G.Gopi[1]*,C.Sashidhar[1], J. Guru Jawahar[2]

[1*]*Department of Civil Engineering, Jawaharlal Nehru Technological University Anantapur,Anantapuramu, India, gopigadde999@gmail.com*

[1]*Department of Civil Engineering, Jawaharlal Nehru Technological University Anantapur,Anantapuramu, India*

[2]*Department of Civil Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, India*

Abstract--- Self compacting concrete (SCC) can be prepared by increasing the cementitious materials (cement + flyash) and decreasing the content of coarse aggregate. SCC find its application in congested areas where traditional concrete has higher resistance to its flowing ability hence need of SCC increased. In the present study we focused on finding the flexural behaviour of reinforced cement concrete (RCC) beams by replacing with recycled coarse aggregate (RCA) and manufactured sand (MSand). Fresh properties were conducted on the mixes. Two point load test was conducted on beams to find flexural properties namely cracking load, cracking deflection, ultimate load,ultimate deflection of the beams. The beams were cured for a period of 28, 90 days in potable water.

Key words --- SCC, RCC, MSand, RCA, two point load, fresh properties.

I.INTRODUCTION

SCC can flow and fill the gaps of congested reinforcement and corners of moulds without any need of compaction during the placing. But it is not yet utilized in house buildings to large extent with the conception that the use of higher fines and chemical admixtures in SCC leads to more material cost and higher strengths, and also higher paste volume and lower coarse aggregate content known to increase the drying shrinkage of SCC. The increased demand and the consumption of natural materials caused the ecological issues and sudden surge in material cost. In the previous decade variable cost of common sand utilized as fine aggregate in concrete increased the cost of construction. On this premise of past research, manufactured sand offers feasible other option to normal sand. on similar lines recycled coarse aggregate provides alternate for the normal coarse aggregates but these recycled coarse aggregates have high porosity and low specific gravity. This examination is basically centered around the development of normal strength M 25 grade of SCC using manufactured sand and reused coarse aggregate for the utilization of typical building developments.

Nine mixes of various level of replacements in coarse aggregate and fine aggregate using recycled coarse aggregate and manufactured sand has been listed in table1 shown below.

From table MIX3 having 100% natural coarse aggregate and each 50% natural sand and manufactured sand found to have high moment carrying capacity and load carrying capacity.

In this investigation cracking load, cracking deflection, ultimate load, ultimate deflection were found at 28 and 90 days on reinforced cement concrete beams of size 700 mmx150 mm x150 mm.

Table 1: Mix Designations of SCC mixes

Mix type	CA	RCA	Sand	MSand
Mix1	100	0	100	0
Mix2	100	0	75	25
Mix3	100	0	50	50
Mix4	75	25	100	0
Mix5	75	25	75	25
Mix6	75	25	50	50
Mix7	50	50	100	0
Mix8	50	50	75	25
Mix9	50	50	50	50

CA: Coarse aggregateRCA: Recycled coarse aggregateMSand: Manufactured sand

Experimental Study on Fresh Properties of Self Compacting Geopolymer Concrete on Replacement of Fine Aggregate with Copper Slag

B. Rohin[1] J. Guru Jawahar[2]
[1]PG Student [2]Professor
[1,2]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology and Sciences, Andhra Pradesh, India

Abstract— An investigation is carried out on the development of Self Compacting geopolymer concrete , to the study the effect of molarity (8M) on strength properties of class F fly ash (FA) and ground granulated blast furnace slag (GGBS) blended geo polymer concrete (GPC) at 10%,20%,30%,40%, 50% replacement level (FA50-GGBS50). Sodium silicate (Na2SiO3) and sodium hydroxide (NaOH) solution has been used as alkaline activator. In the present investigation it is proposed to study the fresh properties and flyash based SCGC replaced with various percentages of copper slag. Hence the results showed that the Self-compacting geo polymer concrete was suitable for room temperature curing with copper slag as replacement to fine aggregate based GPC.

Key words: Fly Ash, Ground Granulated Blast Furnace Slag (GGBS), Copper Slag

I. INTRODUCTION

The economic strength and even degree of civilization of any country is mirrored by the expansion rate of the infrastructures and highlighted by the assembly rate of concrete. Concrete is one in every of the foremost so much used construction resources within the world. Portland cement (PC); a vital constituent of concrete isn't associate environmentally friendly material. The assembly of Portland cement not solely depletes important quantity of natural resources however conjointly liberates a substantial quantity of carbonic acid gas (CO_2) and alternative greenhouse gases into the atmosphere as a results of de carbonation of sedimentary rock and therefore the combustion of fossil fuels. It's reported that the world wide cement trade contributes around one.65 billion heaps of the greenhouse emission annually. Due to the assembly of Portland cement, it's calculable that by the year 2020, the carbonic acid gas emissions can rise by regarding five hundredth from the present levels. Therefore, to preserve the worldwide atmosphere from the impact of cement production, it's currently believed that new binder's area unit indispensable to exchange Portland cement. during this regard, the geopolymer concrete (GC) is one in all the revolutionary developments associated with novel materials leading to inexpensive and environmentally friendly material as an alternate to the laptop. Gig cycle is AN innovative binder material and is created by whole exchange the laptop. it's incontestable that the geopolymer cement generates 5–6times less CO_2 than PC .

Geopolymer concrete is new technology because it utilizes industrial waste and by products. Geopolymer concrete is emerging as a new environmentally friendly construction material for sustainable development, using Slag and alkali instead of PC as the binding material. This results in two benefits. i.e. reducing CO_2 releases from production of PC and also utilisation of industrial waste like fly ash, slag etc. Ground granulated blast furnace slag (GGBS) is a by-product from the blast-furnaces used to make iron. During the process, slag formed and it is then dried and ground to a fine powder.

FA, which is rich in silica and alumina, has full potential to use as one of the source material for Geopolymer binder. Many research studies have manifested the potential use of solfa syllable primarily based rate. For this reason, low-calcium solfa syllable has been chosen as a base material to synthesize geopolymer so as to higher employ this industrial waste.

In fact, all concretes nearly believe basically on being totally compacted. Just in case of huge and sophisticated structures; it's generally become troublesome to confirm full compaction. Despite the great combine style, inadequate compaction considerably lowers final performance of concrete. Placement of the contemporary concrete needs good operatives to confirm adequate compaction to realize the total strength and sturdiness of the hardened concrete .As concrete is created and placed at construction sites, underneath things distant from ideal, standard vibratory concrete in such things could cause risk to labour and there are continuously doubts regarding the strength and durability of concrete placed in such locations. One in every of the solutions to beat these difficulties is that the employment of Self- Compacting Concrete (SCC).

SCC may be a form of concrete which may be compressed into each corner of the shape work strictly by means that of its own weight. It's usually accepted that SCC was developed initial in Japan within the late Nineteen Eighties in response to the dearth of good labour and therefore the want for improved sturdiness. In line with Out, the requirement for SCC was initial known by Okamura in 1986 and therefore the initial model was developed in 1988. SCC offers several advantages and blessings over ancient concrete. These embody Associate in Nursing improved quality of concrete, reduced construction time, easier placement in full reinforcements, uniform and complete consolidation, enhanced bond strength, reduced noise levels because of absence of vibration, lower overall prices, and safe operating environment.. SCGC is an innovative type of concrete that does not require vibration for placing it and can be produced by complete elimination of ordinary Portland cement.

II. SELF-COMPACTING GEOPOLYMER CONCRETE MIX DESIGN PROCEDURE

8M:

1) Step 1: The wet density of geopolymer concrete=2400 kg/m^3
2) Step 2: Mass of combined aggregate = 72.8% of the mass of concrete

Study and Evaluation of Fresh and Mechanical Properties of Self Compacting Geopolymer Concrete on Replacement of Fine Aggregate at Various Percentage Levels with Copper Slag

K. Roja[1], J. Guru Jawahar[2]

[1]P.G Student, Associate Professor[2]
Department of Civil Engineering[1]
Annamacharya Institute of Technology and Sciences,
Andhra Pradesh, India

Abstract: **This paper presents the study of fresh and mechanical properties of self-compacting by geopolymer concrete(SCGC) to the effect 8 molarity on strength properties of classF flyash(FA)ground granulated blast furnace slag(GGBFS)and copper slag blended geopolymer concrete(GPC) At 10%,20%,30%40%and50% at varies levels of replacement of copper slag and chemical admixture are sodium silicate(Na2SiO3), sodium hydroxide(NaOH), this solution has been used as alkaline activator. In the present investigation to study the fresh properties test conducted as shown in below slump, L-box, V-funnel, and T50and same as the investigation to study the mechanical properties are compressive strength, ultrasonic pulse velocity and split tensile test at different curing periods after 7, and 28 days of curing at ambient room temperature. From the results, it is conducted that the increased replacement level of copper slag(CS)from0%to 50% increased the mechanical properties of self-compacting by geopolymer concrete(SCGC) the rebound hammer and UPV values also increase from 0%to50% replacement levels of copper slag(CS).**

***Keywords*: Fly Ash, Ground Granulated Blast Furnace Slag (GGBS) copper slag, alkaline activators**.

I.INTRODUCTION

The economic strength and even degree of civilization of any country is mirrored by the expansion rate of the infrastructures and highlighted by the assembly rate of concrete. Concrete is one in every of the foremost so much used construction resources within the world. Portland cement (PC); a vital constituent of concrete isn't associate environmentally friendly material. The assembly of Portland cement not solely depletes important quantity of natural resources however conjointly liberates a substantial quantity of carbonic acid gas (CO2) and alternative greenhouse gases into the atmosphere as a result of decarbonation of sedimentary rock and therefore the combustion of fossil fuels. it's reported that the worldwide cement trade contributes around one.65 billion heaps of the greenhouse emission annually. Due to the assembly of Portland cement, it's calculable that by the year 2020, the carbonic acid gas emissions can rise by regarding five hundredth from the present levels. Therefore, to preserve the worldwide atmosphere from the impact of cement production, it's currently believed that new binders area unit indispensable to exchange Portland cement. during this regard, the geopolymer concrete (GC) is one in all the revolutionary developments associated with novel materials leading to inexpensive and environmentally friendly material as an alternate to the laptop. gigacycle is AN innovative binder material and is created by whole exchange the laptop. it's incontestable that the geopolymeric cement generates 5–6times less CO_2 than PC.

GEOPOLYMER CONCRETE is new technology because it utilizes industrial waste and by products. Geopolymer concrete is emerging as a new environmentally friendly construction material for sustainable development, using Slag and alkali instead of PC as the binding material. This results in two benefits. i.e. reducing CO_2. GROUND GRANULATED BLAST FURNACE SLAG (GGBS) is a by-product from the blast-furnaces used to make iron. During the process, slag formed and it is then dried and ground to a fine powder.

FLYASH is rich in silica and alumina, has full potential to use as one of the source material for Geopolymer binder. Many research studies have manifested the potential use of solfa syllable primarily based rate. For this reason, low-calcium solfa syllable has been chosen as a base material to synthesize geopolymer so as to higher employ this industrial waste.

In fact, all concretes nearly believe basically on being totally compacted. just in case of huge and sophisticated structures; it's generally become troublesome to confirm full compaction. Despite the great combine style, inadequate compaction considerably lowers final performance of concrete. Placement of the contemporary concrete needs good operatives to confirm adequate compaction to realize the total strength and sturdiness of the hardened concrete. As concrete is created and placed at construction sites, underneath things distant from ideal, standard vibratory concrete in such things could cause risk to lab our and there are

Experimental Investigation on Mechanical Properties of Glass Fibre Reinforced Concrete

G. Asha[1] K. Sai Abhinav[2]
[1]PG Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Andhra Pradesh India

Abstract— A concrete has strong in compression and weak in tension, impact and flexure. To increase these properties we have add some addition to concrete like fibres. Fibres are giving some additional tensile and impact strength to concrete. In this investigation we are adding fibres like Glass with a fibre dosage of 0.5%, 1%, 1.5% were dispersed into the concrete of mix design M30 grade. The results are compared with conventional concrete so that here increasing the fibre dosage in concrete randomly increasing compressive strength, tensile strength and flexure strength .so finally while using fibres in concrete we are going to transfer brittle failure to ductility property.

Key words: Fibre Reinforced Concrete, Glass, Compressive Strength, Split Tensile Strength, Flexural Strength

I. INTRODUCTION

Concrete is the most widely used construction material in this world. Generally concrete has low ductility, tensile and impact resistance on bridge decks, Aircrafts etc., hence glass fibres are added with concrete mix. Due to an increasing use of FRC (fibre-reinforced concrete) in construction like bridge decks and military industries against impact loads, these concretes are important role in human life. Adding fibres to concrete increases its ductility, tensile strength, flexural strength and resistance against dynamic and impact loads. Sai abhinav et al.[1] concluded that increasing the fibre dosage there is increase in impact resistance of fibre reinforced concrete. The aspect ratio (L/d) and volume fraction (Vf) are important fibres parameters in FRC [2]. When cracks are initiated in FRC, the fibres bear the applied loads, when the load increases the fibres tend to transmit the excess stresses to the matrix [3]. If these stresses exceed the fibre-matrix bond strength, which in turn is influenced by fibre properties the fracture process may lead to fibres pullout or rarely rupture of the fibres[4]. Thus, fibre reinforced concretes are more ductile than other concretes.

It was reported that glass fibes were effective in improving strength properties of the concrete. The main objective of this project is to study the mechanical properties of fibre reinforced concrete with mix proportion of fibres for M30 grade concrete and comparing with the conventional concrete and to know the optimum percentage of addition of fibres to concrete and finding maximum ratios[7].

II. EXPERIMENTAL STUDY

The experimental investigation was focused on the effect of various fibre dosages on mechanical properties of FRC. Mix proportion was designed using IS 10262-2009 and IS 456-2000 with mean target strength of 38.25 MPa (M30) for control mix[10].

Ordinary portland cement (type 1) was used in this study. A coarse aggregate with a maximum nominal size of 19 mm and a fine aggregate with a fineness modulus of 3.4 were used in the experiment. Glass fibres were used; their geometry and apparent shape are shown in Fig. 1 and their properties are listed in Table 1. Super plasticizer of SP-430 was used to adjust the workability of mixtures.

Fig. 1: Glass fibres

Fibre	Diameter (μm)	Specific Gravity	Modulus of Elasticity (GPa)
Glass	9-15	2.6	70-80

Table 1: Physical Properties of Glass fibres

Crushed granite stones of size 20 mm and 10 mm were used as coarse aggregate and river sand was used as fine aggregate. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20 mm and 10mm were 2.58 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the sand were 2.62 and 1% respectively.

III. MIX DESIGN

In this study, water cement ratio of 0.5 was adopted for M30 grade concrete and Glass of 0.5%, 1%, 1.5% volume fractions were used[10].

Constituents	Content KG/ m^3 of concrete
Cement	394.32
Fine aggregate	623.45
Coarse aggregate	1097.81
Water content	197.16
Fibres	
0.5%	11.56
1%	23.12
1.5%	34.69
Super plasticizer	9.38

Table 2: Content of mix proportions used

IV. TEST METHOD

A. Details of specimen preparation

Cubes of size 150 mm were used to evaluate the compressive strength of GFRC. Cylinders of size 150 mm x 300 mm were used to determine the split tensile strength. Flexural strength of GFRC was evaluated using 100 mm x 100 mm x 500 mm beams. Steel moulds were used for casting the specimens. Concrete was poured in mould in 3 layers and each layer was vibrated for 15 s after placing it on the vibrating table for

Investigation on Polypropylene Fibre Reinforced Concrete in Acidic Environment

A. Kranthi Kumar[1] K. Sai Abhinav[2]
[1]PG Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology and Sciences, Tirupathi, Andhra Pradesh, India

Abstract— Concrete is the most versatile man-made construction material in the world and being extensively used in all types of construction activities. The strength, durability and other characteristics of concrete depend upon the properties of its ingredients, the mix proportions, the method of compaction and other controls during placing, compaction and curing. To enhance these properties, an attempt was made to study the durability property by introducing polypropylene fibers in concrete. In this paper effect of polypropylene fibers on the durability of concrete for M30 grade have been studied by varying percentage of polypropylene fibers in concrete. Fiber dosages of 0.5%, 1%, and 1.5% by volume of concrete were used in the experimental study. Concrete cubes of size 150mmX150mmX 150mm were tested for compressive strength, Resistance to Acid Attack for 28 days, 56 days curing period. Polypropylene fibers were randomly dispersed in concrete. The results indicated that increasing the volume fraction of fiber showed decrease in compressive strength after subjected to acid attack. High volume PFRC was shown to be more vulnerable to acid attack.

Key words: Fibre Reinforced Concrete, Polypropylene Fibres, Durability Properties, Acid Attack

I. INTRODUCTION

Concrete is the most widely used construction material in this world. Generally concrete has low ductility and has less resistance to chemical attack, Hence polypropylene fibers are added to concrete mix. Due to an increasing use of FRC (fiber-reinforced concrete) in construction like chemical industries against chemical attacks, these concretes have important role in human life. Adding fibers to concrete increases its ductility, tensile strength, flexural strength and resistance against dynamic, impact loads and chemical attacks. The Aspect ratio (L/d) and Volume fraction (VF) are important fibers parameters in FRC.

Sai abhinav et.al. reported that steel fibers were effective in improving the compressive strength and impact resistance of the concrete [1]. It is evident that addition of fiber dosage has no significant role in enhancing compressive strength of FRC. Attiogbe E.K. [2] studied the effect of acid on different concrete mixes. Parameters such as change in weight and change compressive strength were evaluated. It was found that after acid attack, the specimens showed loss in weight and loss in compressive strength for all types of concrete mixes [2].

Srinivasa Rao et al [3] studied the durability effects on glass fiber reinforced concrete. In this investigation Acid attack is determined by immersion of cubes in 5% of HCL and H2SO4 solution respectively of 0.03, 0.06 and 0.10% of glass fiber with M30, M40 and M50 grade of concrete. The results concluded with the reduction in weight loss and also compressive strength with days of 28 and 90 days.

Basavaraj et al [4] studied durability of steel fiber reinforced concrete with M40 grade of concrete of steel content 0.75, 1.0%, and 1.25% by volume of concrete. Experiment was conducted by immersion of cubes in 3% of H2SO4 solution by maintaining constant concentration by changing the solution at regular interval of time. Weight of specimens were measured and loss or gain of weight was determined. They concluded that steel fiber reinforced concrete is more resistant when compared with conventional concrete and they observed that 1.25% steel has high resistance [4]. The results showed that the decrease in compressive strength with respect to increase in fiber dosage and also shows most effect on weight loss when immersed in acid curing. The main objective of this project is to study the durability of fiber reinforced concrete with mix proportion of fibers for M30 grade concrete and comparing with the conventional concrete and to know the optimum percentage of addition of fibers to concrete and finding maximum ratios.

II. EXPERIMENTAL STUDY

The experimental investigation was focused on the effect of various fiber dosages to resist the chemical attack. Mix proportion was designed using IS 10262-2009 [5] and IS 456-2000 [6] with mean target strength of 38.25 MPa (M30) for control mix. Ordinary Portland cement (Type 1) was used in this study. A coarse aggregate with a maximum nominal size of 19 mm and a fine aggregate with a fineness modulus of 3.4 were used in the experiment. Polypropylene fibers were used; their geometry and apparent shape are shown in Fig. 1 and their properties are listed in Table 1. Super plasticizer of SP-430 was used to adjust the workability of mixtures. Crushed granite stones of size 20 mm and 10 mm were used as coarse aggregate and river sand was used as fine aggregate. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20 mm and 10mm were 2.58 and 0.3% and of sand were 2.62 and 1% respectively.

Fig. 1: Polypropylene Fibers

Fiber	Diameter (μm)	Specific Gravity	Modulus of Elasticity
Polypropylene	20-400	0.9-0.95	3.5-10

Table 1: Physical Properties of Polypropylene fibers

To study the acid resistance of specimens immersed in the 3% of H_2SO_4 solution at 28 and 56 days curing period.

Experimental Investigation on Mechanical Properties of HYBRID Fibre Reinforced Concrete

K. Raghava Rao[1] K. Sai Abhinav[2]
[1]PG Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Andhra Pradesh, India

Abstract— A concrete has strong in compression and weak in tension, impact and flexure. To overcome these properties we need to add some addition to concrete like fibres. Fibres are giving some additional tensile,flexure and impact strength to concrete. In this investigation we are adding synthetic and metallic fibres like hybrid(steel+ polypropylene) with a fibre dosage of 0.5%, 1%, 1.5% were dispersed into the concrete of mix design M30 grade. The results are compared with conventional concrete and mono fiber so that here increasing the fibre dosage in concrete gradually increasing in compressive strength, split tensile strength flexure strength and impact resistance respectively for28 days curing period .so finally while using fibres in concrete we are going to transfer brittle failure to ductility property.

Key words: Fibre reinforced concrete, Steel fiber, polypropylene fiber, Compressive strength, Split tensile strength, Flexural strength

I. INTRODUCTION

Concrete is the most widely used construction material in this world. Generally concrete has low ductility, tensile and impact resistance on bridge decks, Aircrafts etc.,

Concrete has little ability to resist tensile stresses and strains due to its brittle behavior. Fibers are randomly added to conventional to enhance its desired engineering properties. Hence hybrid fibers are added with concrete mix. Higher fiber dosage caused decrease in compressive strength. It was found that adding more fibre dosage beyond a limit would have adverse affect on strength parameters. Due to an increasing use of FRC (fibre-reinforced concrete) in construction like bridge decks and military industries against impact loads, these concretes are important role in human life. Sai abhinav et al.[1] concluded that increasing the fibre dosage there is increase in impact resistance of fibre reinforced concrete. G.Jagadeesh et al[2] investigate on polypropylene fibre reinforced concrete and finally concluded that while fibres increasing there increase in mechanical properties. Harika et al [3] investigate on Sisal fibre reinforced concrete and finally concluded that while fibres increasing there is decrease in compressive strength. The aspect ratio (L/d) and volume fraction (Vf) are important fibres parameters in FRC. When cracks are initiated in FRC, the fibres bear the applied loads, when the load increases the fibres tend to transmit the excess stresses to the matrix. Thus, fiber reinforced concretes are more ductile than other concretes.

It was reported that hybrid fibers were effective in improving mechanical properties of the concrete.. The main objective of this project is to study the mechanical properties of fiber reinforced concrete with mix proportion of fibers for M30 grade concrete and comparing with the conventional concrete and mono fiber concrete to know the optimum percentage of addition of fibres to concrete and finding maximum ratios.

II. EXPERIMENTAL STUDY

The experimental investigation was focused on the effect of various fiber dosages on mechanical properties of FRC. Mix proportion was designed using IS 10262-2009 and IS 456-2000 with mean target strength of 38.25 MPa (M30) for control mix.[4]

Ordinary Portland cement (type 1) was used in this study. A coarse aggregate with a maximum nominal size of 20 mm and a fine aggregate with a fineness modulus of 3.4 were used in the experiment. Hybrid fibers (steel+polypropylene) were used; their geometry and apparent shape are shown in Fig. 1 and their properties are listed in Table 1. Super plasticizer of SP-430 was used to adjust the workability of mixtures.

Fig. 1: Steel and Polypropylene fibres

Fibre	Diameter (μm)	Specific Gravity	Modulus of Elasticity (GPa)
Steel	5-500	7.84	200
Polypropylene	20-400	0.9-0.95	3.5-10

Table 1: Physical Properties of fibres

Crushed granite stones of size 20 mm and 10 mm were used as coarse aggregate and river sand was used as fine aggregate. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20 mm and 10mm were 2.58 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the sand were 2.62 and 1% respectively.

III. MIX DESIGN

In this study, water cement ratio of 0.5 was adopted for M30 grade concrete and Sisal of 0.5%, 1%, 1.5% volume fractions were used.

Constituents	Content KG/ m^3 of concrete

Experimental Investigation on Mechanical Properties of Sisal Fibre Reinforced Concrete

P. Harika Sayana[1] K. Sai Abhinav[2]
[1]PG Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Andhra Pradesh, India

Abstract— a concrete has strong in compression and weak in tension, impact and flexure. To overcome these properties we need to add some addition to concrete like fibres. Fibres are giving some additional tensile, flexure and impact strength to concrete. In this investigation we are adding Natural fibres like Sisal with a fibre dosage of 0.5%, 1%, 1.5% were dispersed into the concrete of mix design M30 grade. The results are compared with conventional concrete so that here increasing the fibre dosage in concrete gradually decrease in compressive strength but increase in split tensile strength flexure strength and bond strength respectively for28 days curing period .so finally while using fibres in concrete we are going to transfer brittle failure to ductility property.

Key words: Fibre Reinforced Concrete, Sisal, Compressive Strength, Split Tensile Strength, Flexural Strength

I. INTRODUCTION

Concrete is the most widely used construction material in this world. Generally concrete has low ductility, tensile and impact resistance on bridge decks, Aircrafts etc., hence Sisal fibres are added with concrete mix. Due to an increasing use of FRC (fibre-reinforced concrete) in construction like bridge decks and military industries against impact loads, these concretes are important role in human life. Adding fibres to concrete increases its ductility, tensile strength, flexural strength and resistance against dynamic and impact loads.[1] The aspect ratio (L/d) and volume fraction (Vf) are important fibres parameters in FRC. When cracks are initiated in FRC, the fibres bear the applied loads, when the load increases the fibres tend to transmit the excess stresses to the matrix. If these stresses exceed the fibre-matrix bond strength, which in turn is influenced by fibre properties the fracture process may lead to fibres pullout or rarely rupture of the fibres. Thus, fibre reinforced concretes are more ductile than other concretes.

It was reported that sisal fibes were effective in improving strength properties of the concrete.. The main objective of this project is to study the mechanical properties of fibre reinforced concrete with mix proportion of fibres for M30 grade concrete and comparing with the conventional concrete and to know the optimum percentage of addition of fibres to concrete and finding maximum ratios.[2]

II. EXPERIMENTAL STUDY

The experimental investigation was focused on the effect of various fibre dosages on mechanical properties of FRC. Mix proportion was designed using IS 10262-2009 and IS 456-2000 with mean target strength of 38.25 MPa (M30) for control mix.[11]

Ordinary portland cement (type 1) was used in this study. A coarse aggregate with a maximum nominal size of 19 mm and a fine aggregate with a fineness modulus of 3.4 were used in the experiment. Sisal fibres were used; their geometry and apparent shape are shown in Fig. 1 and their properties are listed in Table 1. Super plasticizer of SP-430 was used to adjust the workability of mixtures.

Fig. 1: Sisal fibres

Fibre	Diameter (μm)	Specific Gravity	Modulus of Elasticity (GPa)
Sisal	10-50	1.5	-

Table 1: Physical Properties of Sisal fibres

Crushed granite stones of size 20 mm and 10 mm were used as coarse aggregate and river sand was used as fine aggregate. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20 mm and 10mm were 2.58 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the sand were 2.62 and 1% respectively. [3]

III. MIX DESIGN

In this study, water cement ratio of 0.5 was adopted for M30 grade concrete and Sisal of 0.5%, 1%, 1.5% volume fractions were used. [4][11]

Constituents	**Content KG/ m^3 of concrete**
Cement	394.32
Fine aggregate	623.45
Coarse aggregate	1097.81
Water content Fibres	197.16
0.5%	11.56
1%	23.12
1.5%	34.69
Super plasticizer	9.38

Table 2: Content of mix proportions used

IV. TEST METHOD

A. *Details of Specimen Preparation*

Cubes of size 150 mm were used to evaluate the compressive strength of SFRC. Cylinders of size 150 mm x 300 mm were used to determine the split tensile strength. Flexural strength of SFRC was evaluated using 100 mm x 100 mm x 500 mm beams. Steel moulds were used for casting the specimens. Concrete was poured in mould in 3 layers and each layer was vibrated for 15 s after placing it on the vibrating table for

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"A STUDY OF EXPANSIVE SOIL USING BETAMCHERLA SLAB POLISH WASTE"

HARISH.P[1], Dr. CH. Sudharani

[1]*Assistant Professor, Department of Civil Engineering in sri kalahastheeshwara institute of technology, sri kalahasthi. Andhra Pradesh.*
[2] *Professor, Department of Civil Engineering in Sri Venkateswara University, Tirupathi, Andhra Pradesh.*

ABSTRACT - Soils are naturally formed materials due to weathering of rocks of different compositions. The soil that undergo swelling in wet condition and shrink in dry condition are known as expansive soils. Expansive soil causes serious problem to structures due to its Swelling and Shrinking tendency. The problems may develop in many forms such as formation of new cracks or widening of existing cracks, tilting of structures etc. In order to reduce the volumetric changes in expansive soils, mechanical stabilization and chemical stabilization i.e using admixtures in the raw form or liquid form to the expansive soil is desirable. An attempt has been made in this project to use Betamcherla Slab Polish Dust or waste as an additive to the expansive soil selected is studied by conducting experiments on Soil-Betamcherla Slab Polish Dust mixtures. Betamcherla Slab Polish Dust is added to the expansive soil in increments of 5% starting from 0% to 30%. In this study, the potential of Betamcherla Slab Polish Dust (by-product of stone polishing industries) as a stabilizing additive to an expansive soil is evaluated.The stabilization characteristics of Betamcherla Slab Polish Dust are mainly due to its high lime content. In this paper investigation the effect of Soil-Slab Polish Dust on Plasticity characteristics, Compaction, Swelling, CBR, of expansive soil is studied.

Key Words : Betamcherla Slab Polish Dust, Compaction CBR, Expansive Soil, Plasticity, Soil Stabilization, Swelling.

INTRODUCTION

Expansive soils, popularly known as black cotton soils in India, are one of the major regional deposits of India covering an area of about one fifth of the country's land area (about 3 lakhs sq. km). Soils containing the clay mineral Montimorillonite generally exhibit these properties. Expansive soils swell and shrink in a marked way due to gain or loss in moisture content. Therefore, during summer when evaporation from the ground and transpiration due to vegetation exceeds the rainfall, the expansive soil dries up and moisture deficiency develops in the soil, giving rise to soil shrinkage. During the rains, the soil absorbs moisture and swells. Because of their susceptibility to high seasonal volumetric changes, extensive damages have been caused to Structures. Such soils are not peculiar to this country alone. In the United States alone, the expansive soils inflict about $9 billion per year in the form of damages to structures which is more than twice the combined damage from earthquakes, floods, tornados and hurricanes (Jones and Holtz, 1973; Jones and Jones, 1987).In general, expansive soils have high plasticity, and are relatively stiff. The pore water pressure is initially negative and the deposit is generally unsaturated. These soils often have some Montmorillonite clay mineral present. The higher the amount of monovalent cations adsorbed to the clay mineral (e.g. sodium), the more severe the expansive soil problem (Fredlund and Rahardjo, 1993). In this paper study the effect of Soil-Slab Polish Dust on Plasticity characteristics, Compaction, Swelling, CBR, of expansive soil is studied.

REVIEW OF LITERATURE

Ground modification techniques have become a major part of civil engineering practice over the last 30 years (Hausmann, 1990). Improvement of sites with weak or high compressible or high swelling or any other such problematic soils is commonly done by removing the problematic soils and replacing them with more competent ones such as compacted gravel, crushed rock, or lightweight aggregates to increase the load bearing capacity (Kukko, 2000). Although this is considered a good solution, usually has the drawback of high cost due to the cost of the replacement materials. The use of admixtures derived from coal combustion by-products (CCPs) such as fly ash are considered is more cost-effective solution which can result in adequate improved engineering properties of the treated foundation soils.In India, expansive soils are found in regions where the annual rainfall ranges from 300 to 900 mm. SubbaRao et al. 1985 have emphasized that the Montmorillonite content is the predominant clay fraction in these soils. The Cation Exchange Capacity of these soils vary from 80 to 130 m.eq/100 gm and their consistency limits vary from 53% to 100%, 20% to 50% and 7% to 18% for liquid limit, plastic limit and shrinkage limit respectively. The specific gravity varies from 2.7 to 2.9 for black cotton soils. The clay fraction of black cotton soils is very rich in silica (60%) with only 15% iron and 15%

Seismic Analysis of Medium Rise Open Ground Storey Framed Building by Response Spectrum Analysis Method

R. Suresh[1] Dr.K. Narasimhulu[2]
[1]M.Tech Student [2]Professor
[1,2]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Tirupati, India

Abstract— The present study primarily focuses on the construct of Open Ground Storey (OGS) building. The collapse mechanism of such style of building is preponderantly owing to the formation of soft- storey behavior within the ground storey of this kind of building the IS 1893 code was revised in 2002, Incorporating new recommendations to handle OGS Frame buildings. in line with this clause 7.10.3(a) of a seismic code states: "The columns and beams of the soft-storey area unit to be designed for the multiplication factor of 2.5 times the structure shears and moments calculated foer seismic loads of bare frame". The given multiplication factor (MF) of 2.5, applicable for all OGS framed buildings, However as knowledgeable by the engineer during the design, MF of 2.5 in not realistic for low and medium rise buildings. This calls for assessment and review of the code suggested multiplication factor for low rise and medium rise Open Ground Storey buildings. The objective of the paper is to check the applicability of the multiplication factor of2.5 within the seismic Analysis of a medium rise open ground storey building. A RC framed building (G+9) with open ground strorey Placed in Bhuj (seismic Zone-V) is thought about for this study. This building is analyzed for 2 different cases by response spectrum analysis method (a) considering infill strength and stiffness (open ground storey), (b) Not considering infill strength and stiffness (Bare frame). Infill Stiffness was created in ETABS by using Equivalent Diagonal Strut approach. ETABS software is used for Structural modelling and Response spectrum analysis. Analysis is carried out for these models and results were compared.

Key words: Open Ground Storey Building, Soft Storey, Bare Frame, ETABS, Equivalent Diagonal Strut Approach, Response Spectrum Analysis

I. INTRODUCTION

Due to growing population since the past few years the car parking area for residential buildings in populated towns is an issue of fundamental worry. therefore the trend has been to make use of the ground storey of the building itself for parking. Those types of buildings having no infill masonry walls in ground storey, however infilled in all top storeys, are known as Open ground Storey (OGS) buildings. They are also called 'open first storey building' (when the storey numbering starts with one from the floor storey), pilotis, or 'stilted buildings'. There is sizable benfit of these category of buildings functionally but from a seismic overall Performance factor of view such buildings are taken into consideration to have expanded vulnerability. From the past earthquakes it was obvious that the major form of failure that occurred in OGS buildings included snapping of lateral ties, crushing of core concrete, buckling of longitudinal reinforcement bars etc. Due to the presence of infill walls in the entire upper storey apport from the ground storey makes the top stories an awful lot stiffer than the open ground storey. For that reason, the upper stories move about together as a single block,and maximum of the horizontal displacement of the building takes place in the soft ground storey itself. In other words, this type of buildings sway from side to side like inverted pendulum(Fig. 1.2) at some point of earthquake shaking, and for this reason the columns in the ground storey columns and beams are heavily pressured. Therefore it's far required that the ground storey columns must have sufficient strength and adequate ductility. The vulnerability of this sort of buildi-ng is attributed to the sudden decreasing of lateral stiffness and strength in ground storey, compared to top stories with infill walls.

The OGS framed building behaves in a way when compared to a bare framed building (without any infill) under lateral load. A bare frame is much less stiffer than totally infilledframe. it resists the applied lateral load through frame action and shows properly-distributed plastic hinges at failure. When this frame is absolutely infilled, truss action is introduced. A completely infilled frame indicates much less inter-storey drift,Even though it generates more base shear (due to increased stiffness). A fully infilled frame yield less force in the frame elements and dissipate larger energy through infill walls.The strengthand stiffness of infill walls in infilled frame buildings are unnoticed in the structural modeling in usual design practice. 7.10.3(a) states: "The columns and beams of the soft storey are to be designed for 2.5 times the storey shears and moments calculated underneath seismic loads of bare frames."The factor 2.5 may be instructed as a multiplication factor (MF). This multiplication factor (MF) is ment to be the reimbursement for the stiffness discontinuity. As a result the intension of this thesis is to check the applicability of the multiplication factor of 2.5 in the ground storey beams and column when the building is to be designed as open ground storey framed Building and to study the effect of infill strength and stiffness in the seismic analysis of low rise open ground storey building. Hence for the present study Response spectrum analysis (RSA) is considered for the Comparative study. To carry out these analyses a typical building model with two different cases are considered.

- Considering infill strength and stiffness (Open ground storey building).
- Without considering infill strength and stiffness (bare frame).

This study deals with fixed end support condition. All other Types of support conditions are not considered in this thesis. Soil-structure interaction is unnoticed for the present study.

Sesimic Analysis of a GFRG Building & Regular RC Building by using ETABS (Static & Dynamic)

G. Umapathi[1] G. Madhu Sudhan[2] K. Narasimhulu[3]
[1]M.Tech Student
[2,3]Department of Civil Engineering
[1,2,3]Annamacharya Institute of Technology & Sciences, Tirupati, India

Abstract— The effective design and the construction of earthquake resistant structures have much greater importance in all over the world. The behavior of GFRG building and regular RC building of G+5 multi stories building under earth quake is complex and it varies of wind loads are assumed to act simultaneously with earth quake loads. In this paper the seismic analysis by the response spectrum method will be done to the GFRG building and regular RC building of calculating various responses in different zones by using ETABS software, so that the both results be compared. The Glass fibre reinforced gypsum (GFRG) walls are gypsum panels with hallow cores or cavities which can be filled with concrete. GFRG walls are in residential, commercial and industrial buildings. GFRG panels are a composite material consisting of gypsum plaster and glass fibers. The gypsum is industrial by product waste the product is not only ecofriendly, but also resistant to water and fire. IIT madras has been involved, since 2003 with the development of building system especially earthquake resistant design for use in India. Our India is still developing country fighting with huge shortage of houses for every year. To meet this challenge, India requires innovative, energy efficient, strong and durable in fast method of construction at economical cost. The main aim of this paper is to find out the different responses like Storey drift, Storey displacements, Base shear and Storey shear and Modal periods and Frequencies of both the GFRG and regular RC buildings. It is found that the GFRG are economical in design and construction in sub urban and low rise building constructions. But Displacements will be increasing with increase in number of storeys.

Key words: GFRG Panels, Wind Load, Earthquake, Story Displacement, Story Shear, Story Drift, Modal Periods and Frequencies, Base Shear and Response Spectrum Analysis

I. INTRODUCTION

GFRG buildings are a new type of construction to which conventional structural theories and design codes are not applicable. Glass fibre reinforced gypsum binder composites were produced by using E-type glass fibre and newly developed water-resistant gypsum binder [5]. The water resistant gypsum binder was produced by blending ground granulated slag, ordinary port land cement and an organic retarder with claimed phosphogypsum in a ball mill to obtain a uniform product. The binder possesses good water resistance as it does not show leaching in water up to 28 days of immersion , while plain plaster shows leaching after 3 days of immersion, in water. For the reinforcing material in this programme, chopped uncoated E-type glass fibre was used [14]. Rapid wall panel is world's largest load bearing light light weight panels. Each panel has 48 modular cavities of 12mx3mxx124m dimension. Reinforced concrete is one of the most widely used modern building materials. Concrete is an "artificial stone" obtained by mixing cement, sand and aggregates with water. Presently reinforced concrete buildings in many earthquake prone areas of the world are built to design codes and yet many still suffer failure during earthquakes. This may mean that they are deficiencies in design. This event cannot be avoided but, by proper planning and design we can prevent it to a notable extent and hence structural engineer's needs to design the structure taking into account all necessary factors including infill walls which plays a important role during earthquakes. We observed the main comparison of different responses like story drift, story shear, story displacements, base shear and modal periods and frequencies of both the modal periods and frequencies of both the GFRG and regular RC buildings in the entire four zones ZONE II, ZONE III, ZONE IV, and ZONE V.

The rapid growth of population, large-scale industrialization and very high land cost has resulted in a vast expansion in building construction industry. Our India is still a developing country fighting with a huge shortage of housing every year. So we need a very fast construction technology which can increase our development rate. Glass fibre reinforced gypsum walls are gypsum panels with hallow cores developed in Australia 1990 [5]. It is a load bearing prefabricated walling system with broad construction applications from industrial dwelling units to multi storey residential buildings, formwork, industrial paneling and compound walling [1].Construction of RC buildings formation of huge amount of co2(about 40% is developed due to construction industry) increases the chances of global warming [3]. Fertilizer industries are facing problems regarding disposal of industrial waste gypsum (2000 tons per day). Rapid wall is a large load bearing panel with modular cavities suitable for both external and internal walls .It can also be used as intermediate floor slab/roof in combination with RCC as composite material. The Light weight rapid wall has high compressive strength, shearing strength, flexural strength and ductility. It has very high level of resistance to fire, heat, water, termites, rot and corrosion [6&9]. Concrete infill with vertical reinforcement rods enhances its vertical and lateral load capabilities. Rapid wall buildings are resistant to earthquakes, cyclones and fire.

II. OBJECTIVE OF THE PROJECT

The main objective of the thesis is to compare the GFRG building (G+5) with regular RC building (G+5) with regular RC building (G+5) with following purposes in all the entire four zones .here we will be discussing the main comparison in zone II.

1) About the GFRG Material and procedure to construction of GFRG Building Systems

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WATER QUALITY ASSESSMENT IN TERMS OF WATER QUALITY INDEX IN GUDUR AREA, NELLORE DISTRICT, ANDHRA PRADESH

G.Veeraswamy[1], Prof A. Nagaraju[1], E. Balaji[2], Y. Sreedhar[3], M. Rajasekhar[4]
E-Mail Id: veeraswamygolla33@gmail.com
1, 2, 3 Department of Geology, S V University, Tirupathi, Andhra Pradesh, India
[4]Yogivemana University, Kadapa, Andhra Pradesh, India

Abstract-The present study was intended to calculate water quality index (WQI) of Gudur area, Nellore district.Andhrapradesh.in order to ascertain to the quality of water for the public consumption, irrigation, agriculture, Recreation and other purpose In the present study area water samples were collected and analyses the different physico-chemical parameter such as P^H, electrical conductivity, total dissolved solids, bicarbonate, chloride, sulphate, calcium, magnesium, sodium, potassium, alkalinity and total hardness of the water sample, determine the presence of the quantity levels in the 40 water samples. Based on that calculate the water quality index for the all samples. In this area the water quality ranges from 88.26 to 186.55.It represented the poor water quality based on water quality index in the study area.

Key Words: water quality index, physico-chemical parameter, Correlation matrix.

1. INTRODUCTION

Groundwater resources are dynamic in nature and are affected by such factors as the expansion of irrigation Activities, industrialization and urbanization; hence monitoring and conserving this important resource is essential. The quality of water is defined in terms of it ascertaining the quality is crucial before its use of various purposes such as drinking; agricultural, recreational and industrial uses etc [Mohan Babu et.al,, 2013].The WQI was first developed by Horton in the early 1970s, is basically a mathematical means of calculating a single value from multiple test results. The index result represents the level of water quality in aim study area, such as Bore wells, ponds or stream. After Horton a number of workers all over the world developed WQI based on rating of different water quality parameters. Basically a WQI attempts to provide a mechanism for presenting a cumulatively derived, numerical expression defining a certain level of water quality (Miller et al., 1986). In Gudur area contains the world richest and high quality minerals are present such as muscovite mica, biotite mica, feldspars minerals ,garnets, tourmaline, beryl, quartz and some eastern part of the gudur area contains the vermiculite deposits. The surface and ground water interact with minerals in this area leads to take pollution. This research aimed at determining water quality status of gudur area, such as drinking purpose, irrigation, agriculture and livestock.

2. STUDY AREA

The present study area is included in the toposheet No.57 N/16 and covers an area of area of 19 km². It is located between longitudes 79° 42' 30" E – 79° 54' 30" E and latitudes 14° 13' 0" N -14° 16' 30" N (Fig.1).

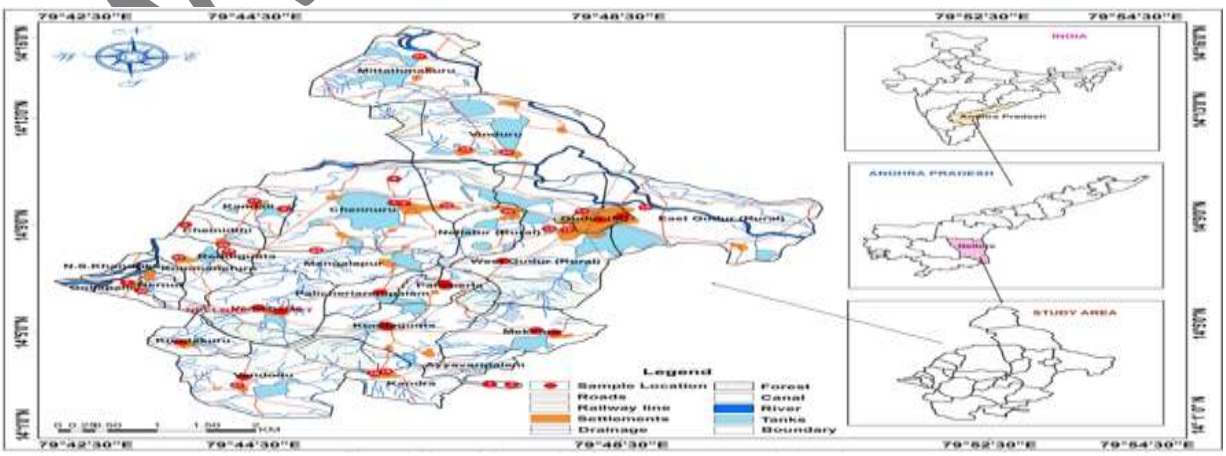

Fig. 1 Map of the Study Area With Water Sample Locations

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Land use and Land Cover analysis using Remote Sensing and GIS:A case study In Gudur area , Nellore District, Andhra Pradesh, India.

G.Veeraswamy , A.Nagaraju , E.Balaji , Y.Sreedhar
[1] Dept.of Geology, Sri Venkateswara University, Tirupathi, Andhra Pradesh,
[2]Dept.of Geology, Sri venkateswara University, Tirupati, Andhra Pradesh, India

ABSTRACT:

Land use/land cover information is essential for selection, planning and implementation of management strategies to meet the increasing demands for basic human needs and welfare of the ever growing population. The aim of the research was to analyze and monitor land use/land cover in Gudur area, Nellore district ,Andhra Pradesh, of south India by using integrated approach of remote sensing and geographical information system. The total study area is about 247.29 km2. The National Land use/Land cover classification developed by National Remote Sensing Centre (NRSC) and Indian Space Research Organization (ISRO) divides the land in the study area into five Level I classes, 11 Level II classes, and fifteen Level III classes. From this three-level hierarchic based classification. The land use and land cover analysis on the study area has been attempted based on thematic mapping of the area consisting of built-up land, cultivated land, water bodies, forest land, barren land and uncultivated land using the satellite image. The result shows that the agriculture lands area well distributed entire study area and it covers 159.83 sq.km (65%). Forest occupies 15.22 km^2 (6.0%), Built up urban and rural area covers 5.31 km^2 and 6.56 km^2 respectively. quarry and industrial area covers 1.78 km2 and 0.43 km^2, Water bodies and uncultivated lands occupy 24.62

Analytical Study on Fly Ash and GGBS Blended Reinforced Geopolymer Concrete Beams by using ANSYS

B. Sri Kalyan[1] Dr.J. Guru Jawahar[2] C. Sreenivasulu[3]
[1,2]PG student
[1,2,3]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Tirupati, India [3]Jawaharlal Nehru Technological University Anantapur, Anantapuram, India

Abstract— The present study mainly focuses on analytical study of fly ash and GGBS blended reinforced geo polymer concrete beams. The beams were analyzed by using Ansys R15.0. The reinforced geo polymer beams analyzed were cured for 28days in an ambient room temperature itself. The conventional reinforced concrete beam analyzed were cured for 28 days in water. The proportions of source materials for geo polymer concrete used are fly ash(FA) 50- Ground Granulated Blast Furnace Slag (GGBS) 50, FA0-GGBS100. The grade of Conventional Concrete (CC) was fixed equivalent to that of Geopolymer concrete with the earlier specified proportions. The grade of geo polymer concrete was fixed to be M45 by doing trial and error method. The beams were analyzed for two- point loading. The parameters such as Max.Equivalent stresses (Von-Misses stress), Max.Normal Stress, Max. Normal Elastic Strain, Max.Shear Stress, Max.Shear strain and Max.central deflection were found. The present study has given a final conclusion that the performance of reinforced geo polymer concrete (RGPC) beams was better than that of equivalent grade of reinforced conventional concrete beams.

Key words: Reinforced Geopolymer concrete beams; Ansys R15.0; Max.Equivalent stresses (Von-Misses stress); Max. Normal Elastic Strain; Max.Shear Stress; Max.central deflection

I. INTRODUCTION

Concrete is the most widely used construction material after water in the world and ordinary Portland cement (OPC) is the major ingredient used in concrete. The production of cement releases large amount of carbon dioxide (CO2) to the atmosphere that significantly contributes to greenhouse gas emissions. It is estimated that one ton of CO2 is released into the atmosphere for every ton of OPC produced [1].The mechanical properties of Geo-polymer concrete(GPC) mixes with different aggregates blending and also combination of sodium hydroxide and sodium silicate solution was used as alkaline activator and conclude that optimum fine aggregate blending and also all Splitting Tensile Strength (STS) and Flexural Strength(FS) of all mixes were compared with ACI 363R, CEB-FIP and ACI 318R predicted equations [2]. The mechanical properties of Geo-polymer concrete(GPC) using granite slurry(GS) as sand replacement at different levels and cured at room temperature and concluded that optimum replacement level of GS used in place of sand and can solve the natural resources [3]. The load deflection relationships, crack pattern, ultimate load was obtained and compared with the experimental results available in literature and obtained results shows good agreement with the experimental results for comparative study of experimental and analytical results of FRP strengthened beams in flexure [2]. A study on the unretrofitted RC beam designated as control beam, RC beams retrofitted with CFRP composites in uncracked and precracked beams were studied in Ansys and The results obtained was in good agreement with the experimental plots [3]. The dynamic analysis of the composite beam was studied and values of Young Modulus, Poisson's ratio and shear modulus were determined by using Ansys [4]. Beams strengthened with Carbon Fiber Reinforced Polymer and the beams were modelled using ANSYS and the obtained results were compared with the experimental one and was found to be in good agreement [5]. The load deflection relationship, crack pattern and ultimate load were obtained and also comparison were done for the CFRP and GFRP and reported that the performance of beams with retrofitting with CFRP was better than the beams with retrofitting with GFRP by using Ansys[6]. An Analytical Investigation of Bonded Glass Fiber Reinforced Polymer Sheets with Reinforced Concrete Beam Using Ansys which has been used to study the strengthened behavior of the beam and gave the conclusion as the Deflections in the beams retrofitted with GFRP are less than RCC beam and for the same load the RCC beam with GFRP have the less stresses and strains. In the comparison cases both experimental and analytical results are coinciding [7]. The models which are analyzed has shown the same structural response and failure modes as found in the experimental investigation [8]. The modelling of RC beams with and without openings by using Ansys and were investigated on beam strength, stiffness, deformed shape, and cracked patterns by the experimental and theoretical results were concluded that the both results were showed satisfactory [9]. A theoretical and experimental study on mechanical properties and flexural strength of fly ash-geo polymer concrete using young's modulus, Poisson's ratio stress-strain relation and indirect tensile strength with four-point loading and as FEM and concluded after the results there were approximate values by comparing both the theoretical and experimental study [10].

II. EXPERIMENTAL STUDY

Our objective was to determine the parameters such as Max.Equivalent stresses (Von-Misses stress), Max.Normal Stress, Max. Normal Elastic Strain, Max.Shear Stress, Max.Shear strain and Max.central deflection for reinforced beams of M45 grade of conventional concrete (CC) and geo polymer concrete having proportions of FA 50- GGBS 50and FA0-GGBS100 were FA is fly ash and GGBS is Ground Granulated Blast Furnace Slag.

A. Materials

The source materials for silica and aluminum were taken as Fly Ash and GGBS. Class F fly ash has been taken as it has

Finite Element Analysis of Geopolymer Concrete Incorporating Copper Slag as Fine Aggregate

V. G. Siva Theja[1] C. Sreenivasulu[2] Dr. J. Guru Jawahar[3] K. Narasimhulu[4]
[1]PG Student [2]Assistant Professor [3,4]Professor
[1,2,3,4]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Tirupati, India [3,4]Jawaharlal Nehru Technological University Anantapur, Anantapuram, India

Abstract— The present paper mainly focuses on analytical study of geopolymer concrete (GPC) incorporating copper slag (CS) as fine aggregate. The beams were analyzed by using Ansys R15.0. Fly ash and ground granulated blast furnace slag were used as geopolymer binders. In our present investigation the specimens of the GPC with incorporating copper slag as the fine aggregate in the proportions of 0%,10%, 20%, 30%, 40% are made, and the parameters such as compressive stress, Max. Equivalent stresses (Von-Misses stress), Max. Normal Stress, Max. Normal Elastic Strain, Max. Shear Stress, Max. Shear strain and Max. central deflection, flexural properties were found. The present study has given a final conclusion that the performance of reinforced geo polymer concrete (RGPC) beams was better than that of equivalent grade of reinforced conventional concrete beams.

Key words: Reinforced Geopolymer Concrete Beams, Ansys R15.0, Copper Slag(CS), Max.Equivalent Stresses (Von-Misses Stress), Max. Normal Elastic Strain, Max.Shear Stress, Max.Central Deflection

I. INTRODUCTION

Concrete is the most widely used construction material after water in the world and ordinary Portland cement (OPC) is the major ingredient used in concrete. The production of cement releases large amount of carbon dioxide (CO_2) to the atmosphere that significantly contributes to greenhouse gas emissions. It is estimated that one ton of CO_2 is released into the atmosphere for every ton of OPC produced [1]. The mechanical properties of Geo-polymer concrete (GPC) mixes with different aggregates blending and also combination of sodium hydroxide and sodium silicate solution was used as alkaline activator and conclude that optimum fine aggregate blending and also all Flexural Strength (FS) of all mixes were found. [2]. In terms of reducing the global warming, the geo polymer technology can reduce the CO_2 emission in to the atmosphere, caused by cement and aggregate industries is about 80% [3]. In this geo polymer technology, the source material is rich in silicon (Si) and Aluminium (Al) is reacted with a highly alkaline solution through the process of geo polymerization to produce the binding material. In our investigation, we are replacing the by-products such as fly ash and GGBS as a part of cement and copper slag as a part of sand to produce geopolymer concrete. [4]. Beams strengthened with Copper Slag Fiber Reinforced Polymer and the beams were modelled using ANSYS and the obtained results were compared. [5]. An Analytical Investigation of Bonded copper slag Fiber Reinforced Polymer Sheets with Reinforced Concrete Beam Using Ansys which has been used to study the strengthened behavior of the beam and gave the conclusion as the Deflections in the beams retrofitted with copper slag gave better results [6]. The models which are analyzed has shown the same structural response and failure modes as found in the experimental investigation [7]. The load deflection relationships, ultimate load, flexural properties were obtained and compared with the experimental results available in literature and obtained results shows good agreement with the experimental results for comparative study of experimental and analytical results strengthened beams in flexure. [8]. A theoretical and experimental study on mechanical properties and flexural strength of fly ash-geo polymer concrete using young's modulus, Poisson's ratio stress-strain relation and with two-point loading and as FEM and concluded after the results there were approximate values by comparing both the theoretical and experimental study.

II. EXPERIMENTAL STUDY

The experimental investigation was focused on the effect of various proportions of copper slag on GPC and determine the parameters such as Compressive Strength, Ultimate Deflection, flexural properties, Max.Equivalent stresses (Von-Misses stress), Max.Normal Stress, Max.Normal Elastic Strain, Max.Shear Stress, Max.Shear strain and Max.central deflection. Sand and CS were used as fine aggregate and CS chemical composition are listed in Table 1. Super plasticizer of SP-430 was used to improve the workability of mixtures.

A. Materials

Composition	% by mass
SiO_2	43.20
Al_2O_3	12.60
Fe_2O_3	1.30
CaO	40.20
Na_2O_3	0.90
K_2O	0.60
TiO_2	-
MgO	1.45
GNO_3	-

Table 1: Chemical composition of CS

Crushed granite stones of the size 20 mm and 10 mm were used as coarse aggregate and the river sand was used as fine aggregate. The bulk specific gravity in oven dry condition and the water absorption of the coarse aggregate 20 mm and 10mm were 2.58 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the sand were 2.62 and 1% respectively and also the fineness modulus is 2.59.

B. Mix proportion

In this study, mechanical properties of geopolymer concrete (GPC) incorporating copper slag(CS) as fine aggregate with the replacement levels of 0%, 10%, 20%, 30% and 40% of

A Study of Geopolymer Concrete Slabs with Silica Sand as Partial Replacement of Natural Sand

K. Niranjankumar[1] C. Sreenivasulu[2] K. Sai Abhinav[3] MM. Premchand[4] J. Guru Jawahar[5]
[1]M.Tech Student [2,3]Assistant Professor [4]Research Scholar [5]Professor
[1,2,3,4,5]Department of Civil Engineering
[1,2,3,5]Annamacharya Institute of Technology & Sciences, India [4]S.V.University, Tirupati, India

Abstract— Many efforts are put on the advances in construction technology. Study on the Geopolymer concrete, which is produced by developing a binder named geopolymer are rich in silica and alumina as source materials by an alkaline reaction, it replaces Ordinary Portland Cement. This study mainly focused on the Flexural behaviour of geopolymer concrete One-way slab with partial replacement of silica sand as natural sand at different proportions like 100:0, 90:10, 80:20, and 70:30 (natural sand: silica sand). The grade of conventional concrete M40, which is equivalent to grade of geopolymer concrete. The Slabs were cured for 28 days at ambient room temperature and tested for two point loading. The flexural parameters under two point loading like Load characteristics, first crack load, Ultimate load, service load, yield load, Ultimate deflection, bending stresses, Moment characteristics are presented. The study final concludes that at 20% replacement level of silica sand as partial replacement of natural sand gives better results at 8M, hence the silica sand used as a filler material for well graded geopolymer concrete.

Key words: Geopolymer Concrete, Silica Sand, Two-Point Loading, Flexural Parameters

I. INTRODUCTION

Slabs are plane structural members whose thickness is small as compared to its length and breadth. One way slab is made with geopolymer concrete, which was introduced by Davidovits1978, rich in silica and aluminium. In the process of polymerization of materials, alkaline substances are to be added [1]. The source material for silica and aluminium are Fly ash (FA), which is produced from thermal power plants as a waste and ground granulated blast furnace slag (GGBS), which is produced from AASTRA Chemicals, Chennai. Alkaline substances used for obtaining Polymerization reaction are alkaline grade sodium silicate solution (Na2Sio3) and sodium hydroxide solution (NaOH) as an alkaline activator, were taken as 8M. Geopolymer concrete made with only flyash as a source material for silica and aluminium has shown poor results [2]. Geopolymer concrete require curing under ambient room temperature itself. Results are already concluded that GGBS and FA blended GPC mixes attained enhanced mechanical properties at ambient room temperature itself [3-6]. Comparative effect of earth quake on flat slab and grid floor system consisting of beam spaced at regular intervals in perpendicular direction, monolithic with slab [7]. Flat slab building structures which are more significantly flexible than traditional concrete, thus becoming more vulnerable to seismic loading. Comparing the behaviour of multistory building having flat slabs with drops to two way slabs with beams and to study the effect of part shear walls on performance under seismic forces [8]. Flat slab RC buildings exhibit several advantages over conventional moment resisting frames. Derivation of fragility curves using medium-rise flat slab buildings with masonry infill walls [9]. The flat slab is preferred as a floor system because of its architectural appearance, flexibility of flat slab RC structure, easy to construct and economic structure. The seismic response of flat slab structure with different heights as well as variation in plan [10]. The seismic behaviour of multi-story flat slab and conventional reinforced concrete framed structures for different heights and changes occured, if height of traditional and flat slab changes [11]. Flat slab buildings in which slab is directly rested on columns, constructed recently due to the advantage of reduced floor to floor heights to meet economical and architectural demands [12]. Punching shear strength of high performance concrete (HPC) two way slabs under simply supported edge condition and tested under a central patch load, possess higher energy absorption, higher punching shear strength than central specimens [13].

The present study aimed to find the flexural parameters viz. Load characteristics, moment characteristics, cracking load, ultimate load, service load, maximum moment resistance capacity and ultimate deflection under the flexural behaviour of geopolymer concrete slabs at different replacement levels of silica sand after 28 days ambient room temperature curing.

II. EXPERIMENTAL STUDY

A. Materials

In this present study, FA, GGBS and silica sand were used as binders who's chemical and physical properties are tabulated in Table1. According to ASTM C 618 (2003) [14], class F fly ash produced from Lanco Industry, sri kalahasti, A.P and GGBS produced from AASTRA chemicals, Chennai, A.P were used in the manufacturing of GPC.

Particulars	Class F fly ash	GGBS	Silica sand
Chemical composition			
% Silica(Sio2)	65.6	30.61	81.5
% Alumina(Al2O3)	28.0	16.24	0.64
%Iron Oxide(Fe2O3)	3.0	0.584	0.76
% Lime(Cao)	1.0	34.48	0.14
% Magnesium(Mgo)	1.0	6.79	0.99
%Titanium Oxide(TiO2)	0.5	-	-
%Sulphur Trioxide(So2)	0.2	1.85	-
Loss on Ignition	0.29	2.1	-
Physical properties			
Specific gravity	2.12	2.94	2.60
Fineness(m2/kg)	360	400	-

Table 1: Chemical & Physical Properties of Class F Flyash, GGBS & Silica Sand

The alkaline liquid used was a combination of sodium silicate solution (Na2O = 13.7%, SiO2 = 29.4% and

An Experimental Studies on GPC at Ambient Curing Temperature

M. Dinesh Kumar[1] C. Sreenivasulu[2] J. Guru Jawahar[3] K. Narasimhulu[4]
[1]M.Tech Student [2]Assistant Professor [3,4]Professor
[1,2,3,4]Annamacharya Institute of Technology & Sciences, Tirupati, India

Abstract— The demand of cement (OPC) is increasing for satisfying the need of development of infrastructure facilities. OPC production releases more quantity of carbon dioxide to the atmosphere, it is harmful to the human health and also pollute environment. Therefore, it is essential to find alternatives to make the concrete environment friendly. In this respect, Davidovits (1988) proposed an alternative binder for the concrete technology and it shows a good results. These binders are produced by an alkaline liquid reacts with the silica (Si) and aluminium (Al) present in the source materials. The technology proposed by the Davidovits is commonly called as Geo-polymers or Geo-polymer technology. This paper presents the study on Mechanical properties of GPC of class f fly ash (FA-50%) & GGBS(50%) based GPC using silica sand as sand replacement at different levels (0%,10%,20%&30%). These properties have been tested for 7, 28&90 days curing at ambient room temperature. From the results, it is concluded that the increased replacement level of Silica Sand from 0% to 20% increased the mechanical properties of GPC mixes.

Key words: Geopolymer Concrete, Silica Sand, Mechanical Properties

I. INTRODUCTION

Geopolymer binder which was introduced by Davidovits1978, is an inorganic polymer binder, rich in silica and aluminium. In the process of polymerization of materials, alkaline substances are to be added [1]. The source material for silica and aluminium are Fly ash (FA), which is produced from thermal power plants as a waste and ground granulated blast furnace slag (GGBS), which is produced from AASTRA Chemicals, Chennai. Alkaline substances used for obtaining Polymerization reaction are alkaline grade sodium silicate solution (Na2Sio3) and sodium hydroxide solution (NaOH) as an alkaline activator, were taken as 8M. Geopolymer concrete made with only fly ash as a source material for silica and aluminium has shown poor results [2]. Geopolymer concrete require curing under ambient room temperature itself. Results are already concluded that GGBS and FA blended GPC mixes attained enhanced mechanical properties at ambient room temperature itself [3]. The behaviour of geopolymers were studied the many of researches using various types of source materials like fly ash, GGBS, silica sand etc. The present study deal with the development and the mechanical properties of geopolymer concrete incorporating silica sand as fine aggregate with different replacement levels from 10% to 30% at ambient room temperature curing [4]. To develop a mixture proportioning process to manufacture fly ash (ASTM Class F) and GGBS based geopolymer concrete incorporating silica sand as fine aggregate [5]. To identify and study the effect of prominent parameters that affects the properties of fly ash and GGBS based geopolymer concrete [6].

The present investigation is aimed to study the strength properties of hardened low calcium fly ash-based geopolymer concrete incorporating silica sand as fine aggregate with different replacement levels from 10% to 30% at ambient room temperature curing.

II. EXPERIMENTAL STUDY

A. Materials

In this respect, FA, GGBS and silica sand were used as binders whose chemical and physical properties are tabulated in Table1. According to ASTM C 618 (2003) [7], class F fly ash produced from Lanco Industry, srikalahasti, A.P and GGBS produced from AASTRA chemicals, Chennai, A.P were used in the manufacturing of GPC.

Particulars	Class F fly ash	GGBS	Silica sand
Chemical composition			
% Silica(Sio2)	65.6	30.61	81.5
% Alumina(Al2O3)	28.0	16.24	0.64
%Iron Oxide(Fe2O3)	3.0	0.584	0.76
% Lime(Cao)	1.0	34.48	0.14
% Magnesium(Mgo)	1.0	6.79	0.99
%Titanium Oxide(TiO)	0.5	-	-
%Sulphur Trioxide(So3)	0.2	1.85	-
Loss on Ignition	0.29	2.1	-
Physical properties			
Specific gravity	2.12	2.94	2.60
Fineness(m2/kg)	360	400	-

Table 1: chemical and physical properties of class F fly ash, GGBS and silica sand

The alkaline liquid used was a combination of sodium silicate solution(Na2O = 13.7%, SiO2 = 29.4% and water = 55.9%) and sodium hydroxide (NaOH) in pellets form with 97% - 98% purity was purchased from local suppliers. The sodium hydroxide (NaOH) solution was prepared with a concentration of 8M. The sodium silicate solution and sodium hydroxide solution were mixed together one day before prior to use. Crushed granite stones of size 20mm and 10mm used as coarse aggregate, river sand used as fine aggregate and silica sand used as replacement of natural sand at different levels 100:0, 90:10, 80:20 and 70:30. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20mm and 10mm were 2.66 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the fine aggregate were 2.62 and 1% respectively. The bulk specific gravity in oven dry condition and water absorption of silica sand were 2.60 and 0.4% respectively.

B. Mix design

Based on the limited past research on GPC, the mix proportions were selected based on Rangan's method. Geopolymer concrete mix proportions of constituent materials are shown in Table 2.

Materials	Mass(Kg/m^3)			
	100:0	90:10	80:20	70:30

An Appropriate Relation between Strength Characteristics & Combined NDT'S of GPC

S. Kalyan Kumar[1] C. Sreenivasulu[2] P. Vijay Kumar[3] A. Lakshmipriya[4] M. Dinesh Kumar[5]
[1,4,5]M.Tech Student [2,3]Assistant Professor
[1,2,3,4,5]Annamacharya Institute of Technology & Sciences, Tirupati, India

Abstract— In present days the demand of cement (OPC) is growing for satisfying the need of improvement of infrastructure facilities. OPC production releases greater amount of carbon dioxide to the environment, it's far harmful to the human health and additionally pollute environment. Consequently, its miles essential to find alternatives to make the concrete surroundings friendly. On this respect, Davidovits (1988) proposed an alternative binder for the concrete era and it indicates a terrific results. Those binders are produced through an alkaline liquid reacts with the silica (Si) and aluminum (Al) present inside the source materials. The technology proposed by way of the Davidovits is usually called as Geo-polymers or Geo-polymer technology. This paper gives the study on Mechanical houses of GPC of class f fly ash (FA-50%) & GGBS (50%) based GPC the use of silica sand, copper slag and granite slurry as sand replacement at unique stages (0%, 10%, 20% & 30%).In the present investigation to study the compressive strength and predict the compressive strength by using Rebound Hammer and Ultrasonic Pulse Velocity at different curing periods after 7, 28 & 90 days curing at ambient room temperature. By using Regression analysis formed the equations Silica Sand from 0% to 30% compressive strength , Rebound number and Ultrasonic Pulse Velocity values increased and form the varies equations and also copper slag and Granite slurry 0% to 30% compressive strength, Rebound number and Ultrasonic Pulse Velocity increased and formed the various equations. By using Regression analysis and available data as compressive strength, Rebound number and Ultrasonic Pulse Velocity formed the various equations at different replacement levels.

Key words: Geo-Polymer Concrete, Silica Sand, Copper Slag & Granite Slurry

I. INTRODUCTION

Geo-polymer binder which was introduced by Davidovits 1978, is an inorganic polymer binder, rich in silica and aluminium. In the process of polymerization of materials, alkaline substances are to be added. The source material for silica and aluminium are Fly ash (FA), which is produced from thermal power plants as a waste and ground granulated blast furnace slag (GGBS), which is produced from AASTRA Chemicals, Chennai. Alkaline substances used for obtaining Polymerization reaction are alkaline grade sodium silicate solution (Na2Sio3) and sodium hydroxide solution (NaOH) as an alkaline activator, were taken as 8M. Geo-polymer concrete made with only fly ash as a source material for silica and aluminium has shown poor results. Geo-polymer concrete require curing under ambient room temperature itself. Results are already concluded that GGBS and FA blended GPC mixes attained enhanced mechanical properties at ambient room temperature itself. The behaviour of geopolymers were studied the many of researches using various types of source materials like fly ash, GGBS, silica sand, copper slag and granite slurry etc. The present study deal with the development and the mechanical properties of geopolymer concrete incorporating silica sand, copper slag and Granite slurry as fine aggregate with different replacement levels from 10% to 30% at ambient room temperature curing. To develop a mixture proportioning process to manufacture fly ash (ASTM Class F) and GGBS based geopolymer concrete incorporating silica sand as fine aggregate. To identify and study the effect of prominent parameters that affects the properties of fly ash and GGBS based geopolymer concrete.

The present investigation is aimed to study the strength properties of hardened low calcium fly ash-based geo-polymer concrete incorporating silica sand, copper slag and granite slurry as fine aggregate with different replacement levels from 10% to 30% at ambient room temperature curing.

II. EXPERIMENTAL STUDY

A. Materials

In this respect, FA, GGBS silica sand, copper slag and Granite slurry were used as binders whose chemical and physical properties are tabulated in Table1. According to ASTM C 618 (2003) [7], class F fly ash produced from Lanco Industry, srikalahasti, A.P and GGBS produced from AASTRA chemicals, Chennai, A.P were used in the manufacturing of GPC.

Particulars	Class F fly ash	GGBS	Silica sand
Chemical composition			
% Silica(Sio2)	65.6	30.61	81.5
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% Lime(Cao)	1.0	34.48	0.14
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%Titanium Oxide(TiO)	0.5	-	-
%Sulphur Trioxide(So3)	0.2	1.85	-
Loss on Ignition	0.29	2.1	-
Physical properties			
Specific gravity	2.12	2.94	2.60
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Table 1: Chemical & Physical Properties of Class F Fly Ash, GGBS & Silica Sand

The alkaline liquid used was a combination of sodium silicate solution (Na2O = 13.7%, SiO2 = 29.4% and water = 55.9%) and sodium hydroxide (NaOH) in pellets form with 97% - 98% purity was purchased from local suppliers. The sodium hydroxide (NaOH) solution was prepared with a concentration of 8M. The sodium silicate solution and sodium hydroxide solution were mixed together one day before prior to use. Crushed granite stones of size

An Experimental Study on Flexural Behaviour of Geopolymer Concrete Beams

A.Lakshmi priya[1] K. Shalini[2] C.Sreenivasulu[3] J. Guru Jawahar[4] K.Narasimhulu[5]
[1]M.Tech Student [2,3]Assistant Professor [4,5]Professor
[1,2,3,4,5]Annamacharya Institute of Technology & Sciences, Tirupati, India

Abstract— Geopolymer binders have been proved to be green building materials that can totally replace OPC by an alkaline reaction between silica and alumina are presented in source material. This paper mainly focused on the Flexural behaviour of geopolymer concrete beams with partial replacement of silica sand as natural sand at different proportions like 100:0, 90:10, 80:20, and 70:30 (natural sand: silica sand). The grade of conventional concrete was made as M40, which is equivalent to grade of geopolymer concrete. The beams were cured for 28 days at ambient room temperature and tested for two point loading. The parameters under flexural behaviour like First crack load, Ultimate load, service load, yield load, Ultimate deflection, bending stresses, Load deflection characteristics, Moment characteristics are presented. The study has given a final conclusion that at 20% replacement level of silica sand as natural sand gives better results at 8M. By increasing the replacement level decreasing the strength, hence the silica sand used as a filler material for well graded geopolymer concrete which is more sustainable.

Key words: Geopolymer Concrete, Silica Sand, Two-Point Loading, Flexural Parameters

I. INTRODUCTION

Geopolymer binder which was introduced by Davidovits1978 is an inorganic polymer binder, rich in silica and aluminium. In the process of polymerization of materials, alkaline substances are to be added [1]. The source material for silica and aluminium are Fly ash (FA), which is produced from thermal power plants as a waste and ground granulated blast furnace slag (GGBS), which is produced from AASTRA Chemicals, Chennai. Alkaline substances used for obtaining Polymerization reaction are alkaline grade sodium silicate solution (Na2Sio3) and sodium hydroxide solution (NaOH) as an alkaline activator, were taken as 8M. Geopolymer concrete made with only fly ash as a source material for silica and aluminium has shown poor results [2]. Geopolymer concrete require curing under ambient room temperature itself. Results are already concluded that GGBS and FA blended GPC mixes attained enhanced mechanical properties at ambient room temperature itself [3-6]. The load deflection characteristic at mid span of the reinforced geopolymer concrete beams and OPC controlled beams were found to be similar and shows slightly more deflections at same load than the reinforced OPCC beams [7]. Research is being conducted on the flexural behaviour of reinforced geopolymer concrete beams (RGPC). The first cracking load and service load of RGPC beams shows slightly high performance when compared to reinforced cement concrete beams [8]. Ultimate load for Geopolymer concrete beams with 75% fly ash and 25% GGBS were found to be higher than the Ultimate loads for reinforced geopolymer concrete beams with only fly ash, irrespective of the quantity of tensile strength [9].

The present investigation is aimed to find the flexural parameters viz. Load deflection characteristics, moment characteristics, cracking load, ultimate load, service load, maximum moment resistance capacity and ultimate deflection under the flexural behaviour of geopolymer concrete beams at different replacement levels of silica sand after 28 days ambient room temperature curing.

II. EXPERIMENTAL STUDY

A. *Materials:*

In this respect, FA, GGBS and silica sand were used as binders whose chemical and physical properties are tabulated in Table1. According to ASTM C 618 (2003) [10], class F fly ash produced from Lanco Industry, srikalahasti, A.P and GGBS produced from AASTRA chemicals, Chennai, A.P were used in the manufacturing of GPC.

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%Titanium Oxide(TiO2)	0.5	-	-
%Sulphur Trioxide(So2)	0.2	1.85	-
Loss on Ignition	0.29	2.1	-
Physical properties			
Specific gravity	2.12	2.94	2.60
Fineness(m2/kg)	360	400	-

Table 1: chemical and physical properties of class F flyash, GGBS and silica sand

The alkaline liquid used was a combination of sodium silicate solution (Na2O = 13.7%, SiO2 = 29.4% and water = 55.9%) and sodium hydroxide (NaOH) in pellets form with 97% - 98% purity was purchased from local suppliers. The sodium hydroxide (NaOH) solution was prepared with a concentration of 8M. The sodium silicate solution and sodium hydroxide solution were mixed together one day before prior to use. Crushed granite stones of size 20mm and 10mm used as coarse aggregate, river sand used as fine aggregate and silica sand used as replacement of natural sand at different levels 100:0, 90:10, 80:20 and 70:30. The bulk specific gravity in oven dry condition and water absorption of the coarse aggregate 20mm and 10mm were 2.66 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the fine aggregate were 2.62 and 1% respectively. The bulk specific gravity in oven dry condition and water absorption of silica sand were 2.60 and 0.4% respectively.

Comparison of GFRG Building with Regular RC Building by Using ETABS

G Madhu sudan[1] K Satya Eswar S.Rao[2] Dr P.V Subba Reddy[3]
[1,2]Assistant Professor [3]Professor
[1,2,3]Department of Civil Engineering
[1]Annamacharya Institute of Science & Technology, Andhra Pradesh, India [2]Gitam University, Andhra Pradesh, India [3]N.B.K.R Institute of Science and Technology, Andhra Pradesh, India

Abstract— The behaviour of GFRG and regular RC of G+5 multi stories building under earth quake is complex and it varies of wind loads are assumed to act simultaneously with earth quake loads. In this paper a comparison of GFRG building with regular RC building of G+5 multi story building is studied for earth quake and wind load using ETABS. The Glass fibre reinforced gypsum (GFRG) walls are gypsum panels with hallow cores or cavities which can filled with concrete .GFRG walls are used in residential, commercial and industrial buildings. GRFG panels are a composite material consisting of gypsum plaster and glass fibres. The gypsum is industrial by product waste the product is not only eco-friendly, but also resistant to water and fire. GFRG panels can be used as various structural elements such as walls and slabs. GFRG walls find more and more applications and interests in the building industry in Australia as well as in other countries including china and India. GFRG panels are presently manufactured to a thickness of 124mm, a length of 12m and a height of 3m. IIT Madras has been involved, since 2003 with the development of building system especially earthquake resistant design for use in India. Our India is still developing country fighting with huge shortage of houses for every year. In India fertilizer industries are facing problem in disposal of industrial waste gypsum (2000 tons per day). To meet this challenge, India requires innovative, energy efficient, strong and durable in fast method of construction at economical cost. The main aim of this paper is to find out the different responses like Story drift, Story Displacements, Story Shear, Base shear and Modal periods and frequencies of both the GFRG and regular RC buildings in the entire four zones ZONE I, ZONE II, ZONE III, ZONE IV and ZONE V.

Key words: GFRG Panels, Loadings, Wind, Earthquake, Story Displacement, Story Shear, Story Drift, Modal Periods and Frequencies and Base Shear

I. INTRODUCTION

The rapid growth of population, large-scale industrialization and very high land cost has resulted in a vast expansion in building construction industry. Our India is still a developing country fighting with a huge shortage of housing every year. So we need a very fast construction technology which can increase our development rate. Glass fibre reinforced gypsum walls are gypsum panels with hollow cores developed in Australia 1990. It is a load bearing pre-fabricated walling system with broad construction applications from industrial dwelling units to multi storey residential buildings, formwork, industrial panelling and compound huge amount of co2 (about 40% is developed due to construction industry) increases the chances of global warming. Fertilizer industries are facing problems regarding disposal of industrial waste gypsum (2000 tons per day). Rapid wall is a large load bearing panel with modular cavities suitable for both external and internal walls. It can be also used as intermediate floor slab/roof in combination with RCC as composite material. It has been used for buildings ranging from single storey to medium-high rise buildings. The Light weight rapid wall has high compressive strength, shearing strength, flexural strength and ductility. It has very high level of resistance to fire, heat, water, termites, rot and corrosion .Concrete infill with vertical reinforcement rods enhances its vertical and lateral load capabilities. Rapid wall buildings are resistant to earthquakes, cyclones and fire.

GFRG buildings are a new type of construction to which conventional structural theories and design codes are not applicable. Glass fibre reinforced gypsum binder composites were produced by using E-type glass fibre and newly developed water-resistant gypsum binder .The water –resistant gypsum binder was produced by blending ground granulated slag , ordinary Portland cement and an organic retarder with claimed phosphogypsum in a ball mill to obtain a uniform product. The binder possesses good water resistance as it does not show leaching in water up to 28 days of immersion , while plain plaster shows leaching after 3 days of immersion in water. For the reinforcing material in this programme, chopped uncoated E-type glass fibre was used. Rapid wall panel is world's largest load bearing light weight panels. Each panel has 48 modular cavities of 12mx3mx124m dimension. Reinforced concrete is walling. Construction of RC buildings formation of one of the most widely used modern building materials. Concrete is an "artificial stone" obtained by mixing cement, sand, and aggregates with water. Presently reinforced concrete buildings in many earthquake prone areas of the world are built to design codes and yet many still suffer failure during earthquakes. This may mean that they are deficiencies in design. This event cannot be avoided but, by proper planning and design we can prevent it to a notable extent and hence structural engineer's needs to design the structure taking into account all necessary factors including infill walls which plays a important role during earthquakes.

II. PROCEDURE TO CONSTRUCTION OF GFRG BUILDING

- A conventional foundation like spread footing, RCC column footing, raft or pile foundation is used as per the soil condition and load factors.
- All around the building RCC plinth beam is provided at basement plinth level.
- For erection of panel as wall, 12 mm diameter vertical reinforcement called "starter bars" of 0.75m length of

Sesimic Analysis of a GFRG Building & Regular RC Building by using ETABS (Static & Dynamic)

G. Umapathi[1] G. Madhu Sudhan[2] K. Narasimhulu[3]
[1]M.Tech Student
[2,3]Department of Civil Engineering
[1,2,3]Annamacharya Institute of Technology & Sciences, Tirupati, India

Abstract— The effective design and the construction of earthquake resistant structures have much greater importance in all over the world. The behavior of GFRG building and regular RC building of G+5 multi stories building under earth quake is complex and it varies of wind loads are assumed to act simultaneously with earth quake loads. In this paper the seismic analysis by the response spectrum method will be done to the GFRG building and regular RC building of calculating various responses in different zones by using ETABS software, so that the both results be compared. The Glass fibre reinforced gypsum (GFRG) walls are gypsum panels with hallow cores or cavities which can be filled with concrete. GFRG walls are in residential, commercial and industrial buildings. GFRG panels are a composite material consisting of gypsum plaster and glass fibers. The gypsum is industrial by product waste the product is not only ecofriendly, but also resistant to water and fire. IIT madras has been involved, since 2003 with the development of building system especially earthquake resistant design for use in India. Our India is still developing country fighting with huge shortage of houses for every year. To meet this challenge, India requires innovative, energy efficient, strong and durable in fast method of construction at economical cost. The main aim of this paper is to find out the different responses like Storey drift, Storey displacements, Base shear and Storey shear and Modal periods and Frequencies of both the GFRG and regular RC buildings. It is found that the GFRG are economical in design and construction in sub urban and low rise building constructions. But Displacements will be increasing with increase in number of storeys.

Key words: GFRG Panels, Wind Load, Earthquake, Story Displacement, Story Shear, Story Drift, Modal Periods and Frequencies, Base Shear and Response Spectrum Analysis

I. INTRODUCTION

GFRG buildings are a new type of construction to which conventional structural theories and design codes are not applicable. Glass fibre reinforced gypsum binder composites were produced by using E-type glass fibre and newly developed water-resistant gypsum binder [5]. The water resistant gypsum binder was produced by blending ground granulated slag, ordinary port land cement and an organic retarder with claimed phosphogypsum in a ball mill to obtain a uniform product. The binder possesses good water resistance as it does not show leaching in water up to 28 days of immersion , while plain plaster shows leaching after 3 days of immersion, in water. For the reinforcing material in this programme, chopped uncoated E-type glass fibre was used [14]. Rapid wall panel is world's largest load bearing light light weight panels. Each panel has 48 modular cavities of 12mx3mxx124m dimension. Reinforced concrete is one of the most widely used modern building materials. Concrete is an "artificial stone" obtained by mixing cement, sand and aggregates with water. Presently reinforced concrete buildings in many earthquake prone areas of the world are built to design codes and yet many still suffer failure during earthquakes. This may mean that they are deficiencies in design. This event cannot be avoided but, by proper planning and design we can prevent it to a notable extent and hence structural engineer's needs to design the structure taking into account all necessary factors including infill walls which plays a important role during earthquakes. We observed the main comparison of different responses like story drift, story shear, story displacements, base shear and modal periods and frequencies of both the modal periods and frequencies of both the GFRG and regular RC buildings in the entire four zones ZONE II, ZONE III, ZONE IV, and ZONE V.

The rapid growth of population, large-scale industrialization and very high land cost has resulted in a vast expansion in building construction industry. Our India is still a developing country fighting with a huge shortage of housing every year. So we need a very fast construction technology which can increase our development rate. Glass fibre reinforced gypsum walls are gypsum panels with hallow cores developed in Australia 1990 [5]. It is a load bearing prefabricated walling system with broad construction applications from industrial dwelling units to multi storey residential buildings, formwork, industrial paneling and compound walling [1].Construction of RC buildings formation of huge amount of co2(about 40% is developed due to construction industry) increases the chances of global warming [3]. Fertilizer industries are facing problems regarding disposal of industrial waste gypsum (2000 tons per day). Rapid wall is a large load bearing panel with modular cavities suitable for both external and internal walls .It can also be used as intermediate floor slab/roof in combination with RCC as composite material. The Light weight rapid wall has high compressive strength, shearing strength, flexural strength and ductility. It has very high level of resistance to fire, heat, water, termites, rot and corrosion [6&9]. Concrete infill with vertical reinforcement rods enhances its vertical and lateral load capabilities. Rapid wall buildings are resistant to earthquakes, cyclones and fire.

II. OBJECTIVE OF THE PROJECT

The main objective of the thesis is to compare the GFRG building (G+5) with regular RC building (G+5) with regular RC building (G+5) with following purposes in all the entire four zones .here we will be discussing the main comparison in zone II.

1) About the GFRG Material and procedure to construction of GFRG Building Systems

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Self-compacting geopolymer concrete-a review

P Ukesh Praveen and K Srinivasan
Department of Structural and Geo-Technical Engineering, School of Civil and Chemical Engineering, VIT University, Vellore, Tamil Nadu – 632014, India.

Email:srinivasan.k@vit.ac.in

Abstract: In this construction world, Geopolymer concrete is a special concrete which doesn't requires the Ordinary Portland Cement and also reduces the emission of carbon-dioxide. The Geopolymer Concrete is made up of industrial by-products (which contains more Silica and Alumina) and activated with the help of Alkaline solution (combination of sodium hydroxide & sodium silicate or potassium hydroxide & potassium silicate). The high viscosity nature of Geopolymer Concrete had the ability to fail due to lack of compaction. In improvising the issue, Self Compacting Geopolymer Concrete has been introduced. The SCGC doesn't require any additional compaction it will flow and compacted by its own weight. This concrete is made up of industrial by-products like Fly ash, GGBFS and Silica Fume and activated with alkaline solution. The earlier research was mostly on Fly ash based SCGC. In few research works Fly ash was partially replaced with GGBS and Silica Fume. They evaluated the compressive strength of concrete with varying molarities of NaOH; curing time and curing temperature. The flexural behaviour of the concrete also examined. The Fly ash based SCGC was got high compressive strength in heat curing as well as low compressive strength in ambient curing. The presence of GGBS improves the strength in ambient curing. For aiming the high strength in ambient curing Fly ash will be completely replace and examine with different mineral admixtures.

1. Introduction

Now-a-days common Portland Cement (OPC) is having a major role in the construction family. Concrete for a building has most likely been based on a usual Portland Cement (OPC) binder [1]. The increase in the progress of population results in growing in construction progress expense. Prof. Dr Joseph Davidovits mentioned that the creation of 1 ton cement releases approximately 0.85 - 1 ton of carbon dioxide [2], [3]. Presently, the cement manufacturer is responding speedily to the perceive societal need for diminished CO2 emissions, via setting up the production of blended Portland cement, utilizing supplementary cementitious factors which possibly traditionally derived from industrial by way of making use of products, similar to blast-furnace slag and coal combustion fly ashes [4]. Amongst all of the materials within the OPC concrete, cement is the primary ingredient which helps to bind the aggregates [5]. A big amount of industrial waste and demolition waste are produced every year [6]. Useful lands are occupied by these waste materials, re-utilizing the waste fabric grew to be the new discipline of research and plenty of experiments were carried out to make use of the commercial waste as substitution of typical Portland cement concrete. This effort helps to find out the alternative material with entire removing of Portland

Experimental Study on Mechanical Prosperities of Self-Compacting Geopolymer Concrete using Vermiculite as Fine Aggregate Replacement

S. Srikanth[1] P. Ukesh Praveen[2]
[1]PG Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Andhra Pradesh, India

Abstract— Self Compacting Geopolymer Concrete (SCGC) is an innovative construction material in concrete technology. As the name replies, it does not need any compaction efforts, to achieve full compaction and utilizes supplementary cementitious materials (SCM) in addition with alkaline solutions like Sodium hydroxide and sodium silicate and super plasticizer as a binder for matrix formation and strength. In the present study, flyash based SCGC replaced with various percentages of VERMICULITE. The concrete specimens were cured at room temperature the results showed that the addition of GGBS to flyash based SCGC, the workability characteristics are decreased and strength was increased with increase in binder content. Hence the results showed that the SCGC was suitable for room temperature curing with VERMICULITE as replacement to fine aggregate based GPC.

Key words: Geopolymer Concrete, Self-Compacting Concrete, SCM, Alkaline Activator, Room Temperature Curing, Vermiculite

I. INTRODUCTION

Concrete is a vital ingredient in infrastructure development and with its versatile application, globally its usage is second to water. For several years, the use of cement as a binder in a concrete mixture has been often criticized by many parties concerned with environmental conservation. This is associated with global warming and depletion of significant amounts of natural resources in Portland cement production that became the main attention during the last decades. Global warming can be caused by greenhouse gas emission such as carbon dioxide, which occurs due to human activities in PC manufacture. So, to overcome this problem, the concrete use should be ecofriendly (or) environmental friendly. Geopolymer Concrete (GPC) is a new binder material that does not need the presence of Portland cement as a binder. Hence, instead of portland cement, we are using source of some source of Supplementary Cementitious Materials such as [Fly Ash, Ground Granulated Blast Furnace Slag (GGBFS), Rice Husk Ash (RHA), Silica Fume (SF), Metakaolin, etc., and these materials are rich in Silicon (Si) and aluminum (Al) are activated by Sodium Hydroxide (NaOH) and Sodium Silicate (Na_2SiO_3) alkaline liquids to produce the Geopolymer binder. Self-Compacting Geopolymer Concrete (SCGC) is relatively a new concept and can be regarded as the most revolutionary development in the field of concrete technology. SCGC is an innovative type of concrete that does not require vibration for placing it and can be produced by complete elimination of Ordinary portland Cement (OPC).

II. GPC MIX DESIGN

Rangan and Hardjito (2005) have noted that unlike conventional cement concretes GPCs are a new class of construction materials and therefore no standard mix design approaches are yet available for GPCs. While GPC involves more constituents in its binder (viz., FA, GGBS, sodium silicate, sodium hydroxide and water), whose interactions and final structure and chemical composition are under intense research whereas the chemistry of Portland cement and its structure and chemical composition (before and after hydration) are well established due to extensive research carried out over more than century. While the strength of cement concrete is known to be well related to its water-cement ratio, such a simplistic formulation may not hold good for GPCs. Therefore, the formulation of the GPC has to be done by trial and error basis. The role and the influence of aggregates are considered to be the same as in the case of Portland cement concrete. The mass of combined aggregates may be taken to be between 75% and 80% of the mass of geopolymer concrete. The performance criteria of a geopolymer concrete mixture depend on the application. For simplicity, the compressive strength of hardened concrete and the workability of fresh concrete are selected as the performance criteria. In order to meet these performance criteria, the alkaline liquid-to-fly ash ratio by mass, water-to-geopolymer solids ratio by mass, the wet-mixing time, the heat-curing temperature, and the heat-curing time are selected as parameters. With regard to alkaline liquid-to-fly ash ratio by mass, values in the range of 0.30 and 0.45 are recommended. Sodium silicate solution is cheaper than sodium hydroxide solids. Commercially available sodium silicate solution A53 with SiO_2-to-Na_2O ratio by mass of approximately 2, i.e., Na_2O = 14.7%, SiO_2 = 29.4%, and water = 55.9% by mass, and sodium hydroxide solids (NaOH) with 97-98% purity are recommended. Laboratory experience suggests that the ratio of sodium silicate solution-to-sodium hydroxide solution by mass may be taken approximately as 2.5 (Hardjito and Rangan, 2005).

Mixture proportion of heat-cured low-calcium fly ash-based geopolymer concrete with design compressive strength of 45 MPa is needed for precast concrete products as follows:Assume that normal-density aggregates in SSD condition are to be used and the unit-weight of concrete is 2400 kg/m^3. Take the mass of combined aggregates as 77% of the mass of concrete, i.e. 0.77x2400 = 1848 kg/m^3. The combined aggregates may be selected to match the standard grading curves used in the design of Portland cement concrete mixtures. For instance, the aggregates may comprise 277 kg/m^3 (15%) of 20 mm aggregates, 370 kg/m^3 (20%) of 14 mm aggregates, 647 kg/m^3 (35%) of 7 mm aggregates, and 554 kg/m^3 (30%) of fine sand to meet the requirements of

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AN EXPERIMENTAL INVESTIGATION ON CERAMIC COARSE AGGREGATE WITH THE PARTIAL REPLACEMENT OF NATURAL COARSE AGGREGATE IN M20 MIX

M.P.Charan Sai[1], A.Vinodh Kumar[2], B. LakshmiNirajan Reddy[3]

[1]*Assistant Professor, Sree Vidyanikethan Engineering College, Tirupati. (India)*

[2]*Assistant Professor, Annamacharya Institute of Technology & Sciences, Tirupati. (India)*

[3]*Assistant Professor (Ad Hoc), JNTU Pulivendula, Pulivendula. (India)*

ABSTRACT

During the design of a concrete structure it becomes complicated with the increase of dead load, also extra columns and beams are designed to counteract that dead load itself, if that dead load is reduced then that extra columns and beams can be utilized to bear the live loads alone such that the structure becomes economical and also structure can be utilized to its best. Keeping reduction of weight of concrete without losing much strength in point of view when the materials used in concrete are analyzed, it is found that ceramic aggregates can be a better option with the replacement of natural coarse aggregate. An Experimental Investigation is done with the replacement of ceramic coarse aggregate with natural coarse aggregate to find out the optimum replacement of ceramic aggregate and also to find the feasibility of usage of ceramic waste in concrete is studied in terms of Slump value, compaction factor, Compressive strength and weight change.

Keywords: **Electrical Ceramic waste, Reduction of Concrete weight, Replacement material for coarse aggregate.**

I. INTRODUCTION

About 19 Billions of Electrical ceramic waste was expected to be generated in India by 2025, the disposal of ceramic waste is quiet complex process since it causes leaching and end up by polluting the environment so to counteract this problem the present experimental investigation is carried out and also by using the ceramic waste as resource in concrete it is capable of reducing the dead load of concrete without losing much strength, Besides that it will be even economical. The Electrical ceramic waste produced from a substation at Tirupati were procured and crushed as ceramic coarse aggregate.

Initially, the materials properties are determined experimentally for cement, Fine aggregate, Natural Coarse aggregate, and ceramic coarse aggregate. Normal M25 mix concrete is prepared as per IS 10262:2009 with stipulated water cement ratio and concrete cubes of size 15cm x 15cm x 15cm are prepared and hardened with various replacements of natural coarse aggregate with ceramic aggregate by 0, 20, 40, 60, 80 and 100% and all

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Research Article Volume 8 Issue No.5

A Study on Mechanical Properties of Self Curing M65 Grade Concrete by Using Polyethylene Glycol

K.MD.Akhib[1], Mr.A.Vinodh Kumar[2]
PG Student[1], Assistant Professor[2]
Department of Civil Engineering
Annamacharya Institute of Technology and Sciences, Tirupati, India

Abstract:
Today concrete is most generally utilized development material in the world due to its strength and durability properties. Since the concrete is open to atmosphere, the water used in concrete evaporates and the water available in the concrete will not be sufficient to effective hydration. To attain good strength, curing of concrete is important so we introduce the concept of self curing to avoid the water scarcity. Self curing concrete is one type of concrete, which cure itself by retaining water in it. It was observed that water solvent polymers can be utilized as a Self curing agent, i.e. Polyethylene Glycol (PEG-400). Shrinkage reducing agent s like Polyethylene Glycol and Light weight aggregates such as Fly ash are used to achieve effective curing results. In this project we investigate the behaviour of concrete while replacing Fly ash in different proportions. The cement has been replaced with fly ash in the range of 20%, 25% and 30% by weight of M65 grade of concrete. In this we are using high strength concrete of M65 grade. High performance concrete is used to study the influences of water binder ratio, composition of setting and the influence of strength, slump and air content in the material. It will give optimized performance quality for the given set of materials, usage requirement of cost, service life and durability. The property such as Compressive strength and Split Tensile strength of concrete was examined with normal curing and self curing at 28 days for M65 grade of concrete.

Key words: Polyethylene Glycol (PEG-400), Fly ash, Compressive Strength, Split Tensile Strength, M65 grade

1. INTRODUCTION

Curing of concrete plays major role in improving the strength and hardness of concrete, which leads to development in durability and performance. The rate of reactions influences the properties of the hardened concrete. The concrete attain its strength through a series of chemical reactions, known as hydration. Proper curing of concrete structure is significant to meet performances and durability requirements. It can be either after it has been placed in position or during the produce of concrete products thereby providing time for the hydration of the cement to occur. Curing is the process of controlling the rate and extends of moisture loss from concrete during cement hydration. Curing may also encompass the control of temperature since this affect the rate at which cement hydrates. Construction industry needs a lot of water in the name of curing. The days are not so far that all the construction industry has to change over to an another curing systemizes, not only to save water for the sustainability growth of the environment but also to support the indoor and outdoor construction activities even in remote areas where there is scarcity of water. The advantages of internal curing are plentiful and consist of better hydration process, strength development, reduced autogenous shrinkage, cracking, reduced permeability and increases durability. For better performances and durability of concrete curing is necessary. The method uses Polyethylene glycol which reduces the evaporation of water from the surfaces of concrete and also helps in water retention. Self curing provides additional moisture in concrete for have better performance and durability. By comparing with conventional concrete the self curing decreases the water evaporation, increase the retention capacity of concrete and also it prevents early age cracking. Self curing is essential for desert area where the ease of use of water is very less or not available so it can help to have an economical construction. In addition to the normal concrete mix various additional compounds in proper dosage and materials such as fly ash is used to increase the durability and strength of concrete mix.

1.1. HIGH STRENGTH CONCRETE

High strength concrete is purely defined based on the compressive strength. High performance concrete is a term used to describe concrete with special properties attributed to normal concrete. High performances mean that the concrete has one or more of the following properties i.e. Low shrinkage, Permeability, a high modulus of elasticity or high strength. High performance concrete is the concrete that meets special performance and uniformity requirements that cannot always be achieved routinely by using only conventional materials and normal mixing, placing and curing practices. High strength concrete can resist loads that normal strength concrete cannot. It is a concrete with a compressive strength class higher than C 50/60. It is made by lowering the water-cement ratio to 0.35 or lower. To compensate for the reduced workability, Super plasticizers are commonly added to high-strength mixtures.

1.2. FLY ASH

Fly ash is the fine powder collected from the exhaust gases from the combustion chambers of the boilers of power stations that burn milled or pulverised coal. Fly ash is known as pulverised fuel ash. The most important properties of fly ash are Fineness, loss of ignition, chemical composition, uniformity of these properties. Fineness is important as it affects the pozzolanic reactivity of the fly ash, the ability of the fly ash to fill voids in the concrete matrix and improvement of workability and pumpability of the concrete. the quality of fly ash is dependent on the coal type, burning conditions and method of collection

1.3.POLYETHYLENE GLYCOL

In this project we are using Polyethylene Glycol as Self curing agent Polyethylene Glycol is a liquid state polymer of ethylene oxide and water. The structure of Polyethylene glycol is expressed as H $(OCH_2CH_2)_n$ OH. The abbreviation indicates average molecular weight and n refers to oxyethylene group. The common feature of Polyethylene glycol appears to be water-soluble nature. Polyethylene glycol is non-toxic, odourless,

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ANALYSIS OF MULTISTORIED BUILDING WITH AND WITHOUT FLOATING COLUMN USING ETABS

Sasidhar T
M.Tech Student, Structural Engineering,
VIT University, Vellore, TamilNadu, India

P. Sai Avinash
M.Tech Student, Structural Engineering,
VIT University, Vellore, TamilNadu, India

N. Janardan
M.Tech Student, Structural Engineering,
VIT University, Vellore, TamilNadu, India

ABSTRACT

In the modern era of construction multi-storied building with floating column plays a major role in Urban India. These floating columns are used mainly for satisfying the space requirement in the structure and to get good architectural view of the building. In the present study, the analysis and design of multistoried building with and without floating columns was done using static analysis. A residential multistoried building consisting of G+5 has been chosen for carrying out project work. The work was carried out considering different cases of removal of columns in different positions and in different floors of the building. The equivalent static analysis is done on the mathematical 3-D model of building and results have been compared. All the work was carried out by using the software ETabs Version 9.7.4.

Key words: Floating Column, ETABS, Equivalent static analysis, Magnification factor.

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1. INTRODUCTION

In the present day construction of buildings in urban India the main problem arises in the accommodation of parking areas, reception lobbies etc. To overcome this problem floating columns came into existence and now it has become an unavoidable feature in most of the multistoried buildings. The floating column shows undesirable results during earthquake

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Research Article Volume 8 Issue No.5

A Study on Mechanical Properties of Self Curing High Strength Concrete by Using Sodium Ligno Sulphonate

K.Saran Kumar Raju[1], N.Janardhan[2], A.Vinodh Kumar[3]
M.Tech Student (Structural Engineering)[1], Assistant Professor[2, 3]
Department of Civil Engineering
Annamacharya Institute of Technology and Sciences, Tirupati, Andhra Pradesh, India

Abstract:
The concrete structures with high strength concrete is essential in present situation such as in high rise structures, long span bridges, sky scrapers, marine structures and in many structures where high strength needed. Concrete which has compressive strength more than 40 mpa at 28 days age of concrete is known as High Strength Concrete. High strength concrete can be made by using suitable design mix, materials used, proper compaction and curing. Due to lack of curing the desired strength and durability of concrete is not attained. Proper curing of concrete cannot be performed where the water sources are low and in desert places . So the Self Curing of concrete is the new enthusiasm concept in present days. In this thesis, I had designed a mix of grade M60 by using ACI211.4R-93. By using trail and mix , the suitable mix proportion is adopted then the cement is partially replaced with fly ash at varing dosages of 20%,25% and 30%. By testing the specimens ,at 20% of fly ash replacement the concrete had optimum compressive strength than the conventional concrete. In this paper Sodium Ligno Sulphonate is used as a self curing agent. Sodium ligno sulphonate is added to the concrete mix in varying dosages of 0% ,0.25% ,0.50% and .75% by the weight of cementious material. and the specimens are casted for compressive test at 3 days ,7 days ,28 days and 56 days and spilt tensile test at 28 days age of concrete. When compared with conventional concrete the self curing concrete with 0.25% sodium ligno sulphonate had shown optimum maximum compressive and split tensile strengths.

Key words: High Strength Concrete, Fly Ash, Self Curing, Sodium Ligno Sulphonate, Compressive Strength, Split Tensile Strength.

1. INTRODUCTION

Concrete is the most used construction material. Concrete is a mix of cement, fine aggregate, coarse aggregate and water, with or without adding admixtures. Concrete gain strength based on materials used, mix design, water cement ratio, proper mixing and compaction and curing of concrete. Curing is defined as the providing of required moisture content to the concrete for heat of hydration. Curing has a vital role in the strength gaining of concrete. Curing can be done in two ways. They are external curing and internal curing. External curing is defined as the provision moisture content from outside to inside. Whereas internal curing is defined as the provision of moisture content from inside to outside. Due to lack of curing concrete does not get desired strengths. To overcome this, some of internal curing or self curing methods are adopted. In internal curing there is no need of additional water content for curing of concrete. In this research I had designed and prepared a high strength concrete of grade M60 by using ACI 211 .4R. The cement is partially replaced with fly ash with varying dosages of 20% ,25% and 30 %. These concrete specimens are externally cured. For the finalized mix proportion, the self curing agent sodium ligno sulphonate is added at dosages of 0.25%, 0.50% and 0.75% by weight of cementious material and specimens are placed in room. I had compared the compressive strength and spilt tensile strength of High strength concrete with external curing and a high strength concrete with self curing. In this investigation, for self curing of concrete I used sodium ligno sulphonate as a self curing agent.

2. LITERATURE REVIEWS

- Mohammed Suhail studied on An Experimental Investigation on Self-Cured Concrete. He used sodium ligno sulphonate as a self curing agent in his research. He added sodium ligno sulphonate in varying dosages of 0.5%, 1%, 1.5% and 2% by the weight of cement. In his study, the compressive strength ,tensile strength and modulus of rupture of self cured concrete for 7 days and 28 days are tested and compared with conventional concrete of same mix design for M20 and M25.He got optimum maximum compressive strength, tensile strength and modulus of rupture at 0.5% dosage of sodium lignosulphonate for M20 and M25 grade of concrete compared to conventional concrete. In his paper, with the increased dosage of sodium ligno sulphonate the slump of concrete increases.
- Riyaz Ahemad studied on Experimental Study On Self Curing Concrete Using Sodium Ligno Sulphonate . In his research study,he compared the compressive strength and split tensile strength of conventional concrete of grade M20 with the self cured concrete of same grade made by sodium ligno sulphonate. He varied the dosage of sodium ligno sulphonate 0.5% ,1%,1.5%,2%,2.5%and 3% by the weight of cement and tested the specimens at 7 days ,14 days ,and 28 days. He got optimum compressive and tensile strengths at 0.5% of sodium ligno sulphonate than conventional concrete.
- Vishnu T research on An Experimental Investigation of Self-Curing Concrete Incorporated with Light Weight Fine Aggregate and Polyethylene Glycol. In his research he varied different dosages of leca *i.e.*10% ,20%,30% by weight of fine

An Experimental Study on Partial Replacement of OPC with Silica Fume and Coarse Aggregate with Waste Ceramic Tiles

O. Deepa[1] D. Nirosha[2]
[1]M.Tech Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]AITS, Tirupathi

Abstract— The main focus of this research is to study the strength of concrete with waste ceramic tile as coarse aggregate and silica fume as cement. Increased construction activity and continuous depends on conventional materials of concrete making are leading to scarcity of the materials and increased construction cost. In this study an attempt has been made to find the suitability of waste ceramic tile coarse aggregate and silica fume as a possible substitute for conventional aggregate and cement in concrete. The both ceramic tile industry and quartz industry are known to generate large amount of waste each year. So for a huge part is used in landfills. Re-using these wastes in concrete could be a within situation. So I prefer ceramic tile waste and silica fume to increase strength and stability of concrete.

Key words: Ceramic Tiles, Silica Fume, Dumping, Stability

I. INTRODUCTION

Concrete is a composite material composed of aggregate bonded together with the fluid cement which hardens over time. Most use of the term concrete refers to Portland cement concrete or to concrete made with other hydraulic cements. In Portland cement concrete and other hydraulic cement concrete, when aggregate is mixed together with dry cement and water, they form a fluid mass that is easily molded into shape. The cement reacts chemically with water and other ingredient to form hard matrix which binds all the materials together into a durable stone-like material that has many uses.

Silica fume is a by-product in the production of silicon alloys such as ferro-chromium, ferro-manganese, calcium silicon etc, which also creates environment pollution and health hazard. In recent past, there has been considerable attempts for improving the properties of concrete with respect to strength and durability especially in aggressive environment. Leaving the waste materials to the environment directly can cause environmental problem. Hence reuse of waste material from industries has been emphasized. Waste can be used to produce new products or can be used as admixtures so that natural resources are used more efficiently and the environment is protected from waste. Silica fume is also known as micro silica or condense silica fume, is used as an artificial pozzlanic admixture. It is a material resulting from reduction of quartz with coal in an electric is furnace in the manufacture as silicon or ferrosilicon alloy.

A. Waste Ceramic Tiles

Aggregate impact about 70% to 75% of volume to concrete. In this aspect consumption of waste tiles or broken tiles as coarse aggregate in concrete manufacturing can be a new scientific sobriety in the field of sustainable concrete. By using these wastes instead of conventional material would be preserving the natural resources, but also solving the problem of disposal of waste, which has become a national problem.

II. EXPERIMENTAL SETUP

In this stage collection of materials required and data required for the mix design are obtained by sieve analysis and specific gravity. Sieve analysis is carried out from various fine aggregate (FA) and coarse aggregate (CA) samples and the samples which suits the requirement is selected. Specific gravity tests are carried out for fine and coarse aggregate. The various materials used were tested as per Indian standard specification.

A. Materials:

Raw materials required for the concreting operations of present work are cement, fine aggregate, coarse aggregate, ceramic waste and water.

1) Cement:

Cement is used as binding material in the concrete where the strength and durability re significant important. The ordinary Portland cement of 53 grades conforming to IS: 12269-1987 is used to manufacture the concrete. Also some tests were conducted such as consistency test, setting time test, specific gravity test.

Property	IS Code(IS 8112:1989)
Specific gravity	3.15
Consistency	30
Initial setting time	55min
Final setting time	9hr 30minutes

Table 1: Properties of cement

2) Aggregate:

The size of aggregates used is 20mm and the grain size of sand is used. The aggregate tests are performed and results are as follows.

a) Fine aggregate:

It consists of small angular or grounded grains of silica (SiO2) and is formed by decomposition of sand stone under the effect weathering agencies. The size which is less than 4.75mm is called as fine aggregate. River sand is used as fine aggregate conforming to the requirements of IS 383. Before using that, it can be properly cleaned by sieving and washing to eliminate the impurities.

b) Coarse aggregate:

Coarse aggregate may be in the form of irregular broken stones or naturally occurring rounded gravel. Materials which are large to be retained on 4.75mm sieve size called as coarse aggregate. It acts as a main filler, and forms the main bulk of concrete. Of which the materials adhere in the form of film. Aggregates balance the shrinkage and volume changes of concrete conforming to IS: 383 are used.

Property	Fine aggregate	Coarse aggregate
Fineness modulus	2.40	6.50

Investigation on Sustainable Concrete using Manufactured Sand & Rice Husk Ash

A. Jyothiprasanna[1] K. G. Rahul Varma[2]
[1]P.G Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]AnnamacharyaInstitute of Technology & Sciences, Tirupati, India

Abstract— As we know that concrete is the second largest consumed material by humans in the entire world after water. If its consumption is done at the same rate, it may get exhausted in the coming future. So we have to find alternatives to replace concrete. Or else as we know that concrete is a mixture of cement, sand and gravel. We can preserve concrete by finding replacement material for cement, sand or gravel which can give same or more strength to concrete. In past, already many replacements were done by many people for cement, sand and gravel to make better concrete. The present proposal involves replacement of river sand with manufactured sand by 25%, 50%, 75%, 100% and cement with rice husk ash by 10% to get good strength concrete. Use of manufactured sand and Rice husk ash in concrete as replacement for sand and cement respectively is very rare and as both the materials are easily available and are of low cost. It would become the best replacement if it gives good strength concrete.

Key words: Manufactured Sand, Rice Husk Ash; Compressive Strength; Ultrasonic Pulse Velocity; Rebound Number, Water Absorption, Acid Resistance

I. INTRODUCTION

Concrete is the most used construction material due to its structural stability and strength. Materials used for making concrete come from the earth's crust. Thus, it depletes its resources every year creating ecological strains. On the other hand, human activities on the Earth produce solid waste in considerable quantities of over 2500/MT per year, including industrial wastes, agricultural wastes and wastes from rural and urban societies. Recent technological development has shown that these materials are valuable as inorganic and organic resources and can produce various useful products. Amongst the solid wastes, the most prominent ones are fly ash, blast furnace slag, rice husk, silica fume and demolished construction materials. From the middle of 20th century, there had been an increase in the consumption of mineral admixtures by the cement and concrete industries.

The increasing demand for cement in concrete is met by partial cement replacement. Substantial energy and cost savings can result when industrial by-products are used as a partial replacement for the energy intense Portland cement. The use of by-products is an environmental friendly method of disposal of large quantities of materials that would otherwise pollute land, water and air. Most of the increase in cement demand will be met by the use of supplementary cementing materials. Sand is the one of main constituents of concrete making which is about 35% of volume of concrete used in construction industry. Natural sand is mainly excavated from river beds and always contain high percentage of in organic materials, chlorides, sulphates, silt and clay that adversely affect the strength, durability of concrete & reinforcing steel there by reducing the life of structure, when concrete is used for buildings in aggressive environments, marine structures, nuclear structures, tunnels, precast units, etc. Digging sand, from river bed in excess quantity is hazardous to environment. The deep pits dug in the river bed, affects the ground water level. Erosion of nearby land is also due to excessive sand lifting. In order to fulfill the requirement of fine aggregate, some alternative material must be found.

Now-a-days good sand is not readily available and these resources are also exhausting very rapidly. Because of its limited supply, the cost of Natural River sand has sky rocketed and its consistent supply cannot be guaranteed. It is also being transported from a long distance, so it is a necessary to find some substitute to natural river sand. The artificial sand produced by proper machines can be a better substitute to river sand. The sand must be of proper gradation (it should have particles from 150 microns to 4.75 mm in proper proportion) and such sand will have few voids and will be more economical as cement quantity required will be less. Demand for manufactured fine aggregates for making concrete is increasing day by day as river sand cannot meet the demands in construction. River sand is not graded properly and has excessive silt and organic impurities and these can affect the durability in concrete whereas manufactured sand has no silt or organic impurities.

II. EXPERIMENTAL WORK

The main objective of this work was to study the suitability of Rice husk ash and manufactured sand as replacement materials of cement and river sand respectively. Preparation of M20 mix as per IS 10262:2009. Prepare the concrete mix by using RHA and M-Sand.

A. Objective

1) Effect of RHA and M-Sand on compressive strength of concrete.
2) Effect on material properties of concrete.
3) Effect on Surface hardness of concrete.
4) Effect of water absorption on concrete.

III. MATERIALS

In this project, RHA and M-Sand were used as replacement materials of cement and river sand. The physical and chemical properties of cement and RHA are tabulated in Table 1.

Particulars	cement	RHA
Chemical composition		
% Silica(SiO_2)	20.65	86.94

Strength Properties of Geo-Polymer Concrete using Flyash, GGBS and Mill Rejected Coal

Hemanth[1] Abhilash[2]
[1]PG Student [2]Assistant Professor
[1,2]Annamacharya Institute of Technology, Tirupati, Andhra Pradesh, India

Abstract— The second most consumed product in the world is Cement. It contributes nearly 7% of the global carbon dioxide emission. Geo-polymer concrete (GPC) is a special type of concrete that is manufactured using industrial waste like fly ash, GGBS which are considered as a more eco-friendly alternative to Ordinary Portland Cement (OPC) based concrete. By using this type of industrial by-products in concrete industry as a replacement for cement we can reduce the usage of cement which results in minimizing the emission of greenhouses gases into the atmosphere and also savings in cost. This project mainly aims at the study of effect of fly ash (FA) and ground granulated blast furnace slag (GGBS) on the mechanical properties of geo polymer concrete (GPC) when they were replaced for cement at different replacement levels (FA50-GGBS50, FA75-GGBS25, FA100-GGBS0) using Sodium silicate (Na_2SiO_3) and sodium hydroxide (NaOH) solutions as alkaline activators , sand as fine aggregate and mill rejected coal (up to 30%) as coarse aggregate, crushed stone of size 10mm, 20mm as coarse aggregate (up to 70%) . Specimens were casted and cured for different curing periods like 7, 14, 28, 56 and 112 days at ambient room temperature to determine the mechanical properties of geo-polymer concrete. Test results shows that as the percentage of GGBS in the mix is increasing, mechanical properties such as compressive strength, split tensile strength and flexural strength were increasing.

Key words: Geopolymer Concrete, GGBS, Fly Ash, Sodium Silicate, Sodium Hydroxide, Compressive Strength, Split Tensile Strength, Flexure Strength

I. INTRODUCTION

Concrete is the most widely used construction material in the world and Ordinary Portland Cement (OPC) is the major ingredient used in concrete. The production of cement releases large amount of carbon dioxide (CO2) to the atmosphere that significantly contributes to greenhouse gas emissions. It is estimated that one ton of CO2 is released into the atmosphere for every ton of OPC produced[1]. In view of this, there is a need to develop sustainable alternatives to conventional cement utilizing the cementitious properties of industrial by-products such as fly ash and ground granulated blast furnace slag[2-4]. On the other side, the abundance and availability of fly ash and GGBS worldwide create opportunity to utilize these by-products, as partial replacement or as performance enhancer for OPC. In 1978, Davidovits developed a binder called geo-polymer to describe an alternative cementitious material which has ceramic-like properties. Geo-polymer technology is one of the new technologies attempted to reduce the use of Portland cement in concrete. Geopolymer are environmental friendly materials that do not emit greenhouse gases during polymerization process. Geopolymer can be produced by combining a pozzolanic compound or aluminosilicate source material with highly alkaline solutions[5]. Geopolymers are made from source materials with silicon (Si) and Aluminium (Al) content and thus cement can be completely replaced by marginal materials such as fly ash and ground granulated blast furnace slag which is rich in silica and alumina[6-7]. Fly ash and GGBS reacts with alkaline solutions to form a cementitious material which does not emit carbon dioxide into the atmosphere and enhances the mechanical properties of the geo-polymer concrete. Davidovits (1978) proposed that binders could also be produced by polymeric reaction of alkaline liquids with the silicon and the aluminium in source materials or by-product materials such as fly ash and rice husk ash. Portland cement is still the main binder in concrete construction prompting a search for more eco-friendly materials. Furthermore, it has been reported that the durability of ordinary Portland cement concrete is under examination, as many concrete structures especially those built in corrosive environments start to deteriorate after 20 to 30 years, even though they have been designed for more than 50 years of service life.

II. EXPERIMENTAL STUDY

A. *Experimental Program*

Our objective was to determine the effect of GGBS and Fly-ash on the mechanical properties of geo polymer concrete. In this respect, GGBS and Fly-ash were used as binders, Sodium hydroxide and Sodium silicate were used as alkaline activators, Crushed granite stones of size 20 mm and 10 mm of coarse aggregate are used, river sand is used as fine aggregate.

B. *Material Properties*

1) *Binders*

Fly ash and GGBS were used as binders in geo polymer concrete and their physical and chemical properties of the Ground Granulated Blast Furnace Slag were tabulated below

Particulars	Class "F" fly ash	GGBS
Chemical composition		
% Silica(SiO_2)	65.6	30.61
% Alumina(Al_2O_3)	28.0	16.24
% Iron Oxide(Fe_2O_3)	3.0	0.584
% Lime(CaO)	1.0	34.48
% Magnesia(MgO)	1.0	6.79
% Titanium Oxide (TiO_2)	0.5	-
% Sulphur Trioxide (SO_3)	0.2	1.85
Loss on Ignition	0.29	2.1
Physical properties		
Specific gravity	2.24	2.86
Fineness (m^2/Kg)	360	400

Table 1: Chemical and Physical Properties of Class F Fly Ash and GGBS

Finite Element Analysis of Geopolymer Concrete Incorporating Copper Slag as Fine Aggregate

V. G. Siva Theja[1] C. Sreenivasulu[2] Dr. J. Guru Jawahar[3] K. Narasimhulu[4]
[1]PG Student [2]Assistant Professor [3,4]Professor
[1,2,3,4]Department of Civil Engineering
[1,2]Annamacharya Institute of Technology & Sciences, Tirupati, India [3,4]Jawaharlal Nehru Technological University Anantapur, Anantapuram, India

Abstract— The present paper mainly focuses on analytical study of geopolymer concrete (GPC) incorporating copper slag (CS) as fine aggregate. The beams were analyzed by using Ansys R15.0. Fly ash and ground granulated blast furnace slag were used as geopolymer binders. In our present investigation the specimens of the GPC with incorporating copper slag as the fine aggregate in the proportions of 0%,10%, 20%, 30%, 40% are made, and the parameters such as compressive stress, Max. Equivalent stresses (Von-Misses stress), Max. Normal Stress, Max. Normal Elastic Strain, Max. Shear Stress, Max. Shear strain and Max. central deflection, flexural properties were found. The present study has given a final conclusion that the performance of reinforced geo polymer concrete (RGPC) beams was better than that of equivalent grade of reinforced conventional concrete beams.

Key words: Reinforced Geopolymer Concrete Beams, Ansys R15.0, Copper Slag(CS), Max.Equivalent Stresses (Von-Misses Stress), Max. Normal Elastic Strain, Max.Shear Stress, Max.Central Deflection

I. INTRODUCTION

Concrete is the most widely used construction material after water in the world and ordinary Portland cement (OPC) is the major ingredient used in concrete. The production of cement releases large amount of carbon dioxide (CO_2) to the atmosphere that significantly contributes to greenhouse gas emissions. It is estimated that one ton of CO_2 is released into the atmosphere for every ton of OPC produced [1]. The mechanical properties of Geo-polymer concrete (GPC) mixes with different aggregates blending and also combination of sodium hydroxide and sodium silicate solution was used as alkaline activator and conclude that optimum fine aggregate blending and also all Flexural Strength (FS) of all mixes were found. [2]. In terms of reducing the global warming, the geo polymer technology can reduce the CO_2 emission in to the atmosphere, caused by cement and aggregate industries is about 80% [3]. In this geo polymer technology, the source material is rich in silicon (Si) and Aluminium (Al) is reacted with a highly alkaline solution through the process of geo polymerization to produce the binding material. In our investigation, we are replacing the by-products such as fly ash and GGBS as a part of cement and copper slag as a part of sand to produce geopolymer concrete. [4]. Beams strengthened with Copper Slag Fiber Reinforced Polymer and the beams were modelled using ANSYS and the obtained results were compared. [5]. An Analytical Investigation of Bonded copper slag Fiber Reinforced Polymer Sheets with Reinforced Concrete Beam Using Ansys which has been used to study the strengthened behavior of the beam and gave the conclusion as the Deflections in the beams retrofitted with copper slag gave better results [6]. The models which are analyzed has shown the same structural response and failure modes as found in the experimental investigation [7]. The load deflection relationships, ultimate load, flexural properties were obtained and compared with the experimental results available in literature and obtained results shows good agreement with the experimental results for comparative study of experimental and analytical results strengthened beams in flexure. [8]. A theoretical and experimental study on mechanical properties and flexural strength of fly ash-geo polymer concrete using young's modulus, Poisson's ratio stress-strain relation and with two-point loading and as FEM and concluded after the results there were approximate values by comparing both the theoretical and experimental study.

II. EXPERIMENTAL STUDY

The experimental investigation was focused on the effect of various proportions of copper slag on GPC and determine the parameters such as Compressive Strength, Ultimate Deflection, flexural properties, Max.Equivalent stresses (Von-Misses stress), Max.Normal Stress, Max.Normal Elastic Strain, Max.Shear Stress, Max.Shear strain and Max.central deflection. Sand and CS were used as fine aggregate and CS chemical composition are listed in Table 1. Super plasticizer of SP-430 was used to improve the workability of mixtures.

A. Materials

Composition	% by mass
SiO_2	43.20
Al_2O_3	12.60
Fe_2O_3	1.30
CaO	40.20
Na_2O_3	0.90
K_2O	0.60
TiO_2	-
MgO	1.45
GNO_3	-

Table 1: Chemical composition of CS

Crushed granite stones of the size 20 mm and 10 mm were used as coarse aggregate and the river sand was used as fine aggregate. The bulk specific gravity in oven dry condition and the water absorption of the coarse aggregate 20 mm and 10mm were 2.58 and 0.3% respectively. The bulk specific gravity in oven dry condition and water absorption of the sand were 2.62 and 1% respectively and also the fineness modulus is 2.59.

B. Mix proportion

In this study, mechanical properties of geopolymer concrete (GPC) incorporating copper slag(CS) as fine aggregate with the replacement levels of 0%, 10%, 20%, 30% and 40% of

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Enhancing the Performance of DSTATCOM in VCM By Designing a Foreign Inductor

[1] Pujari Pavaneshwar, [2] Dr.V.C.Veera Reddy
[1] PG Scholar, [2] Professor
[1] [2] Department of Electrical and Electronics Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, Andhra Pradesh-517507, INDIA

Abstract- **This paper gives an exhaustive investigation of operation, design and multifunctional control strategy of a Distribution Static Compensator (DSTATCOM) working in voltage control mode (VCM). The dynamic reference load voltage production plan is created as an internal part of the control strategy which enables it to adjust load reactive power in nominal operation, with association provides voltage support during unsettling influences. Additionally an investigation of the voltage regulation capacity of it under different feeder impedances (resistive, inductive) and its nature (strong, weak) is exhibited. This investigation spotlights the limited regulation capability of it in resistive and strong feeder. Also, a design methodology to figure out the estimation of foreign inductor (external to the system) utilized for enhancing the regulation capability of it is exhibited. It is then utilized for load voltage control to exhibit the performance.**

Key words—Distribution static compensator (DSTATCOM), current control, voltage control, power factor, power quality

I. INTRODUCTION

In a Distribution system the switching of large loads and faults in the power system are the cause of voltage disturbances such as dip and swell [1]. Also, in case of radial system, voltage may be distorted or unbalanced of a particular bus if the loads in any section of that system are nonlinear or unbalanced. The loads connected to that bus which are not contributing to the bus voltage pollution are also fed by a set of unbalanced and distorted voltages [12].These issues in the distribution system lead to the poor Power Quality (PQ). The performance of the sensitive loads such as electronic equipments, process-control industries, etc., connected to this type of distribution system are worst affected.

At first, the static var compensator (SCV) was used to compensate reactive current, regulate the load voltage and to improve the transient stability. This SVC caused undesired problems like injection of harmonic current into the system, harmonic amplification and also had a possibility of resonance with the source impedance [2]. Distribution static compensator, DSTATCOM, was proposed as most effective solution for load voltage regulation and also to overcome the issued that rose due to SVC [3],[4].

It supplied fundamental reactive current into source for load voltage regulation [5]. The traditional DSTATCOMs used for voltage regulation were assumed as highly inductive or predominantly large feeder impedance but in a distribution system feeder impedance is resistive in nature [6], [7]. In this condition, DSTATCOM will have a limited or restricted voltage regulation capability [13]. The reference load voltage is taken as 1.0 p.u for voltage regulation application in traditional DSTATCOM [12]. At this load voltage, reactive power is always exchanged by VSI with the source and power factor (pf) retains leading in nature, causes continuous power loss in the feeder and VSI, which is a considerable issue.

Also, a traditional DSTATCOM requires high current rating voltage source inverter (VSI) to provide voltage support [6]. The power rating of the VSI is increased due to this high current requirement as a result it produces more losses in the switches as well as in the feeder. The feeder impedance and its nature (resistive, inductive, strong, and weak) influence the voltage regulation performance of DSTATCOM [13]. The performance of the DSTATCOM based on these is nowhere well defined. The thought of inserting a foreign inductor in line with DSTATCOM operating in VCM or grid connected inverters was proposed for better regulation but only the concept was accounted for it leaving adequate scope for further examination and understanding into the plan points of interest [8],[9].

This paper exhibits the exhaustive investigation of operation and design of a DSTATCOM working in VCM along with the proposed foreign inductor. Also a multifunctional control strategy consisting of a dynamic reference load voltage production plan as an internal part of the control strategy. This strategy enables it to adjust load reactive power in nominal operation and provides voltage support during unsettling influences. Additionally an investigation of the voltage regulation capacity of it under different feeder impedances (resistive, inductive) and its nature (strong, weak) is carried out. This

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Optimal Dg Allocation in Distribution System for Loss Minmization

[1] T.Iswarya [2] C.Sasikala
[1] PG Student, [2] Professor
[1][2] Department of Electrical and Electronics Engineering, Annamacharya Institute of Technology and Sciences, Tirupathi, Andhra Pradesh-517507, INDIA

Abstract: **-- Distributed Generation (DG) also known as dispersed generation is small scale generation units directly coupled with the distributed system. There has been great interest in the installation of distributed generation sources close to the consumer load center. The DG technologies comprise of both conventional and non-conventional sources of energy to generate power in order to satisfy the demand of ever rising energy demand. Optimum position and size of DG units can aid the performance of active power system network. Integration of DG units of optimum capacity at ideal locations improves the voltage profile of the system and minimizes the active and reactive losses of the system. In this paper, state of the art techniques for optimum placement and sizing of DG have been suggested. The paper provides an overview of the various methods implemented for determining optimal location and capacity of DG units to maximize the benefits of DG units in the system network**

Keywords: **Distributed Generation, Loss Minimization, Optimum Location, Optimization Techniques, Voltage Profile Improvement.**

I. INTRODUCTION

The deregulation of the electricity sector has created many opportunities to develop new technologies. Dispersed generation is one of those technologies to meet the ever increasing demand of electricity. The term "Dispersed Generation" refers to small-scale electric generation units close to the point of consumption. The advantages could be maximized by proper positioning of DG units at optimum location with ideal capacity and suitable type of DG unit. Distribution generation allows collection of energy from many sources and may give lower environmental impacts and improved security of supply. The benefits of integrating DG are segregated into technical, economical and environmental benefits. Technical advantages comprise of voltage improvement, minimization of real and reactive power losses, enhancement of system efficiency, increase in system reliability, improving power factor of the system and therefore improving power quality of the system. The economical benefits include the reduction of transmission and distribution congestion, decrease in electricity transmission pricing and better performance of network system in deregulated utilities. The environmental benefits constitute the reduction in the emission of pollutants, less noise pollution and extra saving of fuel [1-5]. Several researchers have been working this area to avail the maximum benefits from the integration of DG units in the power system. With the deregulation of the power system network, it is important for the electrical utilities to maximize the positive effects of DG [6]. Numerous methods have been proposed to determine the optimum location and size of DG in order to improve the voltage level and for loss minimization. Improper location and non-optimum capacity of the DG unit can have negative impact on the active power system network. It may cause the voltage to rise above a pre-determined voltage level, increase of fault current in the system, poor efficiency and elevation of system losses. Therefore, it is necessary to find out the optimum location and size of DG units along with its type to enhance the working and planning of active network. This paper suggests various techniques to determine the ideal location and optimum size of DG units for voltage level improvement and loss minimization

II. DISTRIBUTED GENERATION

The electric power generation units placed near to the load and connected directly to the distribution networks is defined as DG. On the basis of the power delivering capability, the classification of DG majorly of four types based on their real and reactive power delivering capabilities are as,

Type-1: DG delivers only active power at unity PF of DG (PFDG = 1). Examples include photovoltaic, micro-turbines, and fuel cells and so on.

Type-2: DG delivers only reactive power at zero PF of DG (PFDG = 0). Examples include synchronous compensators such as gas turbine.

Type-3: DG delivers active power but consumes or absorbs reactive power (Q is negative) at PF range between 0 and 1(i.e. 0< PFDG < 1). For example induction generator (wind farm).

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Cascaded qZS Multilevel Inverter with DTFC Scheme for Soft Starting Induction Motor

R. Murugesan[a] **and M. Manikandan**[b]

[a]*Research scholar, Department of Electrical and electronics engineering, St.Peter's University, Chennai, Tamilnadu, India. Email: rmurugesanphd@gmail.com*
[b]*Associate Professor, Department of Electronics and Communication engineering, Anna University, Chennai, Tamilnadu, India. Email: maniiz@yahoo.com*

Abstract: This paper proposed a three-phase quasi Z-source cascade multilevel-inverter for induction motor application. A qZS-CMI's fed induction motor drive operating under direct torque and flux control (DTFC). The proposed control scheme has achieves soft start capability in induction motor, generally, Quasi Z-source allows continuous input current, improved reliability of the system. But the main aim of the paper, the generated residential DC voltage gain increased without using any dc/dc converter, which is also reduce the passive component stress significantly to perform at same voltage boost up condition, and has inherent limitation of inrush current at startup stage. The shoot-through ratio is very small ($1 > D > 0$). Additionally, the cascaded H-bridge inverter is employed to reduces voltage balancing problem at load feed conditions. Therefore, the inverter can improves system efficiency and improving motor performance by DTFC controller. This technique improves soft starting of the drive. Simulation results have revealed that, the proposed DTFC soft startup strategy is suppressed the inrush surge current. Experiment is carried out on a 7-level voltage output, qZS-CMI based MIC-fed IM drives exhibit interesting performance.

Keywords: Three-phase Quasi-Z-source inverter; cascade multilevel inverter; direct torque and flux control (DTFC); induction motor drives.

1. INTRODUCTION

Asynchronous motor or induction motor drives are generally used in industrial application for heavy load applications. Since, they are more rugged, reliable, compact, and more efficient and also cheaper which is compared with other dc machines. However, difficulties in improving performance of induction motor, as the machine model is complicated, highly coupled, nonlinear, multivariable and uncertain (J. M. Carrasco, L. G. Franquelo, *et. al.,* Aug. 2006). Prolonged passage of large current through the motor during start stage can be cause the steep temperature raises resulting in failure of the insulation of the motor winding. So need to limit a stator current initially on induction motor drive. Soft stat of induction motor drives are generally used in fault timing and high torque ripple problem to compensate fault and ripples of high torque ripples control. Additional

A Switched Inductor Quasi Z source-H-bridge Multilevel Inverter for Soft starting Control of Induction Motor using Direct Torque and Flux Control

R Murugesan[1], M Manikandan[2]
[1]*Research Scholar, Department of Electrical and Electronics Engineering, St.Peter's University, Chennai, Tamilnadu*
[2]*Associate Professor, Department of Electronics and Communication Engineering, Anna University, Chennai, Tamilnadu*

ABSTRACT

An impedance source multilevel inverter schemes applied for traction and industrial drives application. Because it has unique merits ofharmonics less, transformer less drives control application and also soft start capability of induction drives. This paper proposed a reduced source z source H-bridge multilevel inverter and it is applied for induction motor drive control. In order to improving performance of induction motor performance, the torque and speed control is achieved using Direct Torque and Flux Control (DTFC)via phase voltage and current magnitude control. The proposed control scheme of Direct Torque and Flux Control (DTFC) is calculated through phase voltage and phase current sensing and then stator torque and flux is to be calculated byseparate estimation scheme.In reduced source Z source H-bridge multilevel inverter schemes, z source circuit gives a soft start capability across induction motor drive by controlling power magnitude across DC-Link. Reduced source is achieved using capacitor balancing circuit using a common DC-source. A single carrier and multi-reference of Phase Opposition and Disposition (POD) pulse width modulation topology is uses for proposed reduced source z source Multilevel Inverter for soft start control of induction motor.

Keywords: *Induction Motor (IM), Soft Start Capability (SSC), Direct Torque and Flux Control (DTFC), Impedance Source Multilevel Inverter (Z-source MLI), Phase Opposition Disposition (POD), Pulse Width Modulation (PWM).*

INTRODUCTION

Due to short acceleration of induction motor, a high starting current is generated across phase or stator terminals. An integrity of motor and control parameters are varied is depends on stator starting current variation. The high starting current results a voltage magnitude variation, stator insulation failure by generation of magnetic failure across Induction Motor drive[1-2]. The frequent operation of induction motor causes high starting current and high starting torque creates a stator insulation failure via stator current[3]. In literatures explain about soft starting of induction motor and it is given bellow as (i) Electromechanical (ii) solid state (iii) Variable Frequency Drive. Electro-mechanical starting method was implemented using reactor or resistor start, auto-transformer based start.Method is enabled while motor reaches near steady states speed. In this method results a high starting current and torque of induction while changes in that circuit.In solid states method, anti-parallel thyristor are used to reduce voltage and current for controlling torque of motor drives.

Development of solid states method is high over electromechanical method. Since life time cost is less while applied on induction motor drive. This system results a low order harmonics across thyristor circuit so power quality of system was poor and poor performance was drawn on high load motor drives[4-5]. A variable frequency Drive (VFD) system is changes a frequency from fixed level to variable level and also it control A Fixed voltage magnitude to variable voltage magnitude across Induction Motor

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Voltage and Power Flow Control of Dual Voltage Source Inverter

[1] P.Likhitha, [2] K. Balaji Nanda Kumar Reddy
[1] P G Student, [2] Assistant Professor
[1] [2] Dept. of Electrical & Electronics Engineering, Annamacharya Institute of Technologies & Sciences, Tirupati, AP :517507,INDIA

***Abstract*: -- This paper presents a dual voltage source inverter (DVSI) scheme to enhance the power quality and reliability of the microgrid system. The proposed scheme is comprised of two inverters, which enables the microgrid to exchange power generated by the distributed energy resources (DERs) and also to compensate the local unbalanced and nonlinear load. The control algorithms are developed based on instantaneous symmetrical component theory (ISCT) to operate DVSI in grid sharing and grid injecting modes. The proposed scheme has increased relia-bility, lower bandwidth requirement of the main inverter, lower cost due to reduction in filter size, and better utilization of micro-grid power while using reduced dc-link voltage rating for the main inverter. These features make the DVSI scheme a promising option for microgrid supplying sensitive loads. The topology and control algorithm are validated through extensive simulation and experimental results.**

Index Terms—Grid-connected inverter, instantaneous symmet-rical component theory (ISCT), microgrid, power quality..

I. INTRODUCTION

Technological progress and environmental concerns drive the power system to a paradigm shift with more renewable energy sources integrated to the network by means of distributed generation (DG). These DG units with coordinated control of local generation and storage facilities form a microgrid [1]. In a microgrid, power from different renewable energy sources such as fuel cells, photovoltaic (PV) systems, and wind energy systems are interfaced to grid and loads using power electronic converters. A grid interactive inverter plays an important role in exchanging power from the microgrid to the grid and the connected load [2],[3]. This microgrid inverter can either work in a grid sharing mode while supplying a part of local load or in grid injecting mode, by injecting power to the main grid.

Maintaining power quality is another important aspect which has to be addressed while the microgrid system is connected to the main grid. The proliferation of power electronics devices and electrical loads with unbalanced nonlinear currents has degraded the power quality in the power distribution net-work. Moreover, if there is a considerable amount of feeder Manuscript received April 24, 2014; revised November 09, 2014; accepted December 04, 2014. This work was supported by the Department of Science and Technology, India under the Project Grant DST/TM/SERI/2k10/47(G). Paper no. TSTE-00176-2014.

The authors are with the Department of Electrical Engineering, Indian Institute of Technology Madras, Chennai 600036, India (e-mail: yemvee1975@ gmail.com; mahesh@ee.iitm.ac.in; chandan3107@gmail.com). Color versions of one or more of the figures in this paper are available online at http://ieeexplore.ieee.org. Digital Object Identifier 10.1109/TSTE.2014.2386534 impedance in the distribution systems, the propagation of these harmonic currents distorts the voltage at the point of common coupling (PCC). At the same instant, industry automation has reached to a very high level of sophistication, where plants like automobile manufacturing units, chemical factories, and semiconductor industries require clean power. For these appli-cations, it is essential to compensate nonlinear and unbalanced load currents [4]. Load compensation and power injection using grid interac-tive inverters in microgrid have been presented in the literature [5],
[6]. A single inverter system with power quality enhance-ment is discussed in [7]. The main focus of this work is to realize dual functionalities in an inverter that would provide the active power injection from a solar PV system and also works as an active power filter, compensating unbalances and the reactive power required by other loads connected to the system.

In [8], a voltage regulation and power flow control scheme for a wind energy system (WES) is proposed. A distribu-tion static compensator (DSTATCOM) is utilized for voltage regulation and also for active power injection. The control scheme maintains the power balance at the grid terminal during the wind variations using sliding mode control. A multifunc-tional power electronic converter for the DG power system is described in [9]. This scheme has the capability to inject power generated by WES and also to

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Design and Implementation of Dual Voltage Source Inverter for Grid Connected Systems

M.SUBRAMANYAM[1], K. BALAJI NANDA KUMAR REDDY[2]

[1]PG Scholar, Dept of EEE, Annamacharya Institute of Technology and Sciences, India, Email: subbus.mogili@gmail.com.
[2]Assistant Professor, Dept of EEE, Annamacharya Institute of Technology and Sciences, India, Email: balajinkr@gmail.com.

Abstract: This paper presents a dual voltage source inverter (DVSI) scheme to enhance the power quality and reliability of the micro grid system. The proposed scheme is comprised of two inverters, which enables the micro grid to exchange power generated by the distributed energy resources (DERs) and also to compensate the local unbalanced and nonlinear load. The control algorithms are developed based on instantaneous symmetrical component theory (ISCT) to operate DVSI in grid sharing and grid injecting modes. The proposed scheme has increased reliability, lower bandwidth requirement of the main inverter, lower cost due to reduction in filter size, and better utilization of micro grid power while using reduced dc-link voltage rating for the main inverter. These features make the DVSI scheme a promising option for micro grid supplying sensitive loads. The topology and control algorithm are validated through extensive simulation.

Keywords: DVSI, ISCT, DERs.

I. INTRODUCTION

Technological progress and environmental concerns drive the power system to a paradigm shift with more renewable energy sources integrated to the network by means of distributed generation (DG). These DG units with coordinated control of local generation and storage facilities form a microgrid [1]. In a microgrid, power from different renewable energy sources such as fuel cells, photovoltaic (PV) systems, and wind energy systems are interfaced to grid and loads using power electronic converters. A grid interactive inverter plays an important role in exchanging power from the microgrid to the grid and the connected load [2], [3]. This microgrid inverter can either work in a grid sharing mode while supplying a part of local load or in grid injecting mode, by injecting power to the main grid. Maintaining power quality is another important aspect which has to be addressed while the microgrid system is connected to the main grid. The proliferation of power electronics devices and electrical loads with unbalanced nonlinear currents has degraded the power quality in the power distribution network. Moreover, if there is a considerable amount of feeder impedance in the distribution systems, the propagation of these harmonic currents distorts the voltage at the point of common coupling (PCC). At the same instant, industry automation has reached to a very high level of sophistication,where plants like automobile manufacturing units, chemical factories, and semiconductor industries require clean power. For these applications, it is essential to compensate nonlinear and unbalanced load currents [4].

Load compensation and power injection using grid interactive inverters in microgrid have been presented in the literature [5], [6]. A single inverter system with power quality enhancement is discussed in [7]. The main focus of this work is to realize dual functionalities in an inverter that would provide the active power injection from a solar PV system and also works as an active power filter, compensating unbalances and the reactive power required by other loads connected to the system. In [8], a voltage regulation and power flow control scheme for a wind energy system (WES) is proposed. A distribution static compensator (DSTATCOM) is utilized for voltage regulation and also for active power injection. The control scheme maintains the power balance at the grid terminal during the wind variations using sliding mode control. A multifunctional power electronic converter for the DG power system is described in [9]. This scheme has the capability to inject power generated by WES and also to perform as a harmonic compensator. Most of the reported literature in this area discuss the topologies and control algorithms to provide load compensation capability in the same inverter in addition to their active power injection. When a grid-connected inverter is used for active power injection as well as for load compensation, the inverter capacity that can be utilized for achieving the second objective is decided by the available instantaneous microgrid real power [10].

Considering the case of a grid-connected PV inverter, the available capacity of the inverter to supply the reactive power becomes less during the maximum solar insolation periods [1]. At the same instant, the reactive power to regulate the PCC voltage is very much needed during this period [2]. It indicates that providing multifunctional ties in a single inverter degrades either the real power injection or the load compensation capabilities. This paper demonstrates a dual voltage source inverter (DVSI) scheme, in which the power generated by the microgrid is injected as real power by the main voltage source inverter (MVSI) and the reactive, harmonic, and unbalanced load compensation is performed

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Fuzzy Logic Control of a Hybrid-STATCOM with Wide Compensation Range and Low DC-Link Voltage

[1] C.Hemasireesha, [2] P.Suneetha
[1] PG Scholar, Dept of EEE,AITS, Tirupathi, Andhrapradesh, India
[2] Assisstent Professor, Dept of EEE,AITS,Tirupathi,Andhrapradesh,India

***Abstract*: -- This paper proposes a hybrid static synchronous compensator (crossover STATCOM) in a three-phase control transmission system that has a wide remuneration range and low DC-connect voltage. As a result of these noticeable attributes, the system expenses can be significantly lessened. In this paper, the circuit setup of hybrid STATCOM is presented first. Its V-I characteristics is then broke down, examined, and contrasted and conventional STATCOM and capacitive-coupled STATCOM (C-STATCOM). The system parameter configuration is then proposed on the premise of thought of the reactive power pay range and shirking of the potential reverberation issue. From that point forward, a control methodology for hybrid STATCOM is proposed to permit operation under various voltage and current conditions, for example, lopsided current, voltage plunge, and voltage blame. At last, reproduction and test comes about are given to confirm the wide pay range and low DC-interface voltage attributes and the great dynamic execution of the proposed mixture STATCOM**

Index Items— Capacitive-coupled static synchronous compensator (C-STATCOM), hybrid static synchronous compensator (hybrid-STATCOM), static synchronous compensator (STATCOM), wide compensation range, low DC-link voltage

I. INTRODUCTION

THE expansive reactive current in transmission systems is a standout amongst the most widely recognized power issues that expands transmission losses and brings down the soundness of an influence system. Use of reactive power compensators is one of the answers for this issue. Static VAR compensators (SVCs) are customarily used to progressively remunerate reactive streams as the loads differ now and again. Be that as it may, SVCs experience the ill effects of numerous issues, for example, reverberation issues, consonant current infusion, and moderate reaction. To defeat these impediments, static synchronous compensators (STATCOMs) and dynamic powerfilters (APFs) were created for reactive current remuneration with quicker reaction, less symphonious current infusion, and better execution . Be that as it may, the STATCOMs or APFs ordinarily require multilevel structures in a medium-or high-voltage level transmission system to diminish the high-voltage worry over each power switch and DC-link capacitor, which drives up the underlying and operational expenses of the system and furthermore builds the control unpredictability.

Afterward, series sort capacitive-coupled STATCOMs (C-STATCOMs) were proposed to decrease the system DC-interface working voltage necessity, and different arrangement sort hybrid structures that comprise of various inactive power channels (PPFs) in series with STATCOMs or APF structures (PPF-STATCOMs) have been connected to control circulation systems and footing power systems. In any case, C-STATCOMs and different series sort PPF-STATCOMs contain moderately limit reactive power remuneration ranges. At the point when the required repaying reactive power is outside their pay extends, their system exhibitions can altogether weaken. To enhance the working exhibitions of the conventional STATCOMs, C-STATCOMs, and other PPF-STATCOMs, a wide range of control procedures have been proposed, for example, the prompt p-q hypothesis , the momentary d-q hypothesis, the quick id-iq technique, negative-and zero-arrangement control, the back spread (BP) control strategy, nonlinear control, Lyapunov-work based control, immediate symmetrical segment hypothesis , and hybrid voltage and current control . To lessen the present rating of the STATCOMs or APFs, a hybrid mix structure of PPF in parallel with STATCOM (PPF//STATCOM)

Nonetheless, this hybrid compensator is devoted for inductive stacking operation. When it is connected for capacitive stacking remuneration, it effectively loses its little dynamic inverter rating qualities. To grow the pay range and keep low current rating normal for the APF, Dixon et al. proposed another half and half mix structure of SVC in parallel with APF (SVC//APF) in three-phase dispersion systems. In this half and half structure, the APF is controlled to take out the music and make up for the little measures of

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Fuzzy Logic Control of a Mult- Level Converter with a Floating Bridge for Open-Ended Winding Motor Drive Applications

[1] A.Prathima, [2] P.Suneetha
[1] PG Student, [2] Professor,
Department of Electrical and Electronics Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, Andhra Pradesh-517507, INDIA

***Abstract*: -- This paper shows a double three phase open end winding enlistment motor drive. The drive comprises of a three phase enlistment machine with open stator phase windings and double bridge inverter provided from a solitary DC voltage source. To accomplish multi-level output voltage waveforms a floating capacitor bank is utilized for the second of the double bridges. The capacitor voltage is directed utilizing redundant switching states at half of the fundamental dc link voltage. This specific voltage proportion (2:1) is utilized to make a multi-level output voltage waveform with three levels. An adjusted modulation plot is utilized to enhance the waveform nature of this double inverter. This paper additionally analyzes the misfortunes in double inverter system interestingly with single sided three-level NPC converter.**

***Index Items*— Field oriented control, floating bridge, Open End Winding Induction Machine (OEWIM), space vector**

I. INTRODUCTION

Different multi-level converter topologies have been proposed during the most recent two decades [1-4]. A few converter topologies have been examined to accomplish multi-level output voltage waveforms, among them the diode clipped [3], flying capacitor [5, 6] and fell [4] converters are usually utilized. Multi-level converters have bring down dv/ d t and lessened symphonious twisting alongside bring down semiconductor switching gadget blocking voltage necessities, in this way multi-level converters are favorable in medium voltage, high power or low voltage, high recurrence applications [7]. Among the course converters, double two-level inverter topology has gotten consideration because of the effortlessness of the power organize and the game plan's blame tolerant limit. Conventional double two-level inverter topologies utilize two standard three-phase inverters to accomplish a multi-level voltage output. This topology does not have the nonpartisan point vacillations found in NPC converters, utilizes less capacitor than the flying capacitor topology and requires less secluded supplies than H-bridge converters.

Moreover double inverters are more dependable, on the grounds that if there should arise an occurrence of a disappointment in one converter the outputs of the converter can be short-circuited and the system would then be able to work as a standard single sided three phase inverter. To accomplish multi-level voltage waveforms and to cut the way of normal mode current stream two detached dc sources are utilized for conventional double inverter topology, expanding the size and weight of the system. In this paper a double two-level inverter is displayed which diminishes the size and weight of the system for an open end winding enlistment motor drive application. Double inverter topologies have been considered in various papers for various applications.

The customary double inverter topologies (utilizing two detached dc sources) have been dissected, with various space vector modulation plans used to create the multi-level output voltage waveforms. A piece graph of a conventional open phase load and converters is appeared in Fig. 1. It is conceivable to utilize a solitary supply for the double inverters with a typical mode disposal procedure. These topologies utilize particular switching curves that create measure up to regular mode voltages which scratch off at load terminals. A decrease in the quantity of voltage levels and lower dc bus voltage use are the fundamental impediments of this variety of the topology. A regulation method to adjust the power stream between the two inverters in a double inverter system has additionally been proposed. This topology still uses a detachment transformer; the span of this transformer can be lessened to the detriment of decreased modulation file. The coasting capacitor connect topology alongside a reasonable control plan to permit the supply of reactive power was presented. Different creators have displayed techniques to make up for supply voltage droop with a specific end goal to

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An Improved Maximum Power Point Tracking Of Three Phase Grid Connected Based On Robust Nonlinear Controller

[1] M.Sangeetha, [2] C.Prasanna Kumari
[1] PG Student, [2] Assistant Professor,
Department of Electrical and Electronics Engineering, Annamacharaya Institute of Technology and Sciences, Tirupathi, Andhra Pradesh-517507, INDIA

***Abstract*: -- This paper presents a robust nonlinear controller design for a three-phase grid-connected photovoltaic (PV) system to control the current injected into the grid and the dc-link voltage for extracting maximum power from PV units. The controller is designed based on the partial feedback linearization approach, and the robustness of the proposed control scheme is ensured by considering structured uncertainties within the PV system model. An approach for modelling the uncertainties through the satisfaction of matching conditions is provided. The superiority of the proposed robust controller is demonstrated on a test system through simulation results under different system contingencies along with changes in atmospheric conditions. From the simulation results, it is evident that the robust controller provides excellent performance under various operating conditions**

***Index Terms* — Grid-connected PV system, matching conditions, partial feedback linearization, robust nonlinear controller, structured uncertainty.**

I. INTRODUCTION

In response to global concerns regarding the generation and delivery of electrical power, photovoltaic (PV) technologies are gaining popularity as a way of maintaining and improving living standards without harming the environment. To extract maximum power from the PV system [1], a robust controller is required to ensure maximum power-point tracking (MPPT) [1]–[3] and deliver it to the grid through the use of an inverter[4]–[6].Robustness is essential since the power output of PV units varies with changes in atmospheric conditions. Thus, the controller must be robust enough to provide a tighter switching scheme for the inverter to transfer maximum power into the grid over a wide range of operating conditions with a short transient period. In a grid-connected PV system, control objectives are met by using a pulse-width modulation (PWM) scheme based on two cascaded control loops[7].The two cascaded control loops consist of an outer voltage-control loop to track the maximum power point (MPP) and an inner current control loop to control the duty ratio for the generation of a sinusoidal output current which needs to be in phase with the grid voltage for unity power factor operation [7].The current loop is also responsible for maintaining power quality (PQ) and for current protection that has harmonic compensation. Linear controllers are widely used to operate PV systems at MPP [8]–[13]; however, most of these controllers do not account for the uncertainties in the PV system. Over the past few decades, one of the most important contributions in the field of control theory and applications has been the development of robust linear controllers for linear systems in the presence of uncertainties through the control scheme which is often obtained from linear matrix in equality (LMI) methods [14], [15]. A feed forward approach is proposed in [16] to control the current and dc-link voltage, and the robustness is assessed through modal analysis .A robust fuzzy-controlled PV inverter is presented in [17] for the stabilization of a grid-connected PV system where the robustness is achieved by using the Taguchi tuning algorithm. A minimax linear quadratic Gaussian (LQG) technique is proposed in [18] to design a robust controller for the integration of PV generation into the grid where the higher-order terms during the linearization are considered as modelling uncertainties. The controller design methods as presented in [8]–[13] and [16]– [18] are based online arized model so of nonlinear PV systems.In practice, PV sources are time varying, and the system is not linearizable around a unique operating point or a trajectory to achieve the desired performance over a wide range of changes in atmospheric conditions. To overcome the limitations of line are controllers ,an on linear proportional-integral-derivative (PID) controller based on the model prediction is presented in[19],where improved performance is reported. A Lyapunov based control scheme for a grid connected PV inverter is presented in [20] where an adaption law is included to improve the robustness. However, it is well known that the adaption technique is useful for systems with slow parameter variations which is not the case for PV systems as the changes occur rapidly. A sliding mode controller for a nonlinear g-connected PV system is proposed in [21] and [22] along with a new MPPT technique for providing robust tracking again uncertainties and

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Novel Analysis on Placement of Energy Storage Systems in Power Systems with Wind Integration

[1] B.Nageswara, [2] C.Prasanna Kumari
[1] PG Student, [2] Assistant Professor,
Department of Electrical and Electronics Engineering, Annamacharya Institute of Technology and Sciences, Tirupathi, Andhra Pradesh-517507, INDIA

***Abstract*: -- This paper examines the problems posed by wind integration for power system operation. For example this kind of energy source is practically flexible and unstable. The establishment of this in exhaustible source might require the grid to transmit power at full capacity and some transmission lines could wind increasing noticeably congested. Accordingly, some working conditions, wind power could be curtailed (spilled or minimized) which will drive up expenses for system administrators. One of the activities that can be taken to support the incorporation of wind is utilizing energy storage systems (ESSs). For this purpose particle swarm optimization (PSO) power flow problem with energy storage systems is implemented and sets of candidate buses for energy storage systems installation are recognized based on financial criterion to minimize the cost. Tests are performed on IEEE 14-bus and IEEE 118-bus systems to evaluate the robustness of storage location on system operation.**

***Index Terms*—Curtailed wind, Energy Storage Systems (ESSs), LMPs, Location, particle swarm optimization (PSO) Production Cost Wind Integration**

I. INTRODUCTION

ESSs can be an alternative to manage wind power irregularity, and hence provide flexibility and reliability for power systems with high wind penetration level. This technology enables electricity to be stored at times of more wind and less demand and then to be released at less wind, more demand hours. This ability to store electricity of ESSs can efficiently compensate for the irregular behaviour of wind power and provide economically optimal operation for wind generation Potential applications of ESSs for grid connected wind generation are discussed in [1] ESSs can be applied for mitigating wind power curtailment due to limited transmission capacity, which helps avoid any required transmission capacity upgrade, For optimizing the overall cost function. Presentation will give an overview of different storage technologies and how they can be used in a

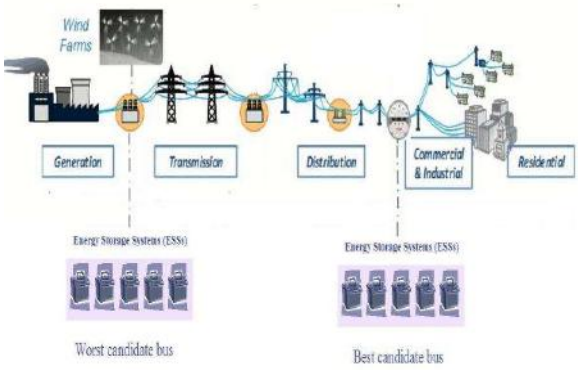

Fig. 1 Single line diagram of test system

sustainable power system [2]. ESSs are studied on optimal sizing and operation of a battery energy storage system (BESS) used for spinning reserve in a small isolated power system and Numerical simulations are performed on a load-frequency control (LFC) [4]. Further studies on other applications of ESSs such as frequency control and risk mitigation can be found in [3]–[5]. Both the operations of ESS and wind generation have very important in many studies. The optimization process is used to maximize revenue for an ESS connected to a wind power curtailment scheme [6], that paper investigates the optimal scheduling of ESS cooperating with wind farms and connected to a distribution network. In [7], presents a security constrained unit responsibility display with wind and BES and talks about the part of BES on Locational price evaluating, financial, peak-load shaving and transmission congestion administration utilizing an 8-bus system contextual investigation. An expanding enthusiasm for ideal operation techniques of ESS in power markets, where power cost is a liability, has been found in [8]-[10]. In [8] presents a stochastic programming structure on ideal offering of free storage units in the day-ahead and hour-ahead energy and reserve markets which is currently grid area in the world that has largest share of wind power in its generation profiles. Managing situation of ESS in power networks, in [11] a system is proposed to designate ESS in a dispersion system with high wind insertion. The ESS is ideally put and estimated to both wind energy and reduce generation costs. In [12] utilizes an affectability investigation strategy to discover ideal areas of ESSs for minimize transmission congestion. [13] Proposes an approach for expand storage devices and talks about the achievability what's more, financial effect of

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Fuzzy Controller for Circulating Current in Parallel Three Phase PWM Converters under Generalized Unbalanced Operating Conditions

[1] M. Madhavi, [2] R. Madhavi
[1] PG Student, [2] Assistant Professor
Department of Electrical and Electronics Engineering, Annamacharya Institute of Technology and Sciences, Tirupathi, Andhra Pradesh-517507, INDIA

***Abstract*: -- The use of common dc-link parallel three-phase PWM converter topology owing to advanced features & applications has become more popular, This paper proposes another control scheme for parallel three phase pulse width modulation (PWM) converters under generalized lopsided working conditions. When three-phase PWM converters are connected in parallel there exist circulating current, which result in current distortion and harmonic loss in parallel module and degrade the overall performance of the parallel system. An average model of the parallel system in positive-sequence synchronous reference frame (PSRF) is derived to dissect the impact of generalized unequal working conditions in AC side. It is seen that the variance in network frequency & the unbalance factors in filter inductance won't just offer ascent to negative-sequence circulating current, additionally add to creating zero-sequence circling current (ZSCC) with the coupling between the active-reactive system. The negative-sequence circling current can be restrained by suppressing the negative-sequence parts in AC output currents of parallel modules with a proportional integral resonant (PIR) controller. An enhanced feed forward system and a fuzzy controller for ZSCC control are proposed for unequal working conditions. The unsettling influences in ZSCC caused by unbalance factors in filter inductance can be rejected with feed forward methodology. The proposed plan with a PIR, Improved feed forward & fuzzy controller can successfully stifle the circulating currents between the parallel modules and therefore, the distortions in output currents can be enormously diminished..**

Index Terms— Parallel three-phase PWM converter & Average model in PSRF mode, Generalized unequal operating conditions, Circulating current control, PIR & Improved feed forward with fuzzy logic controller.

I. INTRODUCTION

Three-phase pulse width modulation (PWM) converter has been broadly utilized in distributed generation systems for achieving fast dynamic response & allows the processing of active and reactive power from the generator to the load and vice versa, depending on the application [1-3]. Attributable to its advanced features, and its parallel association topology is getting to be noticeably famous used to expanding the power rating of distributed generation system because of its simplicity, low cost and high flexibility. In any case, these features are not really accomplished when the converters are directly connected between normal dc and ac buses under generalized working states of unequal network supply and uneven ac filter inductance. The main concern in a parallel system is the currents circulating between the parallel modules [4], [5].Since the circulating current generation is sensitive to output voltage differences [7] & the dead-time effects, which are known to cause load-dependent distortion to inverter output voltages [[4]- ref [12]]. The zero-sequence component in circulating currents is the major problem under balanced operating conditions, the mechanism of circulating current has been analyzed in previous work [18],[19], & the relationships between switching pattern and zero-sequence circulating current (ZSCC) is analyzed in detail by [6].

Traditionally, in order to avoid this circulating current problem which includes the negative-sequence and zero-sequence components can effectively eliminated by isolating transformers as the circulating currents paths are made open circuits[20],These transformers are designed with a certain winding turns-ratio and a certain phase shift, so that the concerned harmonics can be cancelled in the other side. However, these transformer is heavy and bulky in parallel module especially for a high-power application. Similar problems will be encountered by using separate dc supply. For parallel systems with both common dc-link and ac bus to reduce the costs and size, inter-phase reactors may be used to provide high zero-sequence impedance for circulating currents [22]. Nevertheless, the reactors cannot prevent low-frequency components in the circulating current. Therefore, a

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Multipurpose Illumination Control

Kola Leleedhar Rao[1*], A Yuva Kishore[2] and Kola Govardhana Giridhara Rao[3]

[1]*Assistant Professor, EEE Department, Sree Vidyanikethan Engineering College (Autonomous), Andhra Pradesh, India*
[2]*PG Scholar, EEE Department, Sree Vidyanikethan Engineering College (Autonomous), Andhra Pradesh, India*
[3]*Deputy Executive Engineer, WR Department, Government of Andhra Pradesh, Andhra Pradesh, India*
[1*]*klr.power@gmail.com,* [2]*a.yuvakishor@gmail.com,* [3]*gogira70@gmail.com*

Abstract

Today, the humankind is witnessing energy crisis. This necessitates the efficient utilization of electrical energy where ever possible. Power electronics helps in accomplishing this task of efficient energy usage by providing effective control. Thyristor is an imperative family of devices in power electronic system that are commonly used in several alternating power circuits to control output power and to optimize internal power loss at the expense of switching speed. This can be achieved by providing proper control and triggering circuit to the thyristor. In this paper, a new multipurpose high power illumination control scheme that could create a foot step for energy conservation within power and infrastructural amalgam including institutional and industrial utilization is presented. A control scheme in conjunction with UJT firing circuit for controlling the conduction of SCR that acts as a power switch for high power luminary is designed and developed for three different modules under multipurpose illumination control and tested in laboratory for validation.

Keywords: *Illumination, Photo sensor, Silicon controlled rectifier (SCR), Unijunction transistor (UJT)*

1. Introduction

The lighting is considered as a structural material that can be used within a building infrastructure, domestic, institutional and industrial vicinity to help it to serve various functions. Unfortunately it is a common practice, today, to treat lighting like furniture and decoration equipment that can be added after the building has been designed and completed. Poor lighting results in severe consequences like eye-strains, headaches, accidents due to insufficient lighting or to glare. Even then, it is incredible to find that not much attention is paid to this aspect of engineering. If a huge structure like a transmission network, a dam or a bridge is to be constructed, an engineer is always consulted but if a large public building is to be illuminated, the job is normally commended to a practical man who uses rule-of –thumb methods rather than the scientific methods.

In the past, human beings passed most of their time out of door and their lighting needs were served by the nature. However, today he is spending most of his time in buildings and locale where artificial lighting plays an important role. Good lighting, apart from having aesthetic and decorative aspects, reduces accidents, increases the production in the factories and improves the general health of the community due to reduction of eye-strain. For good lighting a close cooperation among the artist, architect, the civil engineer and an illumination engineer is desired.

Recognizing the impact of light on the individual and on a global scale, the United Nations has proclaimed 2015 as the International Year of Light, citing that light plays a

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Robust Controller for Hydro-Plants to Mitigate Frequency Deviations with Wind Power Penetration in the Grid

A.Yuva Kishore[1], G.Ravindra[2]

PG Student, Department of EEE, SVEC, Tirupati, India[1]

M.Tech, Asst. Prof, Department of EEE, SVEC, Tirupati, India[2]

ABSTRACT: This paper exhibits a robust control configuration to incorporate hydro generators to address expanded frequency deviations in power frameworks with high wind control entrance. A Robust control plan system for hydro governors is proposed so as to especially handle with unsettling influences from wind control variance. In the first place, by consolidating state conditions of hydro, thermal, and wind generators through the power stream conditions of system, a state space model of the whole power framework is determined for the control plan of hydro generators. Specifically, the attributes of wind power varieties and the water powered framework flow of hydroelectric power plants are executed in the framework demonstrate. At that point, the H∞-based vigorous controller is integrated by diminishing the request of the framework model and utilizing the direct network disparity strategy. At long last, the IEEE 39-transport test framework is utilized to check the execution of the planned strong controller with 10–40% wind entrance levels. Reenactment results are contrasted and a conventional PID controller. Inquire about discoveries show that the proposed robust controller fundamentally lessens framework frequency deviations and empowers hydro generators to be more receptive to wind control variety in essential frequency direction of energy frameworks.

KEYWORDS: Frequency control, hydroelectric power generation, robust control, wind power.

I. INTRODUCTION

The frequency of power systems, which indicates the real power imbalance between generation and demand, mustbe confined to a narrow range around its nominal value [1]. By adjusting real power injections on generation side, the systemfrequency can be regulated in a hierarchical fashion, comprising three different layers at different timescales. In this regulation mechanism, the primary frequency control provides the most rapid adjustment to system frequency deviation by the local speed governor on each generator, while the secondary frequency control drives the frequency back to its nominal value and tie-line power flows to scheduled values by adjusting economic dispatch, schedules the outputs of online generators and power flows using optimization methods [2], [3].Load variations are usually taken as the main disturbances inthe frequency control loop in traditional power systems [4].With significant wind power penetration, variabilities and uncertainties are introduced into power systems as wind power outputs are highly fluctuating and their prediction accuracy is much lowerthan the accuracy of load forecasts [5], [6]. This results inlarge mismatch between the power supply and the demand for electricity, leading to the increase in frequency deviations from the nominal value [7]. In addition, as most of modern wind generators are connected to power grids by power electronic converters, they contribute no inertial response to power systems[8]. In the near future, with more synchronous generators displaced by wind generators, the frequency of power systems will be more sensitive to the imbalance between generation and demand as the inertia of the whole system is decreasing. Hydro power generators have long been the primary actor in frequency regulation of power systems due to their fast responses to short-term demand variation [9]. In the meantime, due to the smoothing effect of clustered wind generators in the system, the whole fluctuation rate of wind power will be smaller than that of any single wind generator, making it possible for hydro generators to adjust wind power [10], [11]. With the increasing penetration of wind power, hydro power plays a more important role in frequency regulation especially for primary frequency control [12]. However, the existing

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Optimal Dg Allocation in Distribution System for Loss Minmization

[1] T.Iswarya [2] C.Sasikala
[1] PG Student, [2] Professor
[1][2] Department of Electrical and Electronics Engineering, Annamacharya Institute of Technology and Sciences, Tirupathi, Andhra Pradesh-517507, INDIA

Abstract: **-- Distributed Generation (DG) also known as dispersed generation is small scale generation units directly coupled with the distributed system. There has been great interest in the installation of distributed generation sources close to the consumer load center. The DG technologies comprise of both conventional and non-conventional sources of energy to generate power in order to satisfy the demand of ever rising energy demand. Optimum position and size of DG units can aid the performance of active power system network. Integration of DG units of optimum capacity at ideal locations improves the voltage profile of the system and minimizes the active and reactive losses of the system. In this paper, state of the art techniques for optimum placement and sizing of DG have been suggested. The paper provides an overview of the various methods implemented for determining optimal location and capacity of DG units to maximize the benefits of DG units in the system network**

Keywords: **Distributed Generation, Loss Minimization, Optimum Location, Optimization Techniques, Voltage Profile Improvement.**

I. INTRODUCTION

The deregulation of the electricity sector has created many opportunities to develop new technologies. Dispersed generation is one of those technologies to meet the ever increasing demand of electricity. The term "Dispersed Generation" refers to small-scale electric generation units close to the point of consumption. The advantages could be maximized by proper positioning of DG units at optimum location with ideal capacity and suitable type of DG unit. Distribution generation allows collection of energy from many sources and may give lower environmental impacts and improved security of supply. The benefits of integrating DG are segregated into technical, economical and environmental benefits. Technical advantages comprise of voltage improvement, minimization of real and reactive power losses, enhancement of system efficiency, increase in system reliability, improving power factor of the system and therefore improving power quality of the system. The economical benefits include the reduction of transmission and distribution congestion, decrease in electricity transmission pricing and better performance of network system in deregulated utilities. The environmental benefits constitute the reduction in the emission of pollutants, less noise pollution and extra saving of fuel [1-5]. Several researchers have been working this area to avail the maximum benefits from the integration of DG units in the power system. With the deregulation of the power system network, it is important for the electrical utilities to maximize the positive effects of DG [6]. Numerous methods have been proposed to determine the optimum location and size of DG in order to improve the voltage level and for loss minimization. Improper location and non-optimum capacity of the DG unit can have negative impact on the active power system network. It may cause the voltage to rise above a pre-determined voltage level, increase of fault current in the system, poor efficiency and elevation of system losses. Therefore, it is necessary to find out the optimum location and size of DG units along with its type to enhance the working and planning of active network. This paper suggests various techniques to determine the ideal location and optimum size of DG units for voltage level improvement and loss minimization

II. DISTRIBUTED GENERATION

The electric power generation units placed near to the load and connected directly to the distribution networks is defined as DG. On the basis of the power delivering capability, the classification of DG majorly of four types based on their real and reactive power delivering capabilities are as,

Type-1: DG delivers only active power at unity PF of DG (PFDG = 1). Examples include photovoltaic, micro-turbines, and fuel cells and so on.

Type-2: DG delivers only reactive power at zero PF of DG (PFDG = 0). Examples include synchronous compensators such as gas turbine.

Type-3: DG delivers active power but consumes or absorbs reactive power (Q is negative) at PF range between 0 and 1(i.e. 0< PFDG < 1). For example induction generator (wind farm).

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Impact of various load models in distribution system with DG using Harmony and Backtracking Search Algorithms

V. Swetha
Department of EEE SVU College of Engineering, Tirupati, India-517501

Abstract- *In recent few years, the implementation of distributed generator into a distribution system has been increasing rapidly in many parts of the world, due to the liberalization of the electricity markets, constraints on constructing a new distribution network, transmission lives and environmental concerns . Proper locations and sizing of DGs in power systems is important for obtaining their maximum potential benefits. In this paper, finding the optimal location and size of DGs is dealt keeping active power loss as the objective. A very recent swarm optimization technique namely backtracking search optimization algorithm (BSA) is considered. DGs supplying both active and reactive power have been studied. The proposed methodology and Harmony search algorithm (HSA) is verified on IEEE-69 bus system with different load models.*

Keywords*- Backtracking search algorithm, Harmony search algorithm, Distributed generation, Load models, optimal location and sizing.*

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I. Introduction

Distributed Generation (DG) sources are becoming more prominent in distribution systems due to the incremental demands for electrical energy. The distribution system aims to supply the customers with higher levels of demand. Ackermann et al. [1] have given the most recent definition of DG as: ''DG is an electric power generation source connected directly to the distribution network or on the customer side of the meter." The DG benefits in distribution systems can be summarized as economic, technical and environmental advantages. In recent research, different aspects of these benefits have been verified [2-4]. Therefore, the optimization problem of determining the siting and sizing of DGs [5] under the network constraints including load flow and bus voltage are of primary task.

Different methods have been proposed for optimal location and sizing of DG units. Power loss reduction [6 – 7] has remained keen area of interest for placement and sizing. However, other objectives such as voltage profile and reliability improvement, cost minimization and maximizing DG capacity and penetration level have been considered in different studies. Lie Han et al [8] presented analytical method for DG placement in order to enhance the reliability and obtain the benefits of DG placement. Genetic Algorithm has been found useful in dealing with DG placement and sizing [11]. The authors of [10] have used ABC optimization technique to find optimize DG size, power factor and location considering active power was as the network constraint.

In distribution system, voltage stability becomes very important, several works [6], [9] have been done in this area to maintain voltage profile while DG placement. Most of the DG planning studies consider the loads as constant power sinks that are independent of the feeder voltage magnitude. But in practical systems the load does not remain constant and varies differently for different customer type and at different time of day. The load in a distribution system generally consists of three main types i.e., residential, commercial and industrial loads. The nature of these three types of loads is such that their active and reactive power components respond differently to variations in the voltage and frequency of the system [12, 13]. Optimal DG placement considering various load models has been considered by Zonkoly [15] using PSO technique. Singh et al [14] have shown the effects of different load models on DG sizing and sitting.

Considering the effect of voltage dependent loads has a main impact on distribution system planning studies. The authors of [16] has used a multi-objective approach for DG placement and sizing using PSO. P.S. Georgilakis et al [17] has complied various methods, optimization techniques, constraints, etc. which has already been used for DG placement as well as the future research which can be done in this area.

This paper deals with a new evolutionary algorithm i.e. Backtracking search optimization Algorithm [18] , to determine the optimal location and sizing of DGs e to reduce power loss. Its results are compared with the results of Harmony search algorithm and are found to be better.

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Modeling of In-Cylinder Fuel Sprays Combustion in D.I. Diesel Engine

Bhanu Priya K [1], Hema Chandra Reddy K[2], Balaji M[3]

Research Scholar, Department of Mechanical Engineering, JNTU Anantapur, AP, India[1]

Professor, Department of Mechanical Engineering, JNTU Anantapuramu, AP, India[2]

Research Scholar, Department of Mechanical Engineering, JNTU Anantapur, AP, India[3]

ABSTRACT: D.I. Diesel engines are the commercially used vehicles in daily practice. The performance of D.I. Diesel engine largely depends on the combustion dynamics inside the cylinder. Hence, such combustion is influenced by the spray characteristics, fuel content and then the motion of the piston. The main problem with diesel engines is emissions of nitrogen oxides (NOx) and particulates. In order to minimize the emissions, it is necessary to design the diesel engine with better in-cylinder flow (air-fuel mixing) and combustion process. Computational Fluid Dynamics (CFD) simulation helps to understand the Diesel engine temperature distribution and NOx species concentrations with respect to time. A small direct injection (DI) engine was chosen for the study. CFD simulation results were compared with that of engine emission tests. This paper also presents the simulation results of direct injection diesel engine in-cylinder flow (air fuel mixing) and combustion.

KEYWORDS: CFD, Diesel engine, combustion modelling, Turbulent In-cylinder Flow Modeling

I. INTRODUCTION

Direct - injection diesel engines are used both in heavy duty applications and light duty ones due to their high thermal efficiency and low CO2 emissions [1]. Fuel economy and emission norms are compelling to develop more efficient and cleaner engines. It is necessary to improve the combustion process to reduce exhaust emissions. Computational Fluid Dynamics is popularly used in different stages of engine design and optimization. The combustion system performance can be better understood using CFD simulation. The challenge in using CFD is the complexity of interaction of flow, turbulence, spray and combustion inside the IC engine cylinder. High pressure injection [2-5] and modification of combustion chamber geometry [6-9] were tried to reduce particulate emissions. Exhaust gas recirculation (EGR) [10] is another technique used to reduce NOx emissions. Supercharging coupled with better injection timing reduces PM emission and NOx reduction [11]. These methods however, have a trade-off relationship between NOx and particulate emissions. To optimize the combustion and emissions in diesel engine it is necessary to understand the flow inside the cylinder.
This paper presents the CFD simulation of a diesel engine combustion process to predict the temperature distribution inside the cylinder and NOx emission with reference to crank angle variation in the expansion stroke.

II. RELATED WORK

Aita et al.[1] studied the swirl motion in the cylinder during the intake and compression strokes on a real geometry with one intake valve, but presented little validation of their calculations. Chen et al. [2] performed calculations of the full intake and compression processes and presented some comparisons with experimental data. Their results showed that calculations significantly under predicted the turbulence velocity. They explained the differences by errors in the experimental data and the limitations of the standard k–ε model. Dillies et al. [6] also presented similar calculations of a Diesel engine with one intake valve for one combustion chamber, and in this case results compared reasonably well

CASE STUDY OF INFLUENCE OF FORECASTED INFLATION ON BLOCK REPLACEMENT DECISION USING FIRST ORDER MARKOV CHAIN ON COMPUTER AND COMPUTER BASED SYSTEM

U. JAWAHAR SURENDRA
Ph.D. Scholar,
Dept. of Mechanical Engineering,
Rayalaseema University, Kurnool
ujsurendra@gmail.com

Dr. C. NADHAMUNI REDDY
Principal, Annamacharya Institute of Technology and Sciences,
Tirupati, Andhra Pradesh

ABSTRACT

With the advent of Computers and the widespread of the internet and fiber optics network across the world, the huge population comprising good number of unemployed Indian youth provided a platform for MNCs to open up their ICT branches in India. Also Banking, Insurance, Railways, Corporate houses etc. are becoming IT savvy and using computers in large scale for their operations. Consequently the decisions on capital investment on Computer and Computer based system became important and a need for scientific approach for the replacement decisions is felt.

Keywords: *Markov chains, Weighted Moving Transition Probabilities technique.*

INTRODUCTION

Also an attempt has been made to develop block replacement model using higher order Markov chains. In case of higher order Markov Chains, calculation and analysis of large number of transition probabilities is tedious and consumes considerable amount of time. To address this, Weighted Moving Transition Probabilities (WMTP) technique, a parsimonious model that approximates higher order Markov chains is proposed and applied. WMTP technique considers the spread of sizeable past data instead of single period data as in the case of first order Markov chain. The cost analysis is made in evaluating the replacement strategies, - for a block of computers - without considering and with considering the influence of inflation in Indian economic environment and an age at which the block replacement is economical is determined. Also a study is made to evaluate the behavior of the block replacement model under the influence of variable maintenance cost; and also under rapid up-trend and sluggish up-trends in inflation.

Several researchers investigated the optimal age replacement models to tailor the models for different real time situations to reduce the cost.

In Bruce Craig et al [1] appropriate techniques to estimate the transition matrix are summarized for discrete-time homogeneous Markov chains in various combinations of observation intervals and the cycle length. A necessary technique to estimate and interpret higher order Markov models is proposed by David Epstein et al [2]. In political science, they used higher order Markov models to study the democratic transitions and observed that three state model with an intermediary 'partial democracy' state has better explanatory power than the two state models.

For calculating high-order transition probability matrix of finite Markov chain, Zhenqing Li et al [3] explored a mechanism. It is by the application of theory and methods of stochastic process and computer algebra the given problem is converted into a matrix equation in order

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A Study to Optimize Process Parameters of FSW Joints by Using Design-Expert and Fuzzy-Approach

Y. Sankara[1], J. Venumurali[2,*], G. Sivaramudu [1], K. Saraswathi [1]

Lecturer, Department of Mechanical Engineering, G. M. R.Polytechnic College, Srisailam, AP, India[1]

Research Scholar, Department of Mechanical Engineering, S. V. University, Tirupati, AP, India[2]

ABSTRACT: Friction stir welding (FWS) is one of the most vital joining processes in the present scenario. In case, where find its use in structures used by wrought or extruded aluminium which seeks very high strength. It uses a non-consumable tool to adhere two faces without melting base material. In this study aluminium alloy AA6061 joints are welded successfully by friction stir welding process using five rotational speeds, three weld speeds and two different pin profiles. The effects of welding speed, tool rotation and tool profile on the weld performance of joints are investigated by conducting tensile test, hardness test and calculating percentage elongation. Maximum tensile strength 119.781 MPa was exhibited by the FSW with optimized parameters of 950 rpm as tool speed (TS), 25 mm/min as welding speed (WS) using cylindrical tapered tool. Minimum percentage elongation 5.975 is exhibited by the FSW with the optimized parameters of 900 rpm as TS, 15 mm/min as WS using cylindrical threaded tool. Maximum Brinell hardness number 72.122 is exhibited by the FSW joint fabricated with the optimized parameters of 850 rpm as TS, 15 mm/min as WS using cylindrical tapered tool. The fuzzy input membership functions and the output membership functions assigned based upon the experimental condition. All membership conditions (both inputs and output for model) are in triangle and well distributed.

KEYWORDS: AA6061 aluminium alloy, FSW, Tool Speed, Welding Speed, Tensile strength, % of elongation, Brinell hardness number.

I. INTRODUCTION

Friction stir welding (FSW) is a relatively new joining process that is presently attracting significant attention. FSW is a solid state welding process where a machine rotates, plunges, and then traverses a distinct shaped FSW tool along a joint to form a weld. Deep research was carried out on FSW in the last decade to join several non-ferrous and ferrous materials and achieved many useful out comes [1]. The process has capable application for lower melting alloys, which are very much critical to be joined by traditional fusion welding [2].

Several cast and wrought aluminium alloys are used in aircraft structures, automobile bodies, missile components and military tanks reported by [3]. the effect of tool rotational and traversing speed on microstructure and tensile strength of dissimilar friction stir welded A356 and AA6061-T6 joints were s studied [4]. The traverse motion of the tool was resulted in the transportation of plasticized material from front to back of the tool. The axial force applied with respect to the tool axis forges the plasticized material to complete the joining process explored by [5,6].

The RSM is very useful in enhancing a suitable imprecise structure for the sound-designed relationship between the independent variables and response variables that may demonstrate the characteristics of FSW joints [7]. Also Fuzzy-logic-based multi-criteria decision making approaches also become very popular in optimization of manufacturing processes reported by Satpathy et al., [8].

Palanivel and Mathews [9] concluded after carried out research asusing ANOVA test, and scatter diagrams, and found to be satisfactory to brought relationships between process parameters for FS welding of AA5083-H111 aluminium

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Optimization of Process Parameters on Injection Moulding Machine with LLDPE Reinforced Flyash using Taguchi

B. Sudheer Reddy[1], K. Arun[2], Dr. M. Chandra Sekhara Reddy[3]
[1, 2, 3] Department of Dept. Mechanical Engineering, SVCE, Tirupati, India
Email: [1] sudheerb121@gmail.com, [2] arunk4u@gmail.com,

Abstract— *Injection Moulding (IM) is an important polymer process operation in the plastic industry. The Polymer Composite Material is injected into a mould cavity, during the process and solidifies to the shape of the mould. The demand for plastic product is very high because of a good set of their better quality, design and appearance in comparison to other material product in the present market. Operating parameters are needed to produce better quality of plastic products. Hence, the present paper deals with the parameter selection for injection moulding using Taguchi and ANOVA, since there are many critical factors involved in the process, the effect of Melting Temperature, Injection Pressure, Cooling Time and Injection Speed are considered in the present paper. A Plastic product from Linear Low Density Polyethylene (LLDPE) as Matrix Material and Flyash as Reinforcement Material (LLDPE + Flyash) Composites are taken for the experiment to obtain optimal injection moulding to find out Tensile Strength(IS) and Hardness in order to minimize defects and increase its strength, and toughness. The analysis of experimental work is performed on MINITAB-17 Statistical Software. The Design of Experiment (DOE) is used with an attempt to optimize input parameters and achieve good results using "Orthogonal Arrays" (OA) by Taguchi method. The output characteristics analysed and presented the optimal results.*

Keywords— **ANOVA, DOE, Flyash, Hardness, Injection moulding, LLDPE, Taguchi, Tensile Strength.**

I. INTRODUCTION

Need for quality of the products with latest developments has made the industries to search for new methods for manufacturing or production of components with low cost. Among the Production Processes, Injection Moulding (IM) is a practical technique used in manufacturing industry for mass production of plastics parts quickly and inexpensive. Further, the plastic parts have become more popular and critical in modern engineering applications.

Injection moulding is generally used to produce thermoplastic polymers. It consists of heating of thermo plastic materials until it melts and then injecting into the steel mould, where it cools and solidifies to take its final shape. The plastic materials are usually received in the granular form. It is placed in the hopper of the moulding machine from which it is fed to a heated cylinder. Granules are heated in the cylinder to melt or plasticize. The melting temperature varies with the material. The mould is usually made-up of steel and water to cool. A plunger forces the molten plastics from the cylinder into the mould wherein, it cools and solidifies. The mould is opened and the moulded part as well as the attached runner is removed.

The present experimental work done to investigate and optimize the critical parameters in Injection Moulding (IM). The main factors include Melting Temperature, Injection Pressure, Cooling Time and Injection Speed with a formal application of DOE. The material used in this work is LLDE + Flyash. The material is choose because it has good strength, high impact-resistance, optical clarity and good electrical insulator. The property of LLDPE is to undergo large plastic deformations with-out cracking or breaking makes it different from most thermoplastics. Fig.1 shows Injection Moulding Machine Processing the mould.

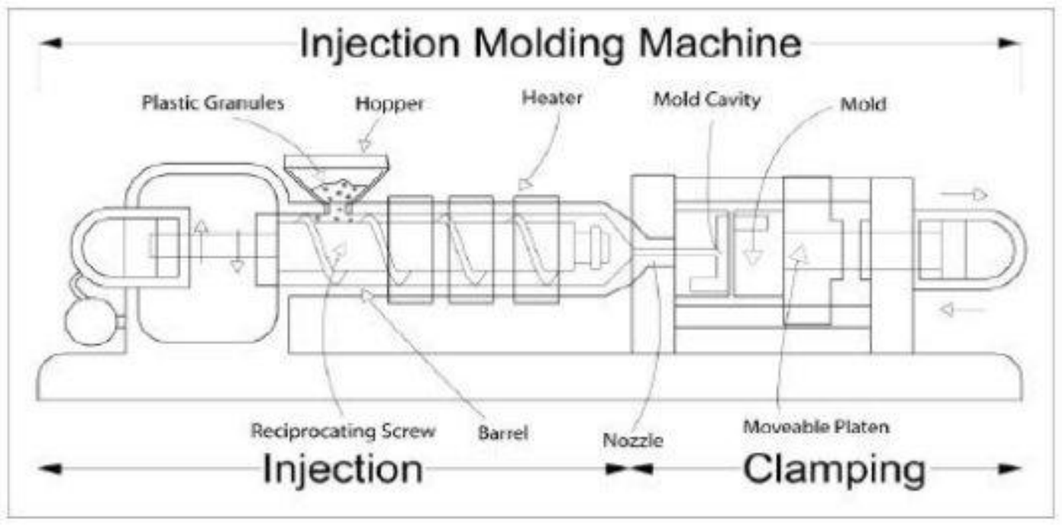

Fig. 1: Schematic view of Injection Moulding Machine.

Experimental Investigation and Optimizing of Parameters on Injection Moulding Process with LLDPE Reinforced Fly ash using Taguchi

B. Sudheer Reddy[1], K. Arun[2], Dr. M. Chandra Sekhara Reddy[3], B.Narayana Reddy[4]
[1]PG Scholar, Dept. Mechanical Engineering, SVCE, Tirupati, India, sudheerb121@gmail.com
[2]Assistant Professor, Dept. Mechanical Engineering, SVCE, Tirupati, India,
[3]Professor, Dept. Mechanical Engineering, SVCE Tirupati, India,
[4]Research Scholar, Dept. Mechanical Engineering, SVUCE, Tirupati, India,

ABSTRACT
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Keywords: LLDPE, Fly Ash, Injection moulding, Impact Strength, DOE, Taguchi, ANOVA.

I. INTRODUCTION

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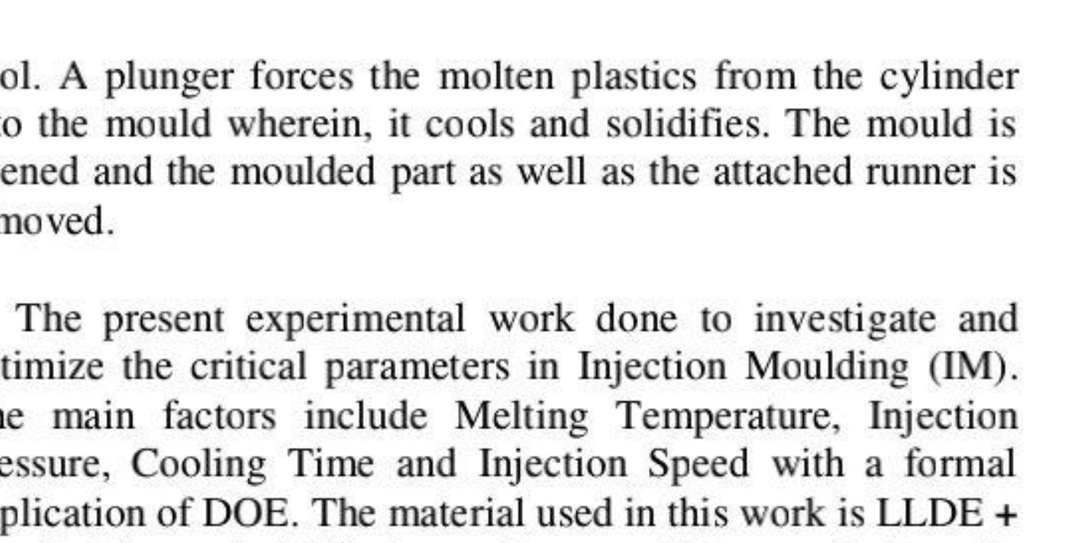

Fig.1 Schematic view of Injection Moulding Machine.

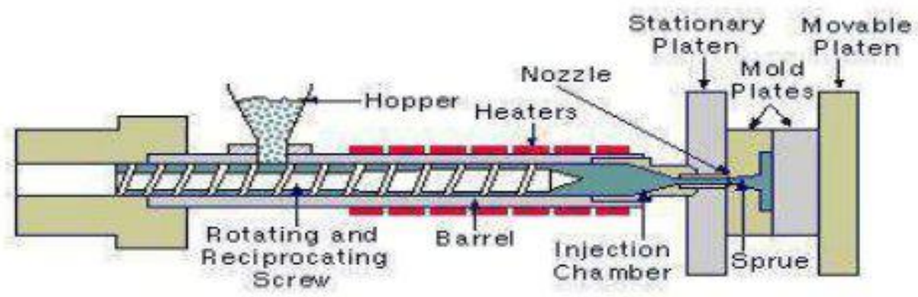

Fig2: Injection Moulding Machine in Operation

Validation of the Mobile Phone Addiction among Under-graduate Students Using SAS

Chand Badshah S B V J[#1], U.Babu*[1], K.Arun[#2], M.Gopala Krishna*[2], M. Peeraiah[#3]

[#1]Assistant Professor, Department of M.E, AITS, Tirupati, Andhra Pradesh, India.
[*1]Assistant Professor, Department of M.E, AITS, Tirupati, Andhra Pradesh, India
[#2]Assistant Professor, Department of M.E, SVCE, Tirupati, Andhra Pradesh, India.
[*2]Assistant Professor, Department of M.E, SVCE, Tirupati, Andhra Pradesh, India.
[#3]Assistant Professor, Department of M.E, SVCE, Tirupati, Andhra Pradesh, India.
[1]chandbadshah36@gmail.com,[1] babu.uppalapati@gmail.com,[2] arunk4u@gmail.com,
[2] gopala523@gmail.com, [3]shreepeeru@gmail.com

***Abstract* — We explored the factors influencing mobile phone addiction in under-graduate students. This investigation is based on age, gender, social status, monthly income and hours of daily phone use time, sending and receiving text messages on weekends, monthly call charges ,internet usage, Wi-Fi usage, media specific factors, social networking, performance in academics etc. To collect data, questionnaire probing mobile phone addiction consisting of several factors were distributed among students. The data were analyzed using the SAS Enterprise guide (ANOVA). The findings are divided as heavy users, average users and light users. There was a statistical difference between females and males were found. These scales were applied for 527 students who are from different Departments of AITS, Tirupati. We found that cell phone use appears to be a sedentary leisure behavior and inserts loneliness.**

Keywords—ANOVA, Under-graduate students, Addiction, Mobile phone, SAS.

I. INTRODUCTION

Communal areas providing Wi-Fi service within universities enable individuals to access to the Internet via smart phones, PDAs and iPods as well as desktops which in turn influences the use of the Internet both negatively and positively[1]. Especially the students studying at departments related to computers and informatics are exposed to the Internet as the departments by nature require doing so and therefore these students are more likely to turn into problematic Internet users.

The order of smart phone addiction indices were as follows: overuse of smart phone, the technological dimension, the psychological-social dimension, preoccupation with smart phones, and the health dimension [6]. Significant gender differences were found in the degree of addiction on the whole questionnaire and all of its dimensions with the exception of the technological dimension in favor of males. Significant differences by social status were found in favor of the unmarried. Bachelor degree students were found to have the highest degree of addiction. Significant differences by hours of daily use were also detected in favor of participants using the smart phone for more than 4 h a day. As to the monthly income dimension, significant differences were found on the health dimension in favor of participants with lower monthly income.

Cell phones are now almost indispensable in our daily life, but the results of our experiment suggest that cell phone use makes pedestrians inattentive to hazards and increases the risk of traffic accidents and possible casualties in railway stations [3]. Talking on a hand-held cell phone while driving an automobile is banned by traffic law in Japan. We may need some kind of prohibition or restriction on walking while using a cell phone in railway stations and busy streets.

The attitudes regarding the mobile phone usage has displayed no differentiation in any sub dimension according to age. Students with high income levels find the mobile phone more beneficial in daily life compared to students with low income levels [7]. Students with high academic success levels know the rules regarding the mobile phone usage better compared to students with low levels of academic success. It has been determined that students who possess mobile phones show more interest in them and know the rules regarding their usage better compared to ones who don't. However, students who don't have mobile phones have indicated that mobile phones are harmful more strongly compared to students who have mobile phones.

Expectedly the traditional calling and use of SMS were the most heavily used features, and were used on a daily basis [9]. These were followed by the calendar feature, which was used by more than half of the respondents on a daily basis. The features Internet, music, notes, and calculator experienced medium usage meaning that half or most respondents used the features 2–3 times a week. All other features (E-mail, pictures, camera + video, games, and MMS) had a lighter usage than this. There were gender differences in the usage of the features as well. Female users were significantly heavier users of calendar, Internet, music, and E-mail.

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The Mechanical / Chemical Properties / SEM Analysis of Natural Reinforced Hybrid Composites

[1] Dr. H. Raghavendra Rao [2] Mr. A. Vamsi Krishna, Dr. Y. Hari Prasada Reddy
[1] Associate Professor, [2] Assistant Professor, [3] Professor
[1][2] Dept of ME, GPREC, Kurnool, [2] Dept of ME, AITS, Tirupathi

Abstract: **The chemical, impact, tensile properties of Bamboo/Grass/Onion fibres reinforced polyester hybrid composites were studied. The effect of alkali treatment for Bamboo/Grass/Onion fibres on these properties was also studied. It was absorbed that tensile properties of hybrid composites increase with bamboo fibre content. These properties found to be higher when alkaline treated bamboo fibres were used in the hybrid composites. The elimination of amorphous hemi – cellulose with alkali treated leading to higher crystallinity of the bamboo fibres with alkali treatment may be responsible for these observations. The effect of alkali treatment on the bonding between Bamboo/Grass/Onion fibres was also studied. The chemical resistance of Bamboo/Grass/Onion reinforced polyester composites to acetic acid, nitric acid, hydrochloric acid, sodium hydroxide, sodium carbonate, benzene, toluene, carbon tetrachloride and water was studied. The bonding between fibres and matrix was studied by metallographic (Scanning Electron Microscope) analysis.**

***Key Words*— Bamboo Fiber, Grass Fiber, Chemical Resistance, Polyester, Tensile Strength, Impact Strength.**

1. INTRODUCTION

Several studies on the composites made from different matrices and natural fibres like Bamboo, Grass, Banana for bugass were reported in the literature. Jindal [1] reported the development of Bamboo fiber reinforced plastic composites using araldite (CIBA CY 230) resin as matrix. Though, Bamboo is extensively used as a valuable material from times immemorial. The studies on this fiber reinforced plastics are meager. In this present work Bamboo, Onion and Grass fiber reinforced high performance polyester hybrid composites were developed and their tensile, impact and chemical properties were studied (with varying ratio of Bamboo / Grass / Onion fiber). The author also investigated the chemical properties of these fibres.

2. MATERIALS AND METHODS

High performance polyester resign and the curing agent hardener HY 951 system were used as the matrix. Bamboo fibers / Grass fiber / Onion fiber were soaked in 1% NAOH solution for 30 Minutes to remove any greasy material and hemicelluloses, washed thoroughly in distilled water and dried under the sun for one week.

2.1 Preparation of Mould

For making a composite, a moulding box was prepared with glass of 200mm x 200mm x 3mm (Length x Width x Thickness).

Preparation of Composite and the Test Specimens: the mould was coated with a thin layer of aqueous solution of Poly Vinyl Alcohol (PVA) which acts as a releasing agent. Further a thin coating of hard wax was layed over it and finally another thin layer of PVA as coated. Each coat was allowed to dry for 20 min in at r00m temperature. Then, the moulding was loaded with the matrix mixture, Bamboo, grass & Onion in random orientation (with varying percentage) and was placed in a vacuum oven which is maintained at 1000 for three hours to complete curing. After curing the plate was removed from the moulding box. With simple tapering and it was cut into samples for impact test with dimensions 120mm X 13 mm x 3mm are cut ASTM specifications. For tensile stress the sample was prepared 150 x 20x 3. And for chemical test with dimension 10mm x 5mm x 5mm. for comparison sake the specimen for matrix are also prepared in similar lines.

2.2 Tensile and Impact Load Measurement

The tensile strength was determined using instron 3367 model UTM. The cross head speed for tensile test was maintained at 10mm/min. The temperature and humidity for this test were maintained at 180 and 25% respectively. In each case five samples were tested and average values are reported.

The impact strength is determined using IZOD impact tester. The test specimens with dimensions 120mm × 13mm × 3 mm are cut as per ASTM D 256-88 specifications. In each case five specimens are tested and average value is recorded.

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Testing and Analysis of TIG Welded Pipe Joints Made of Stainless Steel 304 L: A Review

Sandeep K[1], Chandbadshah S B V J[2]
[1]Asst Professor, Department of MECH, AITS, Tirupati, INDIA.
[2]Asst Professor, Department of MECH, AITS, Tirupati, INDIA.

Abstract: This work aims at the analysis and testing of TIG welded pipe joints made of stainless steel 304L. The mechanical properties and microstructure of 304L stainless steel welds are tested, by using stainless steel filler material. Some Special pipe inspection tests also carried out on the material when it is going to be used in aggressive environments. These tests will ensure that pipe material is able to withstand in such aggressive environments also. Some of the tests are Grain size (AS & SS), IGC- Intergranular Corrosion Test (SS), Hardness Test. The tensile test is done to check yield and ultimate tensile strength of the pipe. Impact test / Charpy V-Notch test, check the ability of material to withstand under low-temperature conditions. Creep test is done to check long term effect of temperature under constant load. Ultrasonic testing of defects was conducted to determine the welding defects more accurately and to know whether any other flaw exists in the welded specimens. Analyzing all the data obtained by conducting tests on pipe joints, we can say that ultimate tensile strength of the joint was improved.

Keywords: TIG, Stainless steel, Review, Pipe Joints, Welding, Analysis

I. INTRODUCTION

Welding process is an important domain of activity of to-day industry, especially in the sector where a lot of assembly of structures has to be done. Generally, the initial design of industrial parts requires revisions, because unpredictable changes occur in the shape or the performance of a component when it is welded because its metallurgical structure was modified by the process. The re-design is very costly since that happen late in the development [1, 2, 4] cycle of the product. It is now possible to avoid this by anticipating the undesirable effects of the manufacturing process early in the design stage, by using numerical simulation, numerical optimization and AI tools. This shows how much virtual welding process can be important in the development of a new component.

Welding is a well-established joining technique. When assessing the structural integrity of a welded pipe, all sources of loading which may increase the risk of failure should be considered. In the offshore industry, pipelines could experience displacement controlled loading during pipe installation or operation. Depending on the installation process, the pipeline can experience different levels of primary load. One method of pipeline installation is reeling which causes high plastic strains (due to bending cycles) in pipelines. For reeled pipes, fatigue and fracture assessments, referred to as Engineering Critical Assessment (ECA) should be carried out to ensure their structural integrity [3].

Austenitic stainless steels (SSs) are engineering alloys with good corrosion resistance in environments containing various compounds of sulphur, normally experienced in refinery process streams [5]. However, austenitic stainless steels are susceptible to stress corrosion cracking (SCC) under certain conditions involving high stress, changes in metallurgical structure due to high temperature operation, and the presence of specific chemicals that promote cracking. The chemicals present in refinery streams known to induce SCC in these alloys are chlorides and polythionic acids [1].

However, recent reported failures and research of annealed austenitic stainless steels under sour gas conditions with insignificant amount of chlorides suggested the contribution of H2S in promoting SCC [2–6]. Cracking is derived from either H2S enhanced hydrogen absorption or H2S enhanced breakdown of the passive film by synergistic action between H2S and Cl−. Due to the H2S/Cl− synergism, the presence of H2S extends the environmental domain of Cl− SCC to lower temperatures and lower Cl− concentrations [7]. Traditionally austenitic stainless steels are joined with welding electrodes that contain 5–10% residual δ-ferrite in the interdendritic boundaries. This retained metastable ferrite phase is believed to be influential

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Simulation of In-cylinder flowin Direct-Injection Diesel engine through CFD

Balaji M[1], Hema Chandra Reddy K[2], Bhanu Priya K [3]

Research Scholar, Department of Mechanical Engineering, JNTU Anantapur, AP, India[1]

Professor, Department of Mechanical Engineering, JNTU Anantapuramu, AP, India[2]

Research Scholar, Department of Mechanical Engineering, JNTU Anantapur, AP, India[3]

ABSTRACT: Internal combustion engines in now a days is the best available reliable source of power for all domestic, large scale industrial and transportation applications. The major issue arises all the efficiency of these engines. Every attempt made to improve these engines tends to attain the maximum efficiency.The study is about the effects of air swirl in the cylinder on its performance.The performances of the diesel engines are enhanced by proper design of inlet manifold, exhaust manifold, combustion chamber, piston etc. The study is about the effect of piston configurations on in- cylinder flow.By changing the piston crown design the enhancement in the turbulence inside the cylinder is achieved. Also grooves are made to achieve the increase in the swirl intensity for better mixing of fuel and air.Swirl Velocities in the charge can be substantially increased during compression by suitable design of the piston. In the present work, a study on the effect of different piston configuration on air motion and turbulence inside the cylinder of a Direct Injection (DI) diesel is carried out using Computational Fluid Dynamics (CFD) code Star CCM+.

KEYWORDS: CFD, inlet manifold, piston configurations, swirl ratio**,** Turbulence kinetic energy; Turbulence intensity.

I. INTRODUCTION

As engines have evolved over the years, pistons have evolved with them. They're getting shorter and lighter, and use smaller skirts — the cylindrical "body" of the piston. Newer pistons are often made of aluminum alloys comprised of more silicon than in the past. This improves resistance to heat and reduces thermal expansion.

One of the biggest advancements in piston technology is the use of different piston "tops" or "crowns," the part that enters the combustion chamber and is subjected to combustion. While older piston tops were mostly flat, many now feature bowls on top that have different effects on the combustion process. The piston bowl is primarily used in diesel engines. Diesels don't have an ignition phase, so the piston crown itself may form the combustion chamber. These engines often use pistons with differently shaped crowns, although with direct injection becoming increasingly popular, gasoline engines are starting to use them as well.

The shape of the piston bowl controls the movement of air and fuel as the piston comes up for the compression stroke (before the mix is ignited and the piston is pushed downward.) The air and fuel swirl into a vortex inside the piston bowl before combustion (or compression) takes place, creating a better mixture.

By affecting the air/fuel mixture, you can achieve better and more efficient combustion, which leads to more power. The bowls have a variety of different shapes; some are also designed to optimize fuel economy. With direct injection becoming the hottest new technology for gasoline engines, expect uniquely-bowled pistons to become more and more popular. In high-speed direct-injection Diesel engines, the flow conditions inside the cylinder at the end of the compression stroke, near top dead center (TDC), are critical for the combustion process

These are determined by the air flowing into the cylinder through the intake valves during the induction process and by its evolution during the compression stroke.

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Reduction of Rejection in 26AH model battery by Using Variable Search DOE Methodology

[1] K. Madhu sudana, [2] D.Kanakaraja, [3] Venkatamuni .K
[1] Student Master of Production Engineering and Engineering Design, AITS-Tirupathi
[2] Professor Dept. of Mechanical Engineering, AITS-Tirupathi
[3] Deputy Manger IE projects, Amara Raja Batteries Ltd.

***Abstract*:-- One of the company who is pioneer in VRLA battery in Asian Pacific Rim has foray into automotive batteries with its new brand addressing automobile segment launched across country by opening many franchises & pit stops covering all metros, major cities and urban towns. Batteries are one of the major components manufactured in the industry. Battery is also called SLI (Starting-lighting-ignition). In order to satisfy the customer needs the battery should be made defect free at the industry itself. This cell short will lead to a large problem, if not rejected in the industry itself.**

This project is on the account of Reduction of rejections in the Formation process of battery that are useful for the customers which is vital battery functioning results in Providing the Maximum Output without any obstruction of power to the customers. Historical data collection found that Cell Shorts Mode of rejections is more in the 26 AH battery model by Brain Storming and DOE Approach Identified the Root cause for the rejections and solved the issue so that this analysis is also used to reduce the rejections in the other similar models and this leads to more customer satisfaction and cost reduction to the company with the results of the six sigma Methodology, Analyzed the Problem generating stage in Pasting section and Parameters affecting to create problem by Six sigma tools application and implemented the solution. These results in reduction of Cell shorts in battery and by this project Cost saving and Customer satisfaction is improved

Key words: **Six sigma, DMAIC, DOE, Variable search, Suspected Source of Variation (SSV's).**

I. INTRODUCTION

1.1 What is Six Sigma methodology:

1. The methodology which are going to discuss is specially focused one eliminating wastes in the manufacturing processes papers and books have been published addressing the fundamentals of Six Sigma .Topics include: What is Six Sigma? (Harry and Schroeder, 1999); Why do we need Six Sigma? (Pande et al., 2000); what makes Six Sigma different from other quality initiatives? Six Sigma deployment (Keller, 2001); critical success factors of Six Sigma implementation (Treichler, 2005); hurdles in Six Sigma implementation (Gijon and Rao, 2005); and Six Sigma.

2. Six sigma helps in eliminating the waste Sigma (σ) represents variation in the process With respect mean (average line). Six Sigma is a data-driven approach to process improvement .Objective of this methodology is to achieve zero defect by reducing variation. Six Sigma was first time developed & introduced by Sir Bill Smith in Motorola in1987. Organizations world over has implemented Six Sigma successfully for more than 20 years with the aim of continuously improving the process. Six Sigma continues to be the best-known approach to process improvement (Taghizadegan, 2006). Six Sigma was introduced in manufacturing processes; today, however, marketing, purchasing, billing, invoicing, etc., functions are also implementing Six Sigma methodology. Implementation of Six Sigma methodology is having a significant impact on profitability and customer satisfaction of the organization, if successfully deployed (Breyfogle, 1999). It takes users away from 'intuition-based decisions' to 'fact-based decisions' (Breyfogle, 1999). A number of in manufacturing process by two methods.

a. Problem solving:

This helps in reducing scrap ,rework and customer complaints.

b. Existing process optimization:

This help's in increasing the productivity and also helps in fixing the correct

2.1 Types of problems:

After selecting the culprit area, now it is decided that which problem is to be killed as per cause and solution of the problem. Some problem becomes chronic because management issues, lack of technology, lack of awareness or lack of facilities. So Problems in any organization are found basically in four categories as shown in fig. Priority is to be given to each category as shown in figure to kill the problem..

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Reduction of Post Burning Blow holes by using Shainin Techniques in Automotive Batteries

[1] C. Jay Shyam, [2] Dr. Y. Hariprasada Reddy, [3] Venkatamuni
[1] Student Master of Production Engineering and Engineering Design
[2] Professor Dept. of Mechanical Engineering
[1][2] AITS-Tirupathi
[3] Deputy Manger IE projects, Amara Raja Batteries Ltd

Abstract:-- **:- Battery is one of the vital components used in automobiles. The main purpose of battery is to start the engine, to run the light system and other sound systems like music, horn etc. Once the engine is ignited and starts running, power for electrical system of the automobile will be supplied by alternator. Modern automobiles batteries are lead acid type using six cells connected in series so as to obtain 12 volts system. Keeping in view the vital role of a battery in an automobile, the battery should be made with high quality, durability and defect free. However, defective batteries would be rejected at quality check (QC) phase in the manufacturing industry. These rejections at QC should not be more, as it may reduce the productivity. The company should identify the root cause for such defects, which are responsible to brand battery as defective and also a rejection.**

Index Terms: Shainin tools, Product/Process search, Variable search, Suspected source of variation SSV's).

1. INTRODUCTION

The demand placed on an organization in today's global business environment are driven by customer satisfaction as well as the fulfillment of expectation of the stakeholders regarding cost reduction Improving business performance and maintaining a competitive advantage. Dorian Shainin, was an influential American quality consultant, aeronautics engineer, author, and college professor who was named an Honorary member in 1996, worked more than 60 years to improve the professional approach to industrial problem solving. He is best known for the "Shainin techniques," practical tools he developed to help manufacturers solve problems, including problems that had been considered unsolvable.

2. SHAININ TECHNIQUES

The Shainin methods are essentially known to produce leap forward upgrades in eliminating chronic quality issues. These are profoundly successful in pinpointing towards the underlying driver and approving .In order to know the complete information of the project each and every accept should be clearly studied. Post burner is a fully automatic burning machine designed to weld the cylindrical bushing of automotive battery to a qualified depth of burn, after battery has finished the container and cover .When the machine's contact detection system determines that the optimum parameters have been met the post burning is initiated. If the blow holes are seen on the battery post then the battery is rejected and the failure is reported on the operator control machine is designed for joining post and the container on lead acid batteries. Shainin introduced several no of power full tools. Among those powerful tools, he considered Design of Experiments as the centre piece among those powerful tools, he considered Design of Experiments as the centerpiece. Shainin DOE basically works at eliminating suspected process variables (Xs) mostly by using seven different tools:

1. Multivari Analysis.
2. Variable Search.
3. Paired Comparison.
4. Component Search
5. Product/Process search.
6. Full Factorials.
7. B vs. C (Better vs Current) Analysis.
8. Scatter Plots or Realistic Tolerance Parallelogram Plots.

2.1 Product/Process Search:

SSV's related to the process parameters or input materials which can be measured in both good and bad parts, 'Product process search DOE tools used Examples Temperature

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Production Improvement by Reducing Down Time Using Root Cause Analysis

[1] P.Mahidhar, [2] P.C.Prakash
[1] P.G Student, [2] Assistant Professor
[1][2] Department of Mechanical Engineering, Annamacharya Institute of Technology, Tirupathi,

***Abstract*:-- :- Now a days manufacturing industries are facing a greater competition in the market. Because of this, they try to improve and increase both quality and productivity continuously. One way to increase the productivity is to increase the availability of existing machines. The manufacturing companies are facing the problem of loss of productivity due to break downs in assembly lines. Reduction in idle time is direct way to increase the productivity and profit. The main objective of the project is to increase the availability of a machine and to reduce the down time of a machine, to maximize production capacity and to improve new preventive maintenance schedule. The reason for the break down has been analyzed and inspected by the method of Fish bone diagram and why-why analysis, this in turn helped to develop and improve a new preventive maintenance checklist for the machine. This project work is aiming at reducing idle time that is breakdown by increasing availability and maintenance. This has been achieved by optimal utilization of time maintenance, inspection frequency by considering manufacturer recommendation and previous experience. By all these procedures the availability of the machine will increase to a certain extent and also increases the production capacity, minimizes the maintenance cost and reduces the downtime.**

I. INTRODUCTION

The demand placed for an organization in today's environment is to satisfy the customer needs and satisfaction, Assembly is the place where key equipments in the manufacturing process will be operated. Production, Productivity of assembly line is vitally determining the output of the plant. Each and every down hours of assembly line leads to heavy production loss. So, the project had taken Reduction of down hours of the equipments. Bath tub curve analysis describes the variation of failure rate of components during their life time.

The item population after having been built in reaches its lowest failure rate levels, which is normally characterized by a relatively constant failure rate, accompanied by negligible or gradual changes due to wear. This period is characterized mainly by occurrence of stress related failures during its normal operation.

Types of maintenance:

Generally maintenance is of following types,

A. Preventive maintenance
B. Breakdown maintenance
C. Corrective maintenance
D. Fixed time maintenance
E. Condition based maintenance
F. Maintenance fore casting

A. Preventive maintenance:

Preventive maintenance is taking of equipment at planned intervals. These intervals are decided mainly keeping in view the complexity of the machine and its load condition. In this Preventive maintenance, duly time scheduled and replacement of overly worn out parts on the part of machine, the preventive maintenance is also called planned maintenance or scheduled maintenance. It is extremely important function for reduction of maintenance cost and to keep the good operational condition of the equipment amiability, preventive maintenance aims to locate the sources of problem or troubles and to remove them before breakdown occurs .it is based on the idea of "prevention is better than cure".

B. Breakdown maintenance:

In break down maintenance, defects are rectified only when the machine cannot perform its function any longer .After the repairing of equipment the maintenance engineer do not attend the equipment Until another failure occurs. There is no element of planning for this type of maintenance. Till the break down comes maintenance becomes no one's job, but once it occurs its becomes everyone job.

C. Corrective maintenance:

Corrective maintenance arises not only when the equipment fails but also when indicated condition based criteria. The basic task is establishment of the most economical way of restoring the equipment to an acceptable condition. Because

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Parametric Optimization of Lathe Turning for Al-7075 Alloy Using Taguchi: An Experimental Study

Dr. G. Bhanodaya Reddy[1], J. Venumurali[1,*], Y.Sankara[2], G. Sivaramudu[2]
[1]*Department of Mechanical Engineering, Sri Venkateswara University, Tirupati, India*
[2]*Department of Mechanical Engineering, G. M. R. Polytechnic College, Srisailam, India*

Abstract: *Turning is a machining process in which a cutting tool, commonly a non-rotary tool bit, exhibits a helical path on work piece material. The conventional metal removal process always influenced by the parameters such as, material machinability, cutting tool material, cutting speed and spindle speed, depth of cut, feed rate, tool geometry, and coolant. Optimizing these parameters is a daedal thing so that, Signal to noise (S/N), Analysis of variance (ANOVA) and Taguchi method using statistical software MINITAB are striving to solve these problems in the present scenario. The present paper is aimed at investigating parametric optimization of turning of 7075 Aluminium alloy using Taguchi L_{27} orthogonal array was employed for both Design of Experiment (DOE) and Signal to noise ratio (S/N) to analyze the effects of the selected parameters. The result demonstrates there are different effects of cutting parameters on cutting force, surface roughness and temperature for two samples and compared the samples. Furthermore, surface morphology of the machined specimen is obtained through SEM analysis. This work can be use full to determine the optimum cutting parameters for better machinability.*

Keywords: *Al-7075 alloy, DOE, Optimization, Parameters, Taguchi method, S/N Ratio*

I. Introduction

Turning is a form of machining, which is used to create rotational parts by cutting away unwanted material. Turning is used to produce rotational, typically axi-symmetric, parts that have many features. In turning, the speed and motion of the cutting tool is specified through several parameters. These parameters are selected for each operation based on the work piece material, tool material, tool size, and more. There are several optimization techniques in order to determine optimum parameters for better machining such as, Box-Behnken design, ANOVA, RSM, Taguchi, Regression analysis, FFD, Grey relational analysis, Factorial DOE., etc.

Taguchi method and the Response Surface Methodologies (RSM) were used for reducing the burr height and irregularity in the surface in hole making operation of Al-7075, research carried out by Kilickap et al. [1]., more over they considered Taguchi as a powerful tool to optimize design quality and used to find out optimal cutting parameters. Authors also reported that, the combination of low cutting speed, low feed rate and high point angle were mandatory to overcome burr height, finally lower cutting speeds and feed rates yielded best outcomes of surface roughness at higher point angles.

Wang and Lan [2] considered four parameters as cutting speed, depth of cut, feed and tool nose radius. Theses parameters used for optimizing three responses such as surface roughness, tool wear and material removal rate (MRR) in precision turning on an ECOCA-3807 CNC lathe by using Orthogonal array of Taguchi paired with the Grey Relational Analysis (GRA). They made analysis on optimization approaches using orthogonal array and GRA and aided a satisfactory technique for improving the multiple machining performances in precision CNC turning.

Taguchi and RSM were used for reducing the surface roughness in turning of Discontinuously Reinforced Aluminum Composite (DRAC), composite made with Al-6061 as matrix and 15 vol.% of SiCp of mean diameter 25 µm via pressurized steam jet approach by Shetty et al. [3]. They also reported that, the effect of cutting parameters on surface roughness was evaluated and determined optimum cutting condition to minimize the surface roughness.

Sahin [4] has chosen cutting speed, feed rate and tool hardness as cutting parameters and compared the tool life of Cubic Boron Nitrate (CBN) and Ceramic inserts in turning hard steel using Taguchi method, more over determined the effect of cutting parameters on tool life using orthogonal array, signal to noise ratio and variance analysis.

In this work, turning operation performed on Al-7075 alloy by using High Speed Steel (HSS) cutting tool. Cutting force, surface roughness and temperature are considered as responses, optimization of process parameters are carried out using Taguchi, and developed design matrix for two samples, and done comparisons. Scanning Electron Microscopy (SEM) also performed simply to show surface morphology.

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Optimization of MIG Welding Process Parameters on AISI 304 Stainless Steel Using Taguchi Method and Fuzzy Logic

S. Vani [1], J. Venumurali [1], N. Swapna [1], B. Prasad kumar [1]
[1]*Depatment of Mechanical Engineering, S. V. University, Tirupati, India*

Abstract: ***The present paper tells about how to predict and optimize the Metal Inert Gas (MIG) welding of AISI 304 Stainless Steel (AISI 304 SS) work pieces, which are most widely in used in many industrial applications. The powerful tool known as Design of Experiments (DOE) was used to optimize the welding process parameters for effective welding joint of the work pieces. The following welding voltage, welding current and welding speed were considered as input parameters and similarly tensile strength, percentage of elongation, and hardness were considered as performance characteristics for DOE application. The values after experimental measurements, compared with corresponding predicted results of tensile strength, percentage of elongation, and hardness. Moreover, the Taguchi Method was also used for DOE and considered*** L_{27} ***orthogonal array matrix and Signal-to-Noise Ratio, the tensile strength, percentage of elongation, and hardness of the predicted values have been creditably acquired via Fuzzy representation.***

Keywords*: AISI 304 SS, MIG welding, DOE, Tensile Strength, Percentage of elongation, Hardness, Fuzzy logic*

I. INTRODUCTION

Gas metal arc welding (GMAW), sometimes referred to by one of its subtypes metal inert gas (MIG) welding, is a welding process in which an electric arc forms between a consumable wire electrode and the work piece metals, which heats the work piece metals, causing them to melt and join. Originally developed for welding of aluminum and other non-ferrous materials in the 1940s, it was soon applied to steels because it provides faster welding time compared to other welding process.

Aghakhani et al. [1] have carried out research on optimization of gas metal arc welding process parameters to enhance quality and productivity of weld ment. They have chosen ST-37 steel plate as work piece, 80% argon combination with 20% CO_2 as shield gas depends on type of base metal being welded. The experiment was designed by Taguchi with L_{27} orthogonal array and it was carried out by Analysis of Variance (ANOVA) by considering weld dilution as output characteristic and wire feed rate, welding voltage, nozzle to plate distance, welding speed, and gas flow rate were as the input parameters. They reported that, the wire feed rate has no much significant effect on the weld dilution while gas flow has no effect at all on it. In another research made by Ajithooda *et al*. [2], AISI 1040 medium carbon steel was used for welding, output characteristic tensile strength was predicted with response surface model. The welding voltage, current, wires speed and gas flow rate were kept as input parameters. Tensile strengths in transverse and in longitudinal were almost same with input parameters explored by face centered design matrix.

Optimization of process parameters in MIG welding of dissimilar metals such as AISI SS with grade 304 and 316 have been studied, Artificial Neural Network (ANN) and Genitic Algorithm (GA) were used to predict tensile strength and the ANN was successfully integrated as other regression model by Amit kumar *et al*. [3]. Arya *et al*. [4] reported that, the optimization of tensile strength and higher penetration of filler metal was prosperously analyzed by Taguchi method followed by grey relational analysis, after completion of MIG welding with its process parameters. The weld ability of MIG welded EN-3A mild steel specimens have been studied to see the influence of process parameters on depth of penetration of welding joint. They were analyzed this issue with help of surface plots, reported by Das *et al*. [5]. Parametric optimization of MIG welded 316L Austenitic stainless steel was studied by Taguchi method. The optimal parameters were identified for maximum tensile strength and percent of elongation in case when Butt welded joints have been made by several levels of current, gas flow rate, and nozzle to plate distance by Ghosh et al. [6].

Kapil et al. [7] carried out research to identify the factors that have most significant effect on welding of AISI 316 Austenitic stain less steel and its welding quality and productivity. Moreover, other mechanical properties such as tensile strength and hardness were assessed with DOE and optimized process parameters using Taguchi technique. Similarly, two different materials like AISI 304 steel and low carbon steel were used for MIG welding with CO_2 as shielding gas. They kept tensile strength and hardness as performance characteristics and current, voltage, and flow rate of welding as input parameters. The experiment was designed with

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Experimental Investigation on Wear Rate of Al6061/SiC/Zr Hybrid Metal Matrix Composite

[1] Rajasekhar Sivapuram, [2] Hariprasada Reddy Yedula
[1] Department of Mechanical Engineering, Kallam Haranadha Reddy Institute of Technology, Guntur-522019, Andhra Pradesh.
[2] Professor of Mechanical Engineering, Annamacharya Institute of Technology and Sciences Tirupati - 517520, Andhra Pradesh.

***Abstract:*-- The emphasis of recent research works in the area of composite materials has been more on improving mechanical properties like tensile strength, micro hardness and wear resistance, fatigue properties etc. The reason is that the desired mechanical properties were not obtained by the ordinary engineering materials. In the present days, significant demand for materials with good wear resistance has been there in automotive, aerospace and military applications. In the present research work, the wear rate of Al6061/SiC metal matrix composite (MMC) has been enhanced by reinforcing Zirconium (Zr) particles to the molten Al6061/SiC metal matrix composites (MMC) by stir casting technique. The wear rate was tested using pin on disk wear tester. An effort has been made to blend 2% of Zr with Al6061 alloy by varying Sic in 10, 15 and 20%. The wear resistance of Al6061/SiC has been improved significantly due to the uniform distribution of Zr particles in the matrix.**

Key words: **Al 6061, SiC, stir casting, wear resistance, Zr particles.**

I. INTRODUCTION

The ceramic particle reinforcement has played an important role while improving the properties of the metal matrix. Matrix materials are usually light in weight and shown good results when combining with ceramic particles [1, 2]. The reinforcing ceramic particles are uniformly distributed in the matrix for improving the mechanical properties like strength, stiffness, micro hardness, wear resistance, creep and fatigue properties etc. MMCs are strengthening by reinforcing the ceramic particles to the matrix during the molten state. The in situ stir casting techniques have been best practice to the uniform distribution of particles in to the metals and also provide the information for thermal stability of the metal matrix. Al 6061 alloy has become strongest metal to improve the mechanical properties of the materials by reinforcing the ceramic particles. The ceramic particles have been used in the form of particles, fibers and whiskers. The metals are strengthening by wear rate phenomenon. Among all the ceramic particles SiC [3,4], Zr are the best practice to reinforcing in to the MMCs due to their high hardness, strength, fatigue, wear resistance to the materials. Devaraju Aruri [5] investigates, the influence of rotational speed on wear properties of the aluminium alloy based surface hybrid composites [(SiC+Gr) and (SiC+Al_2O_3)]. It was observed that high wear rate was finding in the composite due to the presence of SiC and Gr acted as a loading bearing elements. Serajul haque [6] was conducted the experiment to found out the optimum values of wear rates on Al6061-Cu reinforced SiC_p. The optimum values are observed with varying the stirring speed, and pouring temperature as process parameters. S.Nallusamy [7] has made an effort to analysis the wear resistance of metal matrix composites. It was observed that in addition of Al_2O_3 and SiC to Al6061 alloy decreases the range of wear rate.

However, previously no results were found to report on wear resistance of Al6061 alloy by the addition of sic and Zr particles. The main aim of this paper is to investigate the influence of Zr particles on wear rate performance of Al6061/SiC [8, 9] metal matrix composite.

II. EXPERIMENTAL DETAILS

Materials used

The matrix material used in this experimental investigation is al6061. The reinforcing materials are selected as SiC particle as 10, 15, 20% and 2 % of Zr particles. Al alloy was taken in to the stir casting furnace in the graphite crucible. The furnace was initially at the temperature of 650^0C. The temperature of the furnace was raised to 950^0c simultaneously sic and Zr particles were preheated to 450^0C and then added in to the crucible. After adding the ceramic particles the temperature of the casting was raised to 1060^0C and stirring mechanism was adopted by graphite rod before the casting temperature was reached to 1080^0C. For trapping the hydrogen gas during the process the argon was supplied

A Comparative Analysis on Energy Absorption Capabilities of Epoxy E-Glass and Epoxy Carbon Fibres

RAJASEKHAR SIVAPURAM[*], HARI PRASADA REDDY YEDULA[**], CHNADRA MOHANA REDDY BAGGIDI[***]

[*](Department of Mechanical Engineering, QIS College of Engineering & Technology, Ongole-523272, Andhra Pradesh)

rajdme25@gmail.com

[**] (Professor of Mechanical Engineering, Annamacharya Institute of Technology & Science, Tirupati-517520, Andhra Pradesh)

prof.yhpr@gmail.com

*** (Department of Mechanical Engineering, JNTUA College of Engineering, Kalikiri-517234, Chittoor (Dist), Andhra Pradesh)

cmr_b.mech@jntua.ac.in

Abstract

In past few decades, many researchers have report on reducing impact on the passengers by making the automotive and aircraft structures become energy absorbing agents during the crash. Fibre composite materials have wide range applications than metals due to their light in weight, easy of fabrication and offer more strength while loading. Among all fibres glass and carbon fibres are effective for during loading for showing their strength, stiffness and specific energy absorption for given mass of material.In this present experimental investigation E-glass and carbon fibre composite tubes were taken to investigate the energy absorption properties composites. The fibres were manufactured by proper mixing of E-Glass and Carbon fibres with adding epoxy resin and k12 hardener by hand layup process.Quasi-static compressive loading has done on the composite tubes to determine the crash behavior of composite tubes. The results were shown that epoxy carbon fibers shown good results in 0.2% yield strength, tensile strength and more specific energy absorption capacities for a given mass of the material than glass fibre.

Key words: *E-Glass Fibre, Carbon Fibre, Epoxy Resin, K12 Hardener, Yield strength, Tensile Strength, Specific Energy Absorption Capacity.*

I. Introduction

Vehicles and aircraft structures design have become more challenging for designers to design structures during crash. The main concern on the structures is to produce high rate of energy absorption capabilities during the crash for reducing impact on the passengers. The one who is substitution for satisfying the crashworthiness characters are composite materials. Properties of the composite materials superior than ordinary materials due to their light in weight, easy of fabrication and offer more strength while loading.Moreover high design flexibility and wide variety of reinforcement types, orientation, various matrix materials and various manufacturing techniques for better improvement in mechanical properties.An important parameter for studying the energy absorption character is specific energy absorption; it is defined as the energy absorption during the crash per unit mass of the crushed material.

Melo,jose Daniel diniz [1] investigates the energy absorption properties of glass/polyester composites by taking the layups $[0/90]_n$ and $[+/- 45]_n$. the influence of cross section geometry,layup sequence and efficiency of trigger mechanism are examined. Overall the circular cross section of $[90]_n$ showed the highest energy absorption properties.javadmarzbanrad[2] reports on energy absorption properties of thin walled tubes with different geometric dimensions such as square,circular and elliptical tubes of steel and aluminium. The results declare among all sections elliptical crass section had more energy absorption and also increasing the thickness for smaller tubes had good energy absorption capabilities.oshkovar [3] made research on silky/epoxy composite square tubes for energy absorption and failure response. The more energy absorbed by the longest and thickest

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An Experimental Investigation towards Multi Objective Optimization during Hard Turning of Tool Steel Using a Novel MCDM Technique

R.K Suresh
Assistant Professor(Sr), Department of Mechanical Engineering
Sri Kalahasteeswara Institute of Technology, Srikalahasti, India.

G.Krishnaiah
Professor, Department of Mechanical Engineering
S.V.U College of Engineering S.V.University, Tirupati, India.

P.Venkataramaiah
Professor, Department of Mechanical Engineering
S.V.U College of Engineering S.V.University, Tirupati, India.

Abstract
Environmental and Ecological issues call for the reduction in usage of cutting fluids in metal cutting industry. New techniques are being inquired to achieve this objective. Hard turning with minimum quantity lubrication is one such technique which can alleviate the pollution problems associated with cutting fluids. In the present work, vegetable oil based cutting fluids like castor oil, palm oil and ground nut oil is made to drop at tool-work interface using over-head system. The present paper deals with experimental investigation carried out for machinability study of hardened AISI D3 steel in combination with CVD coated cemented carbide inserts of different styles and to obtain optimum process parameters using WASPAS method. An orthogonal array, overall performance index and analysis of variance (ANOVA) are applied to study the performance of process parameters such as insert style, cutting fluid cutting speed, feed and depth of cut with consideration of quality characteristics i.e., surface roughness, material removal rate, interface temperature, specific energy consumption and flank wear. Finally a clear presentation is made for WASPAS method.

Keywords: Hardened AISI D3 steel, CVD coated tool, Surface roughness, Material removal rate, interface temperature, Specific energy consumption, flank wear, ANOVA, Minimum quantity lubrication, WASPAS method.

INTRODUCTION

The important goal in the modern industries is to manufacture the product with lower cost and with high quality in short span of time. There are two main practical problems that engineers face in a manufacturing process, the first is to determine the product quality (meet technical specifications) and the second is to maximize manufacturing system performance using the available resources. The challenge of modern machining industry is mainly focused on achievement of high quality ,in terms of work piece dimensional accuracy, surface finish ,high production rate, less wear on the cutting tools ,economy of machining in terms of cost saving and increase the performance of the product with reduced environmental impact. The selection of cutting fluid not only improves cutting performance but also fulfils a number of requirements which are non-harmful to health for operators, not a fire hazard, no smoke (or) for and cost is less. Cutting fluids are applied to the cutting zone to improve cutting performance. The primary function of cutting fluid is to reduce interface temperature between tool and work thus tool lip will be extended. Secondary cutting fluid acts as good lubricant by which heat generated due to friction will be reduced. To conclude with high lubricant capacity are suitable in low speed machining such as screw cutting, broaching, gear cutting and difficult to cut materials whereas cutting fluids with high cooling ability are generally employed in high speed machining. In the present work, hardened AISI D3 steel was selected as work material which finds applications in the manufacture of Blanking & Forming dies, press tools, punches, bushes, forming rolls and many more. For the purpose of experimentation, factorial design experiments are considered as per Taguchi DOE. By advocating Taguchi design, a clear understanding of the nature of variation and economical consequences of quality engineering in the world of manufacturing can be clearly got through. In the present study, WASPAS approach was performed to combine the multiple performance characteristics in to one numerical score called Overall performance index which is an indicative of the optimal process parameter setting. Analysis of variance (ANOVA) is also performed to investigate the most influencing parameters on the surface roughness, material removal rate, interface temperature, specific energy and flank wear when all the responses are considered simultaneously.

LITERATURE REVIEW

W.H.Yang & Y.S Tang [1] envisages that the Taguchi method is a powerful tool to design optimization for quality and is used to find the optimal cutting parameters for turning operations. An orthogonal array , the signal to noise ratios and ANOVA are employed to investigate the cutting

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An Experimental Investigation with Minimum Quantity Lubrication and its Comparison with Various Vegetable Oil Based Cutting Fluids during Turning

R.K Suresh[a], G.Krishnaiah[b], P.Venkataramaiah[c]

[a]*Assistant Professor(Sr), Department of Mechanical Engineering, Sri Kalahasteeswara Institute of Technology, Srikalahasti, India*
[b,c] *Professor &Associate Professor, Department of Mechanical Engineering, S.V.U College of Engineering S.V.University, Tirupati, India*

Abstract

Environmental and Ecological issues call for the reduction in usage of cutting fluids in metal cutting industry. New techniques are being inquired to achieve this objective. Hard turning with minimum quantity lubrication is one such technique which can alleviate the pollution problems associated with cutting fluids. In the present work, vegetable oil based cutting fluids like castor oil, palm oil and ground nut oil is made to drop at tool-work interface using over-head system. The present paper deals with experimental investigation carried out for machinability study of AISI D3 steel in combination with CVD coated cemented carbide inserts of different styles and to obtain optimum process parameters using TOPSIS and Desirability function analysis. An orthogonal array, closeness coefficient, composite desirability and analysis of variance (ANOVA) are applied to study the performance of process parameters such as insert style, cutting fluid cutting speed, feed and depth of cut with consideration of quality characteristics i.e., Surface roughness, material removal rate and specific energy. Finally a clear comparison is presented between DFA and TOPSIS

*Keywords:*AISI D3 steel; CVD coated tool; Surface roughness; Material removal rate; Specific energy; ANOVA; Minimum quantity lubrication; Desirability function analysis; TOPSIS;

1. Introduction

The important goal in the modern industries is to manufacture the product with lower cost and with high quality in short span of time. There are two main practical problems that engineers face in a manufacturing process, the first is to determine the product quality (meet technical specifications) and the second is to maximize manufacturing

Corresponding author. Tel.: +919440078936;.
E-mail address: rayakuntapalli@gmail.com

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DESIGN OF SIMULATION SYSTEM FOR STRUCTURAL DYNAMIC OPTIMIZATION OF MECHANICAL STRUCTURES

A.Vamsi[1] Dr. G. Janardhana Raju[2] Dr. Y. Hari Prasada Reddy[3]

[1]*Asst. Prof., Asst. Prof. of ME, SV College of Engineering, Tirupati.*
[2]*Dean, School of Engineering, Nalla Narasimha Reddy Group of Institutions,, Hyd.*
[3]*Prof. of ME, Annamacharya Institute of Technology and Sciences, Tirupati*

Abstract

Various structures used in aerospace, automotive, naval and other industrial applications will experience vibration during their service mount condition. Response of a structure to the input vibration will be dictated by three dynamic parameters namely mass (M), stiffness (K) and damping (C). Proper combination of these critical parameters needs to be chosen while configuring particular structure otherwise input vibration energy gets amplified to a greater extent and drives the structure towards catastrophic failure. As of now no practical means are available to evolve optimal combination of above mentioned dynamic parameters. This paper proposes design of a dynamic simulation system which offers a promising solution to have various combinations of mass, stiffness and damping over a specified range. Further intended device can be excited with desired frequency and amplitude by mounting it on a vibrator and response of the device can be measured and quantified for a specified input. With the proposed simulator optimal combination of dynamic parameters can be evolved which becomes input to conFig. The design of a particular structure. To begin with base line configuration of the proposed simulation system is worked out for the purpose of conceptual demonstration and also to identify the subsystems. Subsequently sizing of all these subsystems is arrived at using design calculations. Assembled configuration of the system is worked out using 3D CAD modeling software.

Keywords: *mass (M), stiffness (K) and damping (C), 3D CAD modeling software.*

1. INTRODUCTION

Structural elements designed for any application like automotive, aerospace and industrial will possesses three basic dynamic characteristics like stiffness (k), mass (m) and damping (c). Under the influence of dynamic loading the response of the structure is dictated by these three parameters. Hence designer needs to optimize these key parameters while configuring any structure. Finite Element Method (FEM) is in general used as a tool to evaluate the effectiveness of the optimization with respect to dynamic response of the structure. However accuracy of response predicted by FEM is always questionable as it is considered to be an approximate method. Other way of doing it is to realize the hardware and test so as to obtain the dynamic response. But later one calls for cost implication and if the first fabricated hardware doesn't meet the requirement design needs to be fine-tuned and new hardware has to be realized and so on. To overcome this via media between FEM and hardware realization is proposed in form of dynamic simulation system in this work.

Computer Aided Design (CAD) was introduced to refer to a technique which employs the computer in the design process in order to increase the efficiency with which a designer is able to design. Whilst a computer is incapable of creativity, it is efficient in analysis, robust in repetitive tasks, fast in processing information and capable of storing a large amount of data. As design is an iterative process, it is necessary to update the drawing constantly and often requires a small modification. It can therefore be a cumbersome and time-consuming task to reproduce the drawings for every modification and the use of computers can be very effective [1]. A Genetic Programming formulation is presented, using design modification operators as modular "programmes", and shown to be capable of synthesizing a range of novel, optimally-directed designs. The method developed consistently finds the global optimum for a small 2D planar test problem, generates high-performance designs for larger scale tasks and shows the potential to generate designs meeting user-defined aesthetic requirements [2]. Current engineering analyses rely on running expensive and complex computer codes. Statistical techniques are widely used in engineering design to construct approximate models of these costly analysis codes. These models referred as metamodels, are then used in place of the actual analysis codes to reduce the computational

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"DESIGN AND ENHANCEMENT OF SUBMERGED HAND PUMP OPERATED WITH ULTRA FILTRATION SYSTEM BY USING CFD (COMPUTATIONAL FLUID DYNAMICS) ANALYSIS".

P.Mahidhar

P.G Student, Department of Mechanical Engineering, Annamacharya Institute of Technology, Tirupathi.

P.C.Prakash

Assistant Professor, Department of Mechanical Engineering, Annamacharya Institute of Technology, Tirupathi.

ABSTRACT

In today's day to day scenario Safe drinking water is one of the most promising and essential human need and other life forms even though it provides no calories or organic nutrients. Access to safe drinking water has elaborating over the last decades in every part of the world, but approximately a billion of people still lack the admittance of safe drinking water. However, some eyewitness have estimated that by 2030 more than half of the world population will be facing the water problem. Water that is not potable may be made potable by filtration or distillation. Currently, about a billion people around the world routinely drink unhealthy water.

Globally, improving water, sanitation and hygiene has the potential to prevent at least 9.1 per cent of the disease burden, or 6.3 per cent of all deaths. Deaths due to water related diseases in India are in the range of nearly 80%. The availability of fresh and good quality drinking water to all Indians remains a concern.

A portable movable hand pump with ultra filtration membrane purification system is designed for small capacity of 300 liters, to produce clean and safe drinking. The hand pump operated purification system is low cost and without electricity. The system is added advantage for remote areas of our country where they don't have access to electricity.

The hand pump coupling with membrane candles is a new innovation and is not available in the market. In order to optimize the existing model of hand pump for efficient performance to get pure drinking water. High levels of variation occur in the range of water quality parameters such as turbidity, color, UV- absorbance etc.

This research work is developed for rural area to get benefited (specifically for remote village peoples). the hand operated membrane system is compared with theoretical and CFD analysis. The percentage of error in pressure is 3.68% (approximately 4%) and it is well acceptable for manufacturing of hand pump with membrane candle system.

Key Points; Safe drinking water Act, Hand pumps, Ultra filtration membrane candles purification system, CFD analysis.

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Enhancing Overall Equipment Effectiveness in Battery Industries through Total Productive Maintenance

[1] M. Srinivasa Rao, [2] M. Balaji, [3] Venkatamuni .K
[1] PG Student in Production Engineering and Engineering Design, AITS-Tirupathi
[2] Assistant Professor, Dept. of Mechanical Engineering, AITS-Tirupathi
[3] Deputy Manger IE Projects, Amara Raja Batteries Ltd.

***Abstract*:-- :- Frequent machine breakdowns, low plant availability, increased rejection are a great threat to increase operating cost and lower productivity. The objective of the work is to enhance the overall equipment effectiveness (OEE) in battery industry through the implementation of total productive maintenance (TPM). The company has to suffer due to lower availability of machines as a result of breakdowns. Comparison of OEE between before and after implementation of TPM can provide the much needed force to improve the maintenance policy.**

Index Terms- Total Productive Maintenance, Availability, Performance, Quality, Overall Equipment Effectiveness

1. INTRODUCTION

Effectiveness of equipment plays a major role in modern manufacturing industries to achieve their goals. Total productive maintenance (TPM) is a methodology to increase the availability of the existing equipment hence it reduces the further capital investment. The TPM results in maximum effectiveness of equipment, tidier, and clean work place. Maintenance has been largely considered as a support function which is none productive since it does not generate cash directly. However for industry to produce goods of the right quality and quantity for the customers and be able to deliver them at the right time its plant or equipment must operate efficiently and accurately. For every manufacturing industry, the objective is to produce goods at a profit and this is only achieved by using an effective maintenance system that helps maximize availability by minimizing machine downtime due to unwarranted stoppages. Without an effective and economically viable maintenance system, equipment reliability suffers, and the plant pays the price with poor availability and increased downtime. All these mentioned poor key performance indicators could be a result of poor machine condition and sometimes low employee morale. Low plant availability and overtime costs will negatively affect an industry's operational efficiency. Plant Engineers must therefore design an effective maintenance system for the plant and its equipment. The aim of this paper is to measure the Overall Equipment Effectiveness (OEE) of the existing plant and there by develop a maintenance policy to enhance the OEE.

II. IMPLEMENTATION OF TPM

Implementation of TPM is based on systematic implementation of its pillars. The pillars of TPM are shown in below figure. Many companies struggle today to implement TPM due to two main reasons. First is having insufficient knowledge and skills especially in understanding the linkages between the pillar activities in TPM. The second reason is that TPM requires time, resources and efforts than most of these companies believe they can afford. 5S forms the base and is the starting point for TPM implementation. The TPM pillars are explained below.

Figure 1: Eight Pillars of TPM

5S CONCEPT:

TPM starts with 5S. It is a systematic process of housekeeping to achieve a serene environment in the work

EXPERIMENTAL INVESTIGATION & ANALYSIS OF SS304L & SS410 WELD CHARACTERISTICS USING TIG WELDING

K. RAJASEKHAR[1], C. RAJESH[2], Dr. B. JAYACHANDRAIAH[3]
[1] Assistant Professor, Dept. of M.E, SKIT, Srikalahasti, Chittoor (Dist), A.P-517640, India.
[2] Assistant Professor, Dept. of M.E, SKIT, Srikalahasti, Chittoor (Dist), A.P-517640, India.
[3]Professor, Dept. of M.E, SKIT, Srikalahasti, Chittoor (Dist), A.P-517640, India

Abstract: - TIG welding is highly regarded because of quality and applicability; the process is applied to several industries and aid in the creation and repair of many items. This form of welding is common in the aerospace, automotive, repair and art fields. To improve welding quality of SS 304 L & SS 410 using TIG welding system, by which welding speed can be control during welding process. Surface roughness and tensile strength of the weld joint has been investigated on the weld zone to evaluate the effect of welding parameters on welding quality. Micro-hardness value of the welded zone has been measured at the cross section to understand the change in mechanical property of the welded zone. At lower welding speeds, strength is more due to more intensity of current. With the increase in current, tensile strength of the weld joint increases. Comparison between methodical model and experimental results is in good agreement indicating that the developed models can predict the responses adequately within the limits of welding parameters.

Keywords: TIG Welding System, Surface roughness (Ra), Micro hardness (HV) & UTS

I. INTRODUCTION

Welding is a permanent joining process used to join different materials like metals, alloys or plastics, together at their contacting surfaces by application of heat and or pressure. During welding, the work-pieces to be joined are melted at the interface and after solidification a permanent joint can be achieved. Sometimes a filler material is added to form a weld pool of molten material which after solidification gives a strong bond between the materials. Weld ability of a material depends on different factors like the metallurgical changes that occur during welding, changes in hardness in weld zone due to rapid solidification, extent of oxidation due to reaction of materials with atmospheric oxygen and tendency of crack formation in the joint position.

GTAW or TIG welding process is an arc welding process uses a non-consumable tungsten electrode to produce the weld. The weld area is protected from atmosphere with a shielding gas generally Argon or Helium or sometimes mixture of Argon and Helium. A filler metal may also feed manually for proper welding. GTAW most commonly called TIG welding process was developed during Second World War. The use of TIG today has spread to a variety of metals like stainless steel, mild steel and high tensile steels, Al alloy, Titanium alloy. Like other welding system, TIG welding power sources have also improved from basic transformer types to the electronic controlled power source today.

TIG welding process has specific advantages over other arc welding process as follows -
narrow concentrated arc, able to weld ferrous and non-ferrous metals, does not use flux or leave any slag, no spatter and fumes during welding. This type of welding process is best suited for metal plate of thickness around 5- 10 mm. Thicker material plate can also be welded by TIG using multi passes which results in high

ANALYSIS OF EDFC AND ADFC ALGORITHMS FOR SECURE COMMUNICATION IN VANET

Senthamilselvan[*1], *Dr.Wahidabanu*[2]

[1]Research Scholar, Bharath University, Chennai, Tamilnadu, India.

[2]Professor, Department of Electronics and Communication Engineering,

[2]Government College of Engineering, Thanjavur, [2]Anna University, Chennai, Tamilnadu, India.

*senthamilselvan87@gmail.com

ABSTRACT

In this paper, we propose a novel decentralized implementation of fountain codes in sensor networks, such that data can be encoded in a completely distributed fashion. In our proposed algorithms, a sensor disseminates its data to a random subset of sensors in the network, while each sensor only encodes data that it has received. As the collector collects a sufficient number of encoded data blocks by visiting more and more sensors, it is able to decode all original data with an efficient decoding process designed for fountain codes. The salient and original contribution of this paper is a solution to disseminate data from one sensor to others in an efficient and scalable fashion with the help of Exact Decentralized Fountain Codes (EDFC) as well as Approximate Decentralized Fountain Codes (ADFC). As has been well known, conventional shortest-path routing algorithms require each sensor to maintain a routing table with a size proportional to the total number of sensors in the network with their respective locations. Be that as it may, we have observed that our decentralized implementation of fountain codes does not require the support of a generic layer of routing protocols. In this paper, we propose a decentralized algorithm using fountain codes to guarantee the persistence and reliability of cached data on unreliable sensors. With fountain codes, the collector is able to recover all data as long as a sufficient number of sensors are alive. We have proposed two algorithms based on random walks. Our theoretical analysis and simulation-based studies have shown that, the first algorithm maintains the same level of fault tolerances the original centralized fountain code, while introducing lower overhead than naive random-walk based implementation in the dissemination process. Our second algorithm has lower level of fault tolerance than the original centralized fountain code, but consumes much lower dissemination cost.

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ENHANCEMENT OF HIGH DENSITY WIRELESS SENSOR NETWORK USING VANET

[1]SenthamilSelvan, [2]Wahidabanu
[1]Research Scholar, Bharath University, Chennai, Tamilnadu, India
[2]Professor, Department of Electronics and Communication Engineering,
[2]Government College of Engineering, Thanjavur,
[2]Anna University, Chennai, Tamilnadu, India
[1]senthamilselvan87@gmail.com

Abstract: GPS navigators has widely adopt by drivers. However, due to this sensibility of GPS signals to terrains, vehicles cannot to get their locations, when they are anyone inside a tunnel or a road it's surrounded by high rises, where Satellite signal is ended. This is mainly used for safety and convenience problems. But the VANETS advance into their critical areas and to become more dependent on these localization systems. GPS is starting to locate some uncertain problems, such not always being the available or not being robust enough for this some different applications. For the reason a number of other localizations techniques such as Cellular Localization, Dead Reckoning and Image Video Localization have been used in VANETs (Vehicular Adhoc Network) to overcome the GPS limitations. To address this issues, a novel Grid-based On-road localization Technique (GOT) is proposed, where these vehicles with and without accurate of GPS signals self organizes into a Vehicular Ad Hoc Network (VANET), exchange the locations and distance information and helps to each others to calculate an accurate position for all these vehicles inside the network. The location information's can be exchanged among vehicles one or multiple hops away.

Keywords: Grid based on road localization Technique, Vehicular Ad Hoc Network, Mobile Ad Hoc Network, Vehicle Monitoring, AODV Protocol and Localization.

1. Introduction

The Vehicular Ad hoc Network (VANET) is expected to significantly improve the safety of transportation systems by providing timely and efficient data dissemination has being interested as Vehicular Adhoc Networks (VANETs) for several years since the deployment of this type of networks will be able to provide significant improvements in terms of road safety, where the majority of protocols adopted flooding techniques to warn all the nodes, as well as the traffic authorities, about the accident.

The proposed solution is essentially based on a technique of clustering, where a cluster head is chosen among a group of vehicles and a technique, for the establishment of the relative positions of the nearby nodes. The IEEE 802.11p Medium Access Control (MAC) uses carrier sense multiple access with collision avoidance and some concepts is defined as the distance every cluster head establishes a local coordinate system and calculates the positions of all its neighbors in the group using the distances measured between vehicles. In the aim to reduce the calculate time in dangerous situation, the orientation of the coordinate system of the first cluster head and the global system are considered the same. This new solution provides sufficient location information and accuracy to support basic network functions [1-3].

Real-time video transmission has high requirements of terms on bandwidth and delay, while VANET's is characterized by very limited radio resources and high mobility. Furthermore, to ensure that good behaviour under any type of circumstances, also study the impacts of GPS drift on their schemes. However, [4] due to the sensibility of GPS signals to terrains, vehicles cannot to get their locations, when they inside tunnels or on a road surrounded by high rise where satellite signal is blocked. To address the issues, they proposed a novel Grid based On-road localization Technique (GOT), where vehicles with and without accurate GPS signals self organize into a Vehicular Ad Hoc Network (VANET), exchange location and distance information and help each other to calculate an accurate position for all the vehicles inside the network.

The majority of localization methods presuppose that some of network nodes (beacons) know their position, and these nodes act as a source for localization of the rest

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DESIGN OF LOW VOLTAGE MODIFIED WILSON CURRENT MIRROR CIRCUITS BASED ENERGY EFFICIENT LEVEL SHIFTERS

K. Purna Chandra Rao[*1], R.Senthamil Selvan[2],
P. KrishnaMurthy[3],Dr.V.Thirumurthilu[4]

[1, 2,3]*Assistant Professor, Chadalawada Ramanamma Engineering College, Tirupati, Department of Electronics and Communication Engineering*
JNT-University, Anantapur, Andhra Pradesh, India.
[4]*Professor, Department of Electronics and Communication Engineering, Chadalawada Ramanamma Engineering College, Tirupati*
JNT-University, Anantapur, Andhra Pradesh, India, India.

Abstract — *Wide range level shifters are easiest energy efficient converters capable of the converting low voltages to their high voltage. Level Shifters are mainly used to the shifting voltage from a one level to other levels. Multi voltage systems utilized the advantages of level shifters. Multi voltage systems consist of low voltage as well as high voltage. Existing methods was implemented by a using the LVT (Low Threshold Voltage Transistor) which produce the leakage power dissipation. Proposed method is implementing by a using forced PMOS methods to reduce the leakage power. Usually Level Shifter is inserted only while crossing the low voltage domain to high voltage domain. In this paper modifies the Wilson current mirror circuits based level shifter is designed by using stack techniques. Measurement results were demonstrated by using cadence Tools.*

Keywords— *Level Shifters, Multi voltage systems, Widlar Wilson Circuits, Forced PMOS technique.*

I. INTRODUCTION

The design of modified Wilson circuits increased in power consumption, the price of packaging additionally will increase. In growing market of mobiles, battery powered electronic systems (e.g., cellular phones, Personal digital assistants, etc.). Demand designs of microelectronics circuits, low power dissipation. More generally, as density size and complexity of the chips continues to increases in the difficult to providing the adequate cooling might either add significant costs or limit the functionality of the computing systems, which makes its use of those integrated circuits. In their past ten years several techniques methodology tools for designing for low power circuits have been presented. However, only a few of them have found then their ways in current design flows [1]. There are three different major sources of power dissipations in a CMOS circuit. There are switching power, short circuit power, and leakage power. Switching power is due to their charging and discharging capacitors, driven by the circuits. Short circuit power is caused by the short circuits current that arise, when pairs of PMOS/NMOS transistors are conducting simultaneously.

Finally the Leakage power is originates from substrates injection and sub threshold effects. One of the major reasons causing the leakage power increases in the X sub threshold leakage power also increases. When technology features size scales down, supply voltage and threshold voltages also scale down. Sub threshold leakage power increase exponentially as threshold voltage decreases. Stack method, Forced NMOS, Forced PMOS and sleepy keeper method are the some of the leakage current reduction methods [2]. When technology feature size scales down, supply voltage and threshold voltage also scale down.

This paper presents a new design method of Level Shifter for wide range operations and bidirectional conversion.

I. LEVEL SHIFTERS

A. Conventional Level Shifter

Sub threshold Level Shifters is surveyed in these section. Conventional cross coupled LS is a differential cascade voltage switch logics (DCVSL) for raising a low voltage level, as shown in fig.1. The drive strength of NMOS transistor is enhanced to an overcome the leakage power of weakly conducting PMOS transistor. The operating ranges of CC LSs depend on the transistor threshold voltage (VT) and size; However, the operating range of CC LSs is difficult to extend to the sub threshold region (with respect to the NMOS v_t) because the NMOS drive strength decreases exponentially. This is often achieved by semiconductor unit size, i.e., creating the NMOS transistors sufficiently wide. However, the large width of NMOS transistors does not make it suitable for sub-threshold to above-threshold level shifting. For converting a sub threshold voltage, CC LS require an exponential increase in NMOS transistor size, which is impractical [3].

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DESIGN A QUALITY OF SERVICE BASED MULTIHOP NETWORK ARCHITECTURE INTEGRATING COGNITIVE RADIO ADHOC NETWORKS

R.Senthamilselvan[1], K.Purna Chandra Rao[2], Dr.V.Thirumurthilu[3],

Assistant Professor[1,2],
Professor, Head of ECE department[3],
Electronics and Communication Engineering[1,2,3],
Chadalawada Ramanamma Engineering College, Tirupathi, Andra Pradesh[1,2,3].

Abstract: *The paper deals with hybrid wireless sensor network where both static and mobile sensors are used, where static sensors detects one attributes or one event like location of the device where as the mobile sensors detects multiple attributes which is more in-depth analysis, critical issue is setting the path for this mobile sensors. Recent advances in wireless sensor networks have led to many new protocols specifically designed for sensor networks where energy awareness is an essential consideration. Most of the attention, however, has been given to the routing protocols since they might differ depending on the application and network architecture. However, in cognitive radio (CR) ad hoc networks, unlicensed users may observe heterogeneous spectrum availability, which is unknown to other unlicensed users before the control information was broadcast. Transmission of video and imaging data requires both energy and QoS aware routing in order to ensure efficient usage of the sensors and effective access to the gathered measurements. In this paper, we propose an energy-aware QoS routing protocol for sensor networks which can also run efficiently with best-effort traffic. Moreover, the throughput for non-real-time data is maximized by adjusting the service rate for both real-time and non-real-time data at the sensor nodes. Simulation results have demonstrated the effectiveness of our approach for different metrics.*

Keywords: *Broadcast protocol, cognitive radio (CR), Multihop communications, Quality-of-Service (QoS).*

I. INTRODUCTION

The rising field of remote sensor systems joins sensing, calculation & correspondence into a solitary modest device. Through cutting edge cross section organizing conventions, these devices structure an ocean of network that extends the range of the internet out into the physical world. Recent advances in miniaturization and low-power design have led to active research in large-scale, highly distributed systems of small-size, wireless unattended sensors [1]. Each sensor is capable of detecting ambient conditions such as temperature, sound, or the presence of certain objects. For the improvement of modern and advanced technological world, the computers are contributed more optimality and ease of implementation. Wireless sensor networks (WSNs) are deployed to an area of interest to sense phenomena. Wireless sensor network is a type of ad-hoc networks that has the ability of sensing A number of multichannel MAC protocols compares through analysis and simulation. Especially the computer networks provide more dominant and powerful way for resource sharing and data transmission. The computer network starts with wired technologies and spreads its wings using wireless components and now it advanced using sensor elements [2].

The process starts with classification of protocol into four categories based on their principles of operation: Dedicated Control Channel, Common Hopping, Split Phase and Parallel Rendezvous protocols. Then examine the effects of the number of channels and devices, channel switching times, and traffic patterns on the throughput and delay of the protocols. The results show that our distributed resource-management approach improves the peak signal-to-noise ratio (PSNR) of multiple video streams by more than 3 dB, as opposed to the state-of-the-art dynamic frequency channel/route selection approaches without learning capability, when the network resources are limited. The information horizon is assumed to be fixed in this paper for different priority classes over the whole wireless networks [3]. This paper examines how cognitive radios initially find one another among the expanse of ever-changing open spectrum, termed the rendezvous problem. Specifically, it addresses the problem of rendezvous under varying levels of system capabilities, spectrum policies, and environmental conditions. The focus is on rendezvous when there are no control channels or centralized controllers, which we term the blind rendezvous problem [4].

The goal of this system is to minimize the required network-wide resource to support a set of multicast sessions; with a given bit rate requirement for each multicast session is studied. By intelligently downsizing the original available channel set and designing the broadcasting sequences and scheduling schemes, our proposed broadcast protocol can provide very high successful broadcast ratio while achieving very short average broadcast delay. N heterogeneous sensors introduced on versatile stages are utilized to identify, track, and seek after M moving targets. This unequivocally implies that M

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Special Issue

ANALYSIS OF SPAWN PROTOCOL AND EDFC ALGORITHM FOR SECURE COMMUNICATION IN VANET

[1]Senthamilselvan, [2]Wahidabanu
[1]Research Scholar, Bharath University, Chennai, Tamilnadu, India.
[2]Professor, Department of Electronics and Communication Engineering.
[2]Government College of Engineering, Thanjavur, Anna University, Chennai, Tamilnadu, India.
[1]senthamilselvan87@gmail.com

Abstract: In this paper wireless sensor networks (WSN), are similar to wireless ad hoc networks in the sense that they rely on wireless connectivity and anomalous generation of networks so that sensor data can be transported wirelessly. Here we propose a novel decentralized implementation of fountain codes in sensor networks, such that data can be encoded in a completely distributed fashion. In our proposed algorithms, a sensor disseminates its data to a random subset of sensors in the network, while each sensor only encodes data that it has received. As the collector collects a sufficient number of encoded data blocks by visiting more and more sensors, it is able to decode all original data with an efficient decoding process designed for fountain codes. The salient and original contribution of this paper is a solution to disseminate data from one sensor to others in an efficient and scalable fashion with the help of Exact Decentralized Fountain Codes (EDFC) along with the routing SPAWN protocol. As has been well known, conventional shortest-path routing algorithms require each sensor to maintain a routing table with a size proportional to the total number of sensors in the network with their respective locations. Be that as it may, we have observed that our decentralized implementation of fountain codes does not require the support of a generic layer of SPAWN routing protocol. We propose SPAWN (Swarming Protocol for vehicular Adhoc Wireless Networks), a simple cooperative strategy for content delivery in future vehicular networks. The issues involved in using a strategy from the standpoint of Vehicular Adhoc networks. In this paper, we propose a decentralized algorithm using fountain codes to guarantee the persistence and reliability of cached data on unreliable sensors. With fountain codes, the collector is able to recover all data as long as a sufficient number of sensors are alive. Our theoretical analysis and simulation-based studies have shown that, the EDFC algorithm maintains the level of fault tolerances the original centralized fountain code, while introducing lower overhead than naive random-walk based implementation in the dissemination process. Finally we bring that ad hoc relay wireless networks, based on NS_2 simulation technologies, have potential for many prominent applications of this kind.

Keywords: Vehicular Networks (VANET), Content Distribution, SPAWN Protocol, EDFC, Data Dissemination, Broadcast, Adaptive Traffic Control Scheme.

1. Introduction

Wireless sensor networks consist of unreliable and energy-constrained sensors communicating with one another wire-lessly. It has been a conventional assumption that, in wireless sensor networks, measured data in individual sensors are gathered (via data aggregation) and processed en masse at powered sinks with Internet connections [1]. There are, however, at least two cases in which this assumption may not realistically hold. First, if sensor networks consist of a large number of sensors (in the order of tens of thousands or higher), it may not be energy efficient to gather measured data from sensors to sinks using data aggregation. Second, if sensors are randomly deployed in inaccessible geographical regions or environments, it may not be feasible to deploy powered sinks as well. Along with the industrial development and technological progress, monitoring the environment plays a very vital role. Many research works have been built-up on monitoring systems that can replace traditional systems in critical environments [2].

Wireless sensor networks (WSNs) are deployed to an area of interest to sense phenomena. Wireless sensor network is a type of ad-hoc networks that has the ability of sensing and processing data collected from the environment. These networks are comprised of autonomous devices, called sensor nodes. Each sensor has a buffer which can be divided into small slots. Wireless Sensor Networks are recently applied in many environmental applications such as measuring temperature, humidity, salts or monitoring objects and others.WSNs applications have common task, which is environmental monitoring [3]. This task is realized by using nodes to sense data from the environment and

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Research paper

Design and Analysis of Spawn Protocol for Secure Communication in VANET

SenthamilSelvan[1*], Dr.Wahidabanu[2]

[1]Research Scholar, Bharath Institute of Higher Education and Research, Chennai, Tamilnadu, India
[2]Professor, Department of Electronics and Communication Engineering,
[2]Government College of Engineering, Thanjavur, [2]Anna University, Chennai, Tamilnadu, India
**Corresponding Author E-mail: [1]senthamilselvan87@gmail.com*

Abstract

Wireless Sensor Networks are seen as enormous accumulations of small sensor hubs that can order themselves in an Adhoc framework. Energy efficiency and coverage sensing distance networks have increased an essential metrics for enhancing the Vehicular Adhoc Networks. Traffic density is an important metric in monitoring traffic conditions to improve free from risk and efficiency of roads. The upside of the spatial assorted qualities and communicate nature of wireless transmissions to embrace an agreeable approach. We propose SPAWN (Swarming Protocol for WANET), an easy way for content release in future WANET. The distribution involved in strategy from the standpoint of WANET. To address these issues, to propose a novel Grid based on road localization system, it develops an analytical model that accurately characterizes the maximum throughput rate performance achievable under a prescribed outage probability constraint. On the premise of formal set hypothesis, as appeared from the point of view of worldwide versatile WSN activities, and how neighbourhood movement adjustment is ensured. Enactment is hold using NS2 to appraise the action of the integrated network design.

Keywords: *Vehicular Networks, Content Distribution, SPAWN Protocol, Data Dissemination, Broadcast, Spatial Range Suspicion, Suspicion Validation and Adjustable Gridlock Control Scheme.*

1. Introduction

In this work, a new decentralized usage of wellspring codes in sensor systems are proposed, with the end goal that information can be encoded in a totally disseminated manner. In proposed calculations, a photoelectric cell scatters its information to an irregular system, while every sensor encodes information that it has received. As the adequate number of encoded information hinders by going by an ever increasing number of sensors, it can unravel every single unique data with an effective translating process intended for stream codes. The remarkable unique commitment of this paper is an answer for scatter information from one sensor to others in an effective and versatile mold. It performs at a number of periods in 5.9 GHz, detached into 7 channels, each operating at a number of periods in 10 MHz. It supply a high data transfer rate, ranging from 6 Mbps to 27 Mbps and a short range radio broadcasting of nearly 300 meters.

Rather, we utilize arbitrary strolls to disperse information from one sensor to an irregular part of larger set sensors in the system. The notable favourable position of irregular strolls is that they just need neighbourhood data, and don't accept the learning of sensor areas. Large scale wireless sensor networks (WSN) are conveyed for drawn out stretch of time in secluded and unforgiving condition to accumulate data. It has been a regular suspicion that, in remote photoelectric cell systems, calculated information in single sensors are assembled (by means of information accumulation) and handled as a group at controlled sinks with Internet associations [1].

There are, in any case, no less than two cases in which this supposition may not reasonably hold. The quick ascent of podcasting lays on two in number patterns in interchanges: to start with, the enthusiasm for participatory media that permit anyone with a PC and system access to deliver and disseminate substance, and, second, the fast development being used of the Internet for circulating mass information. These two patterns are in fact not new and exude from the presentation of the internet and the consequent notoriety for making individual and business website pages freely accessible.

A proficient [2] convention ought to be solid so that every one of the hubs of the system receives all the packets without any loss. The protocol ought to be adaptable for system of size arranged by 1,000s of hubs. The transmission protocol should mull over the restricted equipment limit of the bits. In flooding each hub rebroadcast the parcels it has gotten. This situation prompts high repetitive transmissions, as a hub may get parcels it has as of now caught from different neighbors, and increase packet collision probability because of higher number of hubs fighting to transmit.

2. The Spawn Protocol

SPAWN (Swarming Protocol for WANET), has general design of any swarming protocol. To come into view, downloading a data form a mesh and transfer packets of data by all themselves. On the other hand transmitting without connecting wires mounting of SPAWN, distinguished by limited capacity, recurrent connective also large degree of agitation in points requires it to adapt in

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Research paper

Collective Network Channel Decentralized Fountain Design Codes for Safe Communication in VANET Network

SenthamilSelvan[1*], Wahidabanu[2]

[1]Research Scholar, Bharath Institute of Higher Education and Research, Chennai, Tamilnadu, India
[2]Professor, Department of Electronics and Communication Engineering,
[2]Government College of Engineering, Thanjavur, [2]Anna University, Chennai, Tamilnadu, India
**Corresponding Author Email: [1]senthamilselvan87@gmail.com*

Abstract

Wireless sensor network is noticed as bulk aggregation of slender sensor knobs that can characterize themselves in a decentralized system. Wireless communications assist these trades to increase plant knowledge by acquiring additional measurements from processes and apparatus when wired communication would be infeasible. The merits of the space diversity and transmit nature of wireless transmissions to adopt combined accession in which node transmit the host, that recover the lost host with long credibility by overhearing the transmission of its acquaintance.

Article represents an indicating flexible unified management. On the basis of regular set code, the aspect of overall managed flexible WSN activity, local action conversion is protected.

Keywords: *Vehicular Networks, Content Distribution, Data Dissemination, Broadcast, WSN, Finite length query, query recognition, flexible traffic control scheme.*

1. Introduction

In this article, we introduce a innovative circulated employment of rateless erasure cipher in device structures, similarly information encrypted in a completely delivered model. In our recommended design, a module circulates irregular part of device in the network, device only encrypt information obtained. As the collectors gather plentiful figure encrypted information sections by call higher devices, ability to translate all original information with an active interpreting operation constructed for rateless erasure cipher. The research is a solution to b ro ad cast information f ro m one device to others in a powerful and extensible model. Graph direction design requires all device to maintain a conquer table with a capacity comparable to the overall figure of devices in the structure. Rather, geological conquer contracts [1] are higher extensible, with the supposition of modules corresponding positions. We examined circulated attainment of rateless erasure cipher do not need backing general conquering protocols.

Rather unplanned steps to propagate information from one module to an unplanned part of devices in the network. The merits of unplanned steps are only provincial message and do not consider ability of device positions. Broad range wireless device networks (WSN) are used for lengthy duration of time in standard and hard climate to collect data. In wireless module, calculated data in individual devices are collected (via information aggression) and operated in stab network links [2]. However, at least two envelopes premise may not rational control. The fast growth of device composure on two active movements in transmission: first, the absorption in characterize radio that allows computer network connection to generate and deliver data, second: the fast growth in use of the network for delivering bulk data. These two methods are absolutely not current and arise from the initiation of world-wide -web, consecutive demand for making special and trade web side public policy applicable.

An active [3] OAP protocol should be stable for all the knobs in the network receive all the packages left out all destruction. The protocol should be extensible for network size in order of 1,000s of knobs.

Inundation all knob repeated packages are received. This scheme leads to big unnecessary transmissions, as a knob may receive packages has already recorded from other acquaintance, and increase package crash chance because of bigger number of knobs resist to transmit.

2. Coded Cooperative Data Transmission

1) Motivating Example

This article, suggest a quiet two directional transportation contract using network coding and binary fountain cipher; Commercial version of GloMoSim (Network Emulator) operator is a greatly extensible, fast simulator for huge varied network that backing cabled and Wi-Fi network contract. In planned contracts, the EOR mechanism is used for the original information. Also, study the two directional transportation plans with multiple-broadcast.

Modifying way establishes on resembling classic networks by conceal detachment, radio band cutback and limited transportation scope using quality of service and conquer works.

Network coding is lower level to a specific point of loss. A pragmatic function of network coding conferred in [4] huge range data allocation in wired network. After appropriating plentiful

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Articulate Steer Robot

N.Dilip Kumar[1], K.Sindhuja[2], K.A.Saradha[3]
[1](Asst. Prof., Dept. of ECE, AITS,TIRUPATHI, INDIA)
[2](Student, Dept. of ECE, AITS,TIRUPATHI, INDIA)
[3](Student, Dept. of ECE, AITS,TIRUPATHI, INDIA)
Corresponding Author: N.Dilip Kumar1

***Abstract**: Articulate steer Robot (ASR) is a mobile robot whose motions can be controlled by the user by giving specific voice commands. The speech is received by a microphone and processed by the voice module. When a command for the robot is recognized, then voice module sends a command message to the robot's microcontroller. The microcontroller analyzes the message and takes appropriate actions. The objective is to design a walking robot which is controlled by servo motors. When any commands are given on the transmitter, the EasyVR module will take the voice commands and convert the voice commands into digital signals. Then these digital signals are transmitted via ZIGBEE module to the robot. On the receiver side the other ZIGBEE module receives the command from the transmitter side and then performs the respective operations. The Hardware Development board used here is ATmega 2560 development board. In ATmega 2560 there are 15 PWM channels which are needed to drive the servo motors. Addition to this there is camera which is mounted in the head of the robot will give live transmission and recording of the area. The speech-recognition circuit functions independently from the robot's main intelligence [central processing unit (CPU)]. This is a good thing because it doesn't take any of the robot's main CPU processing power for word recognition. The CPU must merely poll the speech circuit's recognition lines occasionally to check if a command has been issued to the robot. The software part is done in Arduino IDE using Embedded C. Hardware is implemented and software porting is done.*

***Key Words:** Arduino, ATmega 2560, EadyVR, S*

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I. Introduction

When we say voice control, the first term to be considered is Speech Recognition i.e., making the system to understand human voice. Speech Recognition is a technology where the system understands the words (not its meaning) given through speech.Robots are indispensable in many manufacturing industries. The reason is that the cost per hour to operate a robot is a fraction of the cost of the human labor needed to perform the same function. More than this, once programmed, robots repeatedly perform functions with a high accuracy that surpasses that of the most experienced human operator. Human operators are, however, far more versatile. Humans can switch job tasks easily. Robots are built and programmed to be job specific. You wouldn't be able to program a welding robot to start counting parts in a bin. Today's most advanced industrial robots will soon become "dinosaurs." Robots are in the infancy stage of their evolution. As robots evolve, they will become more versatile, emulating the human capacity and ability to switch job tasks easily. While the personal computer has made an indelible mark on society, the personal robot hasn't made an appearance. Obviously there's more to a personal robot than a personal computer. Robots require a combination of elements to be effective: sophistication of intelligence, movement, mobility, navigation, and purpose.

II. Description of Articulate Steer Robot

Speech Recognition: Speech recognition is the process of capturing spoken words using a microphone or telephone and converting them into a digitally stored set of words.Speech recognition technology has endless applications. Commonly, such software is used for automatic translations, dictation, hands-free computing, medical transcription, robotics, automated customer service, and much more. If you have ever paid a bill over the phone using an automated system, you have probably benefited fromspeech recognitionsoftware.

Speaker verificationis the process of using a person'svoice to verify that they are who they say they are. Essentially, a person's voice is used like a fingerprint. Once a sample of their speech is recorded, a person's speech patterns are tested against a database to see if their voice matches their claimed identity. Most commonly, speaker verification is applied to situations where secure access is needed. Such systems operate with the user's knowledge and cooperation.

Application of Satellite Remote Sensing to find Soil Fertilization by using CNN Algorithm

[1]A.V.S.Kalakrishna, [2]A.Rajani,[3]Dr.Irala Suneetha
[1]M.tech student (DSCE), Department of ECE, Annamacharya Institute of Technology and Sciencess Tirupati
[2] Assistant Professor, Department of ECE, Annamacharya Institute of Technology and Sciencess Tirupati
[3] Professor & HOD, Department of ECE, Annamacharya Institute of Technology and Sciencess Tirupati

Abstract-

Nowadays the usage of Remote Sensing and GIS techniques are too vast and many Earth observations had been done by Remote Sensing and GIS techniques. The innovation of this work is to use the LANDSAT image data and GIS Techniques to assess land information and soil classification in the most coming up area of Vellore district and propose the possible fertilization for this study area. Landsat image is classified by minimum distance classification algorithm and according to the reflectance characteristics of the surface material. From the classified data we can find out the best fertilization for the best soil using colour of the soil. It is proved that, within limitations the classification algorithms and threshold parameters have an important influence on the classification result. In proposed method using CNN Algorithm to improve the perfamnce levels in classifications of Soil. This paper have been developed using MATLAB 2013a version.

Index terms – **Remote Sensing, GIS, Soil identification, Image Classification, Fertilization by remote sensing**

I. INTRODUCTION

Remote sensing techniques and Geographical Information System (GIS) techniques are used to estimate soil types and its spatial distribution with reasonable costs and much better accuracy in very larger earth spaces. Soil erosions were estimated by remote sensing, geographical information system and. In general, remote sensing data were used to create the cover management factor image by land cover classifications, while Geographical Information System tools were used for derive the topographic factor from DEM (Data Elevation Model) data RUSLE [1].

Remote sensing methods provided perspective for spatial and instantaneous measurement of soil content. Thermal emissions from soils in the region were used to find soil series and sensitivity of the surface. Less amount of water in a soil that emits low amount of microwave radiation. Soil series were calculated by active microwave remote sensing via synthetic aperture raw data. Microwave radiometer widely used for mapping large area soil types [2].

The soil property is directly correlated to the reflectance based data, soil properties have been inferred from reflectance measurements under better lab conditions such as nitrogen, moisture, organic carbon and other chemical properties. Soil series were calculated by reflectance measurements of surface texture, organic matter, salinity and moisture of soil conditions [3].

Land cover is being practiced for delineating the soil boundary. Multispectral satellite data were being used for mapping soil. Soil mapping needs identification of a number of elements, these elements which are major importance for soil survey, land type, vegetation, Landuse. Visual interpretation is based on shape, size, tone, shadow, texture, pattern, site and association. Soils are surveyed and mapped by comprising interpretation of remote sensing imagery, field survey, and cartography. A soil map generated through visual interpretation of satellite images. The remote-sensing data in conjunction with ancillary data gives the best alternative with better delineation of soil mapping units [4].

Soil fertilization could be calculated by soil sampling which was taken from study area, Aerial image analysis, and Yield monitor data. Correlations of soil variables measured over the particular duration of the study were determined in order to assess temporal consistency. This is a very important consideration in precision agriculture. Every soil properties showed high temporal correlation coefficients. Cross-correlations between soil variables help to find the soil character and quality of the soil.

The main principle of the study is to inspect the Possibilities of using remote sensing data for a common survey of the soil conditions and land use in the Chittoor District area. This inspection has four processes [6]. First process is the establishment of the associations between the ground truth and the images; it is based upon the reports and maps, and the Satellite Images. Second process is creating the correlation between the soil conditions and the present day land use, vegetation and other factors of that area. Third process is the founding most appropriate augmentation techniques and best classification methods for the detection of different soil conditions of Vellore District. Final process is the mapping of different soils using satellite image classification methods.

Authentication System through Hand Veins and Knuckle Shape

[1] Shaik Sonu, [2]B.Neelima,[3]A.Rajani,[4]Dr.Irala Suneetha
[1] PG Scholar, Department of ECE, Annamacharya Institute of technology and sciences, Tirupati
[2] Assistant Professor, Department of ECE, Annamacharya Institute of technology and sciences, Tirupati
[3] Assistant professor, Department of ECE, Annamacharya Institute of technology and sciences, Tirupati
[4]Professor & HOD, Department of ECE, Annamacharya Institute of technology and sciences, Tirupati

ABSTRACT

Biometrics is a way that identifies people with the help of physical human features. There are many ways of biometric identification and recognition systems such as fingerprints, face, iris and veins etc. However, these conventional methods have some problems with respect of performance and convenience. Every human hand has unique veins patterns. Hand veins based recognition is most feasible than all of other conventional methods especially because of its easy acquisition process and also difficult to forge hand vein pattern. The proposed sytem 'Dorsal Hand Veins Biometric Recognition System Using Hybrid Algorithms is one of the biometric techniques which introduces the design and implementation of a system using QFT and Butterwort high pass filter algorithms is used to selecting ROI and to estimate the image ROI, edge and morphological filtering for future extraction. These algorithms give good accuracy for the specified region of interest. The first step is to pre-process the image and find the knuckle profile using grayscale thresholding and image inversion. Image segmentation is performed on the image to get the significant edges. The image is then processed to remove noise, and using morphological operations the vein pattern is signified. The region of interest is then cropped and a 1-pixel thick skeleton pattern is obtained using image thinning which is used as a feature for matching and recognition. Triangulation method using Delaunay's principle is used to find vein bifurcations and endings using local thresholding. Finally triplets are matched and used as a parameter to compare image stored in database and input image. The proposed results have been improved when compared to the existing results. The proposed system have been developed in MATLAB 2013a version.

Keywords: - Digital Image Processing, Biometric, Dorsal Hand Veins, Vein recognition.

1. INTRODUCTION

The word biometric is derived from the combination of two Greek words "bio" means "life" and "metrics "means "measure" [1]. Biometric systems are of two types, one behavioral that deals with the behavioral patterns or traits of human body like gait, typing style, handwriting, speaking and movement of body whereas second one is Physiological that deals with the physical appearance of the human body parts doesn't matters either these part are external or internal. For example, hand veins, retina, iris, palm, finger, foot, face and etc. As security has become more valuable in different fields especially in highly protocol cases, that's why these biometrics systems are taken into account because they are unique from human to human and provide far greater security and reliability than other systems. There are many methods that are designed in order to fulfill the security, reliability and high performance criteria by using human biometrics. The oldest technique among these systems is "Facial Recognition System" that was designed to identify a person in crowd. Other biometrics systems used for authentication are handwriting, veins, fingerprint, and voice and so on [2][3]. System that uses fingerprint for authentication and identification is used mostly due to low price and ease of use and identification [4]. People brought implementation closer to eye like Iris and Retina scan because they have better results than voice, handwriting, facial and finger print. One step forward to this people used human hand veins for identification process and so do we. Human veins pattern are unique to every human body and provide a good constraint to differentiate a person from others even in twins [5]. It is very easy to get the pattern of hand veins because hand veins absorb more light than other tissues and gives a prominent image that is enriched in information and easy to classify [3][5]. The vein structure's view depends on many factors such as: skin thickness, person's age, surrounding temperature and a physical activity done by the person and other surface conditions like warts, moles, injury scars, hairs etc [6]. Imaging technologies that are used to acquire images of hand veins are of two types: first one is Far-Infrared (FIR) technology that has spectrum ranges between 8-14 micrometer and effective in capturing the large veins on the back side of hand but it is very sensitive to surrounding conditions due to which it cannot results a good and information enriched image. Second technology is Near Infrared (NIR) technology that has a spectrum ranges from 700-1000 nanometer yielding better and information enriched and

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Blockchain-Bitcoin Transaction Management System for Current Banking System

Hemalatha T, S. Rohini, D Vivekananda Reddy
Department of CSE S V U College of Engineering, Tirupati.
Department of ECE, Annamacharya Institute of Technology and Sciences, Tirupati, India.
Department of CSE S V U College of Engineering, Tirupati. India
**Corresponding author: Hemalatha T, S. Rohini*

Abstract: *Now-a-days Blockchain and Bitcoin are some of the trendiest keywords as part of the today's technology and even those who are not familiar with Cryptocurrency are quite impressed in the same. The Blockchain is been used highly for Transaction Management and it is replacing the current existing Transaction Management System. If a technology is replacing the existing system there must be a certain problem. To overcome such problems Blockchain Concept is used. In this paper, the Blockchain-Bitcoin Transaction Management System is proposed to overcome the issues with current Banking Systems like, Transactional charges, Financial Crises and Financial Depression and Net Banking Frauds. Bitcoin Blockchain solve these issues with the Centralized, Private ledgers/Distributed ledgers with Peer-to-Peer Networks , Prone to Hacks by using Digital Signatures and Double Spending.*

Keywords: *Blockchain; Bitcoin; Transaction Management; Cryptocurrency;Transaction Management System; Banking System; Peer-to-Peer Networks;*

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I. Introduction

A blockchain is a chain of blocks that has taken from an ancient. This technique was visually described in 1991 by the group of researchers and was reasonably intended into timestamp digital documents. So that it was not possible to pack their than or to tamper with them(like notary). However, it depend by mostly on used by and deputed by ―Satoshi Nakamotoll in 2009 to create a digital Cryptocurrency ‗Bitcoinll.

Fig. 1. Blockchain Structure

Blockchain technology promises to be enormously in troublesome and empowering in both public and private sector computing applications. As a way to order transactions in a distributed ledger, blockchains offer a record of consensus with a cryptographic audit trail that can be maintained and validated by multiple nodes. It lets contracting parties dynamically track assets and agreements using a common protocol, thus streamlining and even completely collapsing many in-house and third-party verification processes[1].

Blockchain systems possess a number of attractive attributes for the banking and financial-services markets. Such systems are resilient and can operate as decentralized networks that do not require a central server and do not have a single point of failure. Because they operate using distributed open source protocols, they have integrity and do not need to trust a third party to execute transactions. Public blockchain systems are also inherently transparent, because all changes are visible by all parties. The blockchain functionality also allows applications and users to operate with a high degree of confidence because transactions are unchangeable they cannot be reversed or resequenced. In general, blockchain systems are uniquely able to ensure that contracting parties all have accurate and identical records[1].

Currency transactions between persons or companies are often centralized and controlled by a third party organization. Making a digital payment or currency transfer requires a bank or credit card provider as a middleman to complete the transaction. In addition, a transaction causes a fee from a bank or a credit card company. The same process applies also in several other domains, such as games, music, software etc. The transaction system is typically centralized, and all data and information are controlled and managed by a third party organization, rather than the two principal entities involved in the transaction. Blockchain technology has

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Combined Inference Approach for Large Scale Ontologies based on Map Reduce Paradigm

K. Lakshmi Rupa*, Dr. S. S. Arumugam

Department of Computer Science and Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, Andhra Pradesh, India

ABSTRACT

In blessing technique, an progressive and meted out deduction procedure for Goliath scale ontology's via creating use of Map curb, that acknowledges unbalanced execution thinking and runtime searching, specifically for progressive present's base. With the assistance of constructing up modification induction lush territory and powerful assertion triples, the potential is clearly brought down and therefore the thinking system is disentangled and quickened. At long final, a mannequin method is connected to a Hadoop constitution and therefore the trial influence approves the convenience and adequacy of the projected procedure. We tend to place in energy the FastRAQ methodology on the UNIX system stage, and appraisal it's effectively with around 10 billion aptitudes records. take a look at results exhibit that FastRAQ presents assortment combine inquiry have an effect on at intervals an amount interim 2 requests of activity drop than that of Hive, whilst the relative mistake is prevented than third throughout the given self-belief short-time.

Keywords : Balanced Partition, Large Information, Four-Dimensional Bar Chart, Variety-Total Question

I. INTRODUCTION

WITH an interesting volume of linguistics net understanding and their speedy improve, quite a ton of administrations have up in a very majority of areas like meditative services and life sciences, exchange technique cluster, counseled functions, e-market, internet administrations structure, and cloud framework administration. The linguistics net was as presently as assessed to include four billion triples in 2009 and has currently returned to larger than 20 billion triples. Its advancement value stays to extend. As it's advancing into a worldwide learning targeted approach to vow a mode of reckoning machine insight, serving to capacities viewing over this kind of huge associate degreed fixing dataset has developed to be the main deterrent.

1.1 Motivation

Gigantic talent assessment will watch qualities of distinct social elements and inclinations of character daily practices. This offers a recent out of the sphere new threat to look out Brobdingnagian inquiries involving the difficult world. Case in issue, to amass a robust speculation suggests that Pries et al. bust down the substantial activity abilities units with admire to back associate degreed came an advantage of even 326% larger than that of a discretional funding methodology. Choi et al. equipped gauge representations to conjecture monetary cautioning indicators, adequate to the social state, auto deal, and even areas for a man or lady visiting. Terribly quickly, it's dominating to outfit intense methodologies and instruments for mammoth capacities investigation. We tend to provide a product outline of massive advantage assessment. Distributed interruption awareness strategies (DIDS) uncover and record inconsistency targets or outlandish examples on the gathering level. A DIDS distinguishes oddities with the help of methodology for understanding searching for of abridging website viewer's sides from over a couple of sensors to create stronger false-alert rates of deciding composed strikes.

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TSS: A Time Sequence Scheme for Efficient Message Broadcast in Wireless Networks

BITTI VENKATA SREENIVASAKALYAN[1], DR. S. S. ARUMUGAM[2]

[1]PG Scholar, Dept of CSE, Annamacharya Institute of Technology and Sciences, Tirupathi, AP, India,
E-mail: tejakalyan3@gmail.com.

[2]Professor & HOD, Dept of CSE, Annamacharya Institute of Technology and Sciences, Tirupathi, AP, India,
E-mail: ssarumugam.me@gmail.com.

Abstract: Broadcast is a principal operation in systems, particularly in reconfigurable remote impromptu systems. For instance, some type of broadcasting is utilized by all on-request portable systems steering conventions, when there is vulnerability with regards to the area of the goal hub, or for benefit revelation .In this work, we exhibit another way to deal with productive communicate in systems with dynamic topologies, and we present the time grouping plan (TSS), another online nearby communicating calculation for such systems administration conditions. TSS positions by need, distributedly, competitor broadcasting hubs with the goal that the general number of re-communicates in the system is limited.

Keywords: Broadcast, Time Sequence Scheme, Protocols, Networks, Nodes.

I. INTRODUCTION

In the current framework we proposed an Efficient Tree-based Self-sorting out Protocol (ETSP) for sensor systems of IoTs. In ETSP, all hubs are separated into two sorts: organize hubs and non-arrange hubs. System hubs can communicate parcels to their neighboring hubs. Non-arrange hubs gather the communicated parcels and decide if to join the system. Amid the self-sorting out process, we utilize distinctive measurements, for example, number of tyke hubs, bounce, correspondence separation and lingering vitality to achieve accessible sink hubs' weight, the hub with max weight will be chosen as sink hub. Non-arrange hubs can be transformed into organize hubs when they join the system effectively. At that point a tree-based system can be gotten one layer by one layer. The topology is balanced progressively to adjust vitality utilization and drag out system lifetime. We direct tries different things with NS2 to assess ETSP. Reenactment comes about demonstrate that our proposed convention can build a dependable tree-based system rapidly. With the system scale expanding, the self-association time, normal bounce and parcel misfortune proportion won't build more .in the proposed framework.

We display another way to deal with proficient communicate in systems with Dynamic topologies, and we present the time grouping plan (TSS), another online neighborhood broadcasting calculation for such systems administration conditions. TSS positions by need, distributedly, hopeful telecom hubs with the goal that the general number of re-communicates in the system is limited. We assess TSS, demonstrating that its execution comes amazingly near the comparing hypothetical execution limits, even within the sight of parcel misfortune due, for instance, to MAC-layer crashes. Moreover, we contrast our calculation and various as of late proposed plans considering their execution in different reasonable system portability situations. We exhibit that TSS execution is hearty with regards to versatility actuated topology reconfigurations including fleeting system apportioning amid proliferation of the communicate message.

II. RELATED WORK

Internet of things empowers articles to gather or trade information utilizing many system advancements, for example, sensor systems, remote correspondence, information accumulation and so forth. Among them, sensors arrange is basic to IoTs. It has been broadly utilized as a part of limitation, modern computerization, ecological checking and different applications. Sensor systems comprise of a considerable measure of ease, low-control minor sensor hubs which are haphazardly conveyed. These hubs can speak with each other to gather and forward detecting information. With the scale expanding and gadgets refreshing, the system framework turns out to be increasingly unpredictable. The memory, vitality and capacity of registering are restricted by arrange hubs. With a specific end goal to expand lifetime, numerous specialists put forth a concentrated effort to control arrange topology manufacture better information transmission course and adjust vitality utilization of hubs Tree organize is basically a mix of transport system and star organize, which can draw out the lifetime of system. In this way, how to construct a tree-based system with a most extreme lifetime for sensor systems of IoTs has turned into a basic issue at exhibit. Be

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A Novel Path Inference Approach to Reconstructing the Per-Packet Routing Paths in Wireless Sensor Networks

M. VENGABABU[1], B. PURUSHOTHAM[2]

[1]PG Scholar, Dept of CSE, Annamacharya Institute of Technology & Sciences, Tirupati, AP, India,
E-mail: vengababumiriam@gmail.com.

[2]Assistant Professor, Dept of ECE, Annamacharya Institute of Technology & Sciences, Tirupati, AP, India,
E-mail: purush_bmp@yahoo.com.

Abstract: The wireless sensor networks (WSNs) are fetching more and more difficult with the growing community scale and the dynamic nature of wsn communications. Many measurements and diagnostic methods depend upon per-packet routing paths for accurate and first-rate-grained analysis of the complex community behaviors. In previous reviews, we used iPath, a novel course inference technique to reconstructing the per-packet routing paths in dynamic and huge-scale networks. The basic suggestion of iPath is to exploit excessive route similarity to iteratively infer lengthy paths from short ones. However a wireless sensor community can get separated into more than one connected accessories due to the failure of a few of its nodes, which is referred to as a cut. In this we do not forget the drawback of detecting cuts with the aid of the rest nodes of a wireless sensor community. We endorse an algorithm that permits each node to realize when the connectivity to a in particular exact node has been misplaced, and one or more nodes to notice the occurrence of the reduce.

Keywords: Wireless Networks, Sensor Networks, Network Separation, Detection And Estimation, Iterative Computation.

I. INTRODUCTION

Wireless sensor networks (WSNs) can also be useful in lots of software eventualities, e.g., structural safety [1], ecosystem administration [2], and urban CO monitoring [3]. In a normal WSN, a quantity of self-prepared sensor nodes file the sensing knowledge periodically to a important sink by way of multihop wireless. Some nodes may just fail as a result of mechanical concern, battery hindrance, etc... Actually, node failure is expected to be fairly normal because of the most often restricted energy budget of the nodes which might be powered by using small batteries. Failure of a collection of nodes will scale down the number of multi-hop paths within the network. Such failures can cause a subset of nodes – that have not failed – to become disconnected from the rest, resulting in a "cut". Two nodes are stated to be disconnected if there is no route between them. In this we advocate a disbursed algorithm to become aware of cuts, named the distributed reduce Detection (DCD) algorithm. The algorithm allows each node to observe DOS (Disconnected from supply) pursuits and a subset of nodes to observe CCOS (linked, but a cut passed off somewhere) routine. The algorithm we advise is allotted and asynchronous: it includes most effective nearby communication between neighboring nodes, and is strong to rapidly communication failure between node pairs. A key element of the DCD algorithm is a disbursed iterative computational step through which the nodes compute their electrical potentials. The convergence rate of the computation is independent of the scale and constitution of the community.

II. RELATED WORK

In wired IP networks, best-grained community dimension entails many elements equivalent to routing path reconstruction, packet prolong estimation, and packet loss tomography. In these works, probes are used for dimension motive [4][5]. Hint route is a ordinary community diagnostic instrument for exhibiting the path more than one probes. DTrack [5] is a probe-established path monitoring approach that predicts and tracks internet path alterations. In keeping with the prediction of route changes, DTrack is capable to monitor direction changes effortlessly. FineComb [4] is a recent probe-headquartered community extend and loss topography method that makes a specialty of resolving packet reordering. Actually, a recent work [6] summarizes the design space of probing algorithms for network efficiency size. Making use of probes, nevertheless, is mainly now not fascinating in WSNs. The essential intent is that the wireless dynamic is difficult to be captured with the aid of a small quantity of probes, and popular probing will introduce excessive energy consumption. A recent work [7] investigates the quandary of selecting per-hop metrics from finish-to-finish course measurements, below the belief that hyperlink metrics are additive and consistent. Without making use of any energetic probe, it constructs a linear method by means of the top to finish measurements from a quantity of inside monitors. Course knowledge is believed to exist as prior capabilities to build the linear approach.

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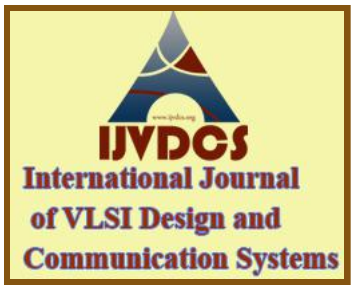

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Secure Share Data KP_ABE with Third Party Verification in Cloud Computing

K. HARISH[1], G. LAKSHMI NARAYANA

[1]PG Scholar, Dept of CSE, Annamacharya Institute of Technology & Sciences, Tirupathi, AP, India,
Email: khnr.it@gmail.com.

[2]Assistant Professor, Dept of CSE, Annamacharya Institute of Technology & Sciences, Tirupathi, AP, India,
Email: laxminarayana0526@gmail.com.

Abstract: In the cloud, for achieving access control and keeping data confidential, the data owners could adopt attribute-based encryption to encrypt the stored data. Users with limited computing power are however more likely to delegate the mask of the decryption task to the cloud servers to reduce the computing cost. As a result, attribute-based encryption with delegation emerges. Still, there are caveats and questions remaining in the previous relevant works. For instance, during the delegation, the cloud servers could tamper or replace the delegated ciphertext and respond a forged computing result with malicious intent. They may also cheat the eligible users by responding them that they are ineligible for the purpose of cost saving. Furthermore, during the encryption, the access policies may not be flexible enough as well. Since policy for general circuits enables to achieve the strongest form of access control, a construction for realizing circuit Secure Share Data KP_ABE with Third Party Verification with verifiable delegation has been considered in our work. In such a system, combined with verifiable computation and encrypt-then-mac mechanism, the data confidentiality, the fine-grained access control and the correctness of the delegated computing results are well guaranteed at the same time. Besides, our scheme achieves security against chosen-plaintext attacks under the k-multilinear Decisional Diffie-Hellman assumption. Moreover, an extensive simulation campaign confirms the feasibility and efficiency of the proposed solution.

Keywords: KP_ABE, VD-CPABE, Ciphertext, Cloud Servers.

I. INTRODUCTION

The emergence of cloud computing brings a revolutionary innovation to the management of the data resources. Within these computing environments, the cloud servers can offer various data services, such as remote data storage [1] and outsourced delegation computation [2], [3], etc. For data storage, the servers store a large amount of shared data, which could be accessed by authorized users. For delegation computation, the servers could be used to handle and calculate numerous data according to the user's demands. As applications move to cloud computing platforms, ciphertext-policy attribute-based encryption (CP-ABE) [4], [5] and verifiable delegation (VD) [6], [7] are used to ensure the data confidentiality and the verifiability of delegation on dishonest cloud servers. There are two complementary forms of attribute-based encryption. One is key-policy attribute-based encryption (KP-ABE) [8], [9], [10], and the other is ciphertext-policy attribute-based encryption. In a KP-ABE system, the decision of access policy is made by the key distributor instead of the encipherer, which limits the practicability and usability for the system in practical applications. On the contrary, in a CP-ABE system, each ciphertext is associated with an access structure, and each private key is labeled with a set of descriptive attributes[11]. A user is able to decrypt a cipher-text if the key's attribute set satisfies the access structure associated with a ciphertext.

Apparently, this system is conceptually closer to traditional access control methods. On the other hand, in a ABE system, the access policy for general circuits could be regarded as the strongest form of the policy expression that circuits can express any program of fixed running time. Delegation computing is another main service provided by the cloud servers. In the above scenario, the healthcare organizations store data files in the cloud by using CP-ABE under certain access policies. The users, who want to access the data files, choose not to handle the complex process of decryption locally due to limited resources. Instead, they are most likely to outsource part of the decryption process to the cloud server. While the untrusted cloud servers who can translate the original ciphertext into a simple one could learn nothing about the plaintext from the delegation. The work of delegation is promising but inevitably suffers from two problems. a) The cloud server might tamper or replace the data owner's original ciphertext for malicious attacks, and then respond a false transformed ciphertext. b) The cloud server might cheat the authorized user for cost saving. Though the servers could not respond a correct transformed ciphertext to an unauthorized user, he could cheat an authorized one that he/she is not eligible. Further, during the deployments of the storage and delegation services, the main requirements of this research are presented as follows.

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An Effective Thresholding Technique for Otsu's Method using Contrast Enhancement

[1]A Sankar Reddy, [2] C Usha Rani, [3] M. Sudhakar
[1] Assistant Professor, [2] Assistant Professor, [3] Research Associate
[1, 2] AITS, JNTUA University, [3] VIT Chennai
[1] sankar551@gmail.com
[2] ch.usha86@gmail.com
[3] malla.sudhakara2015@vit.ac.in

Abstract
Image segmentation is the fundamental approach of digital image processing. Among all the segmentation methods, Otsu method is one of the most successful methods for image thresholding because of its simple calculation. Otsu is an automatic threshold selection region based segmentation method. This paper works based on the principle of binarization of Otsu's method. In addition, various enhancement schemes are used for enhancing an image which includes gray scale manipulation, filtering and Histogram Equalization (HE). Histogram equalization is one of the well-known image enhancement technique. It became a popular technique for contrast enhancement because this method is simple and effective. In the latter case, preserving the input brightness of the image is required to avoid the generation of non-existing artifacts in the output image. Although these methods preserve the input brightness on the output image with a significant contrast enhancement, they may produce images with do not look as natural as the input ones. The proposed work is divided into three stages. Firstly, Histogram Equalization is applied to the low contrast input image. Secondly, we are obtaining the bimodal image by applying Otsu's binarization, Thirdly, Otsu's thresholding technique is applied to get the binary image. The experimental analysis shows that the results are better than the state of the art methods applied. We have shown the comparison results subjectively as well as objectively. Subjective parameters are visual quality and computation time and objective parameters are Peak signal to-noise ratio (PSNR), Mean squared error (MSE and Average Information Content (AIC).

Index Terms: Image Enhancement, Otsu algorithm, Segmentation, Thresholding.

I.Introduction

Image segmentation is one of the most fundamental and difficult problems in image analysis. Image segmentation is an important part of image processing. In computer vision, image segmentation is the process of partitioning an image into meaningful regions or objects. There are various applications of image segmentation like locate tumors or other pathologies, measure tissue volume, computer-guided surgery, treatment planning, study of anatomical structure, locate objects in satellite images and fingerprint recognition etc. Segmentation subdivides an image into its constituent region or object. Image segmentation methods are categorized on the basis of two properties discontinuity and similarity [1].Based on this property image segmentation is categorized as Edged based segmentation and region based segmentation.

The segmentation methods that are based on discontinuity property of pixels are considered as boundary or edges based techniques. Edge based

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The Study and Literature Review of a Feature Extraction Mechanism in Computer Vison

[1]S Reddy Sowmya, [2]ASankar Reddy,[3] M Sudhakar
[1] PG Scholar, [2]Assistant Professor, [3]Research Scholar
[1] SSITS, [2]AITS JNTUA University,[3]VIT
[1]*sowmyasettipalli@gmail.com*
[2]*sankar551@gmail.com*
[3]*mallasudhakar.cse@gmail.com*

Abstract— Detecting the Features in the image is a challenging task in computer vison and numerous image processing applications. For example to detect the corners in an image there exists numerous algorithms. Corners are formed by combining multiple edges and which sometimes may not define the boundary of an image. This paper is mainly concentrates on the study of the Harris corner detection algorithm which accurately detects the corners exists in the image. The Harris corner detector is a widely used interest point detector due to strong features such as rotation, scale, illumination and in the case of noise. It is based on the local auto-correlation function of a signal; where the local auto-correlation function measures the local changes of the signal with patches shifted by a small amount in different directions. In out experiments we have shown the results for gray scale images as well as for color images which gives the results for the individual regions present in the image. This algorithm is more reliable than the conventional methods.

Index Terms: *corner detection, Harris methodology, pattern recognition.*

*****

I. INTRODUCTION

Extracting the features and identifying the matching region of features in digital image processing is the key technology in the field of computer vision, which establish the feature description and look for the corresponding relationship between the pixels in the same scene through the salient features extracted from the image, and it have a wide range of applications in 3D modeling, pattern recognition, image registration, motion capture and direction.A digital image is denoted as a two dimensional image which contains a finite set of digital values, called picture elements. These picture elements are also known as pixels. Pixel values typically represent gray levels, colors, heights; opacities etc. Remember digitization implies that a digital image is an approximation of a real scene. Processing of image data for storage, transmission and representation for autonomous machine perception some argument about where image processing ends and fields such as image analysis and computer vision start Image registration is an important step of remote sensing image processing, and it is pre-processing of image mosaic, image fusion, relative radiometric normalization, land use classification, and land use change detection, etc. Primary task of the remote sensing image registration is to find correct ground control point correspondences on the base image and the warp image. With the development of the computer science, pattern recognition, artificial intelligence, and image processing technology, many kinds of full-automatic or semi-automatic image registration algorithms are proposed, the key procedures including two aspects: one is to detect ground control point automatically.

Corners are important local features in images. Generally speaking, they are the points that have high curvature and lie in the junction of different brightness regions of images. In a variety of image features, corners are not affected by illumination and have the property of rotational invariance. They are only about 0.05% in the whole pixels. Without losing image data information, extracting corners can minimize the processing data. In other words, Corner is the point which testing function energy is very intense in any direction changes, it is one of the most important feature of the data information. The accuracy and quality of the corner detection directly affect the results of image processing, and can determine the outline features and important information of the image. Corner detection are used for camera calibration, optical flow velocity measuring, motion estimation, measurement and positioning etc., and has become an important tool for image processing. Corner detection can not only keep the useful image information but also can reduce data redundancy and improve the detection efficiency [1]. At present, the corner detection algorithm can be divided into two types: one is based on the image gray data; the other is based on image edge data. The former algorithm firstly compared the size of the template region's gray values with the image regions, and then matches. The accuracy of the algorithm is relatively higher, but it has some drawback such as complex calculations, precision positioning is not high and real-time processing of image data is poor. While the latter algorithm need to encode the image edges, and has great dependence on the edge of the image, the corner detection information will be lost if the image cannot provide completely [2] [3]. In order to take full advantage of the corner information in different scales, this paper obtained the different frequency components of the image by wavelet decomposition. And then, extracts the corner information on each sub-band. Simulation results

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TRAINING NEEDS ASSESSMENT (TNA) THROUGH MAPPING OF EMPLOYEE COMPETENCY: A REVIEW OF RESEARCH

P. Akthar Sulthana[1] | [1]*Research Scholar, Rayalaseema University, Kurnool, Andhra Pradesh, India*

Dr. C. Madhavaiah[2] | [2]*Asst. Professor, Pondicherry University, Karaikal Campus, Pondicherry, India*

ABSTRACT

At the heart of any successful activity lies a competence or a skill. In today's competitive world it is becoming particularly important to build on the competitive activities of business. Over the years, highly skilled and knowledge based jobs are increasing while low skilled jobs are decreasing. Competency Mapping is a process of identifying key competencies for an organization, the jobs and functions within it. So, every well managed organization should have well defined roles and list of competencies required to perform each role effectively. Competency mapping analyses individual's SWOT for better understanding and this helps to improve his career growth and to generate the most successful things and the maximum quality work. This identifies the gap for improving knowledge to develop. The large organizations often employ some kind of competency mapping to understand how to most competently employ the competencies of workers. Competency mapping has been used for job-evaluation, recruitment, training and development, performance management, succession planning etc. The purpose of this article is to identify the importance of employee competency mapping and the benefits of Training need assessment.

KEY WORDS: *TNA, Training needs assessment, competency mapping, competence, and skills.*

I. INTRODUCTION

One of the major objectives of every company is to improve its performance every year and set new standards and norms. For every operation and machine there is a human being and it is the quality of the man behind the machine or process which determines the performance of the company. In view of this, the performance of the company depends not on the human assets but the human asset having right match of competencies and their levels for performance requirements. It the right match of competencies is available with the employees, and then it is their motivation, work environment and incentives which help them to give their best performance. In **InfoTech**, a PCMM Level 5 company has a successful competency-based HR system. Recruitment, training, job rotation, succession planning and promotions-all are defined by competency mapping. Dr. Devendra Nath, executive vice-president of the company, who had initiated the PCMM process in the parent company (L&T) in 1997, said, "Nearly all our HR interventions are linked to competency. Competencies are enhanced through training and job rotation." He adds that all People who have gone through job rotation undergo a transformation and get a broader perspective of the company. For Instance, a person lacking in negotiation skills might be put in the sales or purchase department for a year to hone his skills in the area.

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RESEARCH ARTICLE

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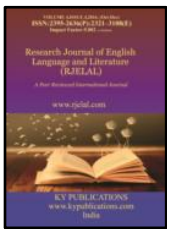
IDENTITY CRISIS IN THE NOVEL OF BAPSI SIDHWA'S *ICE- CANDY- MAN*

Dr.D.BHARATHI[1], Dr.P.KRISHNAVENI[2]
[1,2]Assistant Professor of English,
Annamacharya Institute of Technology & Sciences, Tirupati



ABSTRACT
Bapsi Sidhwa, "Pakistan's finest English language novelist" is an international writer and she got international acclamation for her works. She received several prestigious awards like Sitara-i-Imtiaz, Pakistan's highest national honour in arts in 1991, the LiBeraturepreis Award, Lila Wallace Reader's Digest Writer's Award etc. Basically Sidhwa is an active social worker. She was born on August 11, 1939, in Karachi, Pakistan, the then part of India and was brought up in Lahore. She is the author for five novels and her third novel is *Ice-Candy-Man* (1988) – in USA it was published as *Cracking India*. The novel deals about the Pre-Partition and Post-Partition of India. Sidhwa writes this novel from a Parsi perspective. The novel depicts the holocausts of Partition without morbidity or censure. She not only depicts how communal riots played a vital role in the Partition but also how women in all communities were used as a play material in the Partition play ground.

KEY WORDS: Partition of India, Communal riots, Women bodies, Identity of Minorities, Atrocity

INTRODUCTION:

The topic of Indian Independence is an ever interesting theme for many writers. On this arena one can find not only works on conflagrations on either side of Radcliffe Line but a number of films were also deal with the same theme. *Ice-Candy-Man* or *Cracking India* by Bapsi Sidhwa (1988), which was made into a film *1947* subtitled *Earth* (1999) is one among them that focus on "Freedom was not FREE to the sub-continent." In fact *Ice-Candy-Man* has an element of autobiography where Sidhwa not only narrates from the perspective of a Pakistani regarding the "dark days" in the history of united India, through a character called Lenny, an eight-year-old polio affected girl-child belonging to a marginalized Parsi community who stands as a full-time spectator and a witness to various socio-religious and political disparities and also provides Ranna's experience as a victim – how minorities were marginalized during and after the partition.

DISCUSSION

Lenny is under the total care of Shanta, a Hindu from Amritsar, called *Ayah*, one of the servants in Lenny's house at Warris Road in Lahore. Lenny is not sent to school because her family doctor suggests that she should evade strain to her mind and to her polio-effected leg since it needs complete supervision. Being intelligent, Lenny observes that people of different religions such as Hinduism, Islam, Christianity, Sikhism, Zoroastrianism, etc. are very amicable with one another and they are ready to help and even sacrifice for one another as they are bound to friendship. Though the people of different communities live within their own houses, the boundaries drawn around them are never rigid. There is a lot of intermingling and exchange. They

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Full Length Article

Morphological and structural analysis of manganese oxide nanoflowers prepared under different reaction conditions

J. Venkata Swetha, A. Geetha*, K. Ramamurthi

Crystal Growth and Thin Film Laboratory, Department of Physics and Nanotechnology, Faculty of Engineering and Technology, SRM Institute of Science and Technology, Kattankulathur, 603203, Tamil Nadu, India

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ABSTRACT

Manganese oxide nanoflowers were synthesized by a simple hydrothermal method at 150 °C and 170 °C temperature using potassium permanganate (0.1 M and 0.3 M) as manganese source and cetyltrimethylammonium bromide (0.05 M) as size reducing reagent. A reaction duration of 12 h was used in all the experiments. The synthesized product consists of the mixed phases of cubic Mn_2O_3 and orthorhombic Mn_3O_4 systems as analyzed from X-ray diffraction studies. Fourier transform infrared spectroscopic studies confirmed the presence of Mn-O bond. High resolution transmission electron microscopic images show the formation of nanoflower structures. The average diameter of the nanoflowers is ~771 nm. The influence of reaction temperature and molar concentration of potassium permanganate on the morphology of manganese oxide was studied by field emission scanning electron microscopy.

1. Introduction

Nanostructured materials with hierarchical architectures have drawn the attention of many investigators because of their outstanding structural diversity and peculiar chemical and physical properties. Dimensionality and quantum confinement effects make nanostructured materials to find applications in various fields such as magnetic storage devices, catalysis, electrode materials, energy storage devices and sensors [1]. In recent years, semiconductor metal oxides are attracting great attention because of their wide applications [2,3]. One of such metal oxides, manganese oxide, is non-toxic, abundant in nature and cost effective. Mn exists in various oxidation states (+2, +3, +4) and yields different phases of MnO, MnO_2, Mn_2O_3 and Mn_3O_4. Among these manganese oxides Mn_3O_4 and Mn_2O_3 find potential applications in catalysis [4], energy storage medium in lithium-ion battery [5], supercapacitors [6] and sensors [7]. Reports show that manganese oxide nanoparticles possessing various nanostructures, like rods [8], wires [9], cubes [10,11] and hollow spheres [12] were synthesized through sol–gel [13], hydrothermal [14–17], thermal decomposition [18] and precipitation [19] methods. Wang et al. [1] reported on the synthesis of three-dimensional flower like Mn_3O_4/Mn_2O_3 hierarchical architectures by novel chemical reaction route. Jana et al. [20] synthesized flower like hierarchical nanostructures of Ag doped MnO_2 by using facile wet chemical and photo chemical routes. Ni et al. [21] synthesized manganese oxide flower like nanostructures with size 35 nm by simple and effective low temperature reduction route. Zhang et al. [22] reported synthesis of porous Mn_2O_3 nanoflower structures with ~20 μm size by using simple hydrothermal method. Sun et al. [23] prepared nano wires with diameter ranging from 30 nm to 100 nm by using hydrothermal process. Shrividhya et al. [24] synthesized manganese oxide nano particles with 31 nm size by co-precipitation method. Ali et al. [25] reported on the synthesis of MnO_2 nano flowers with 100 nm diameter by electro winning technique. Zhu et al. [26], Zhang et al. [27], Hassan et al. [9], Dang et al. [6] and Wang et al. [28] reported on the synthesis of manganese oxide flower-like microsphere, Mn_2O_3 nanoflowers and Mn_3O_4 nano ellipsoids, Mn_2O_3 nanowires,MnO_2 worm-like fibers and 3D-flower like structures respectively by hydrothermal method. Thus among various methods employed to synthesize manganese oxides, the hydrothermal method provides various nanostructures and these structures can be used for applications in various fields [9,11]. Hence, in this work, we employed the hydrothermal method to synthesize manganese oxide nanoflowers varying the synthesis parameters and studied their effect on the structural and morphological properties.

* Corresponding author.
E-mail address: geetha.a@ktr.srmuniv.ac.in (G. A.).

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Morphology dependent facile synthesis of manganese oxide nanostructures for oxygen reduction reaction

J. Venkata Swetha[a], Haridas Parse[b], Bhalchandra Kakade[b,*], A. Geetha[a,*]

[a] Department of Physics and Nanotechnology, Faculty of Engineering and Technology, SRM Institute of Science and Technology, Kattankulathur 603203, Tamil Nadu, India
[b] SRM Research Institute, SRM Institute of Science and Technology, Kattankulathur 603203, Tamil Nadu, India

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ABSTRACT

The present work demonstrates the morphology dependent synthesis of manganese oxide using simple hydrothermal method just by adjusting the reaction temperature. The structural and morphological studies confirm the formation of manganese oxide with different phases and anisotropic structures of manganese oxide. Interestingly, electrochemical studies exhibit significant oxygen reduction reaction (ORR) kinetics by manganese oxide nanowires with improved onset potential of +0.83 V versus reversible hydrogen electrode (RHE) and current density of 1.75 mA/cm^2 in alkaline condition. Among three different morphologies, nanowires show better catalytic activity due to improved diffusion path length and higher aspect ratio. However, all the three samples follow two (2) - electron transfer ORR kinetics, though four electron transfer kinetics has been of great interest for energy conversion applications. Experimental results represent that the reaction temperature plays a key role in forming different shapes and affect the crystal phase and growth process thereby affecting electrochemical properties.

1. Introduction

In the past few decades transition metal oxides (TMOs) have gained attention because of their promising physical and chemical behaviours. TMOs are extensively used for many technological applications in various fields, catalysis, molecular, adsorption, magnetic devices and energy storage applications [1–3]. Among various TMOs, manganese oxide has been a special candidate as it exhibits variable oxidation states like +2, +3 and +4 [4], yields different phases of MnO, MnO_2, Mn_2O_3 and Mn_3O_4 which could make them to exhibit various promising features like high surface area, catalytic activity, redox stability and reduced toxicity and so on. As a result, a plethora of applications in various energy conversion and storage device like fuel cells [5], ion based batteries [6], supercapacitors [7], waste water treatment [8], catalysis [9], sensors [10] and rechargeable batteries [11–13] have been shown previously. Especially, Mn_2O_3 and Mn_3O_4 play a major role in rechargeable batteries [14], hydrogen storage [15] and micro electronics [16]. Consequently, several novel and effective routes are available to synthesize manganese oxide including hydrothermal [17–19], sol-gel [20,21], pulse laser ablation [22], precipitation [23] and so on. Among these methods, the hydrothermal method has been most widely employed due to its better control over thermodynamics. It also permits lower working temperature and controlled reaction kinetics during various materials synthesis. Moreover, it is quite suitable and reliable for the synthesis of identical anisotropic nanostructures [24–26]. Importantly, the hydrothermal process could be efficiently employed for the synthesis of well-structured manganese oxide by changing different growth parameters such as temperature, concentration of reactants, concentration of surfactant, solvent etc. to improve the material properties [27]. Additionally, the hydrothermal method has great advantage to synthesize size and morphology controlled single phase, pure and porous Mn_3O_4 hierarchical structures [28]. As a result, different nanostructures of manganese oxide like nanotubes [29], nanosphere [30], nanorods [31] nanowires [32] and nanoflowers [33,34] have been reported using hydrothermal process.

Besides, oxygen reduction reaction (ORR), a rate determining cathodic reaction in low temperature fuel cells has been of great importance since many decades [35]. Platinum (Pt) has been reported as one of the most promising electrocatalysts for such application. However, Pt is very expensive and corrosive in fuel cell operating conditions and thus many researchers are trying to develop cost-effective catalysts like TMOs as better alternative to Pt, especially in alkaline fuel cells [36]. A plethora of TMO based noble metal-free electrocatalysts have been reported in the past 2–3 decades, which show competitive ORR kinetics to that of Pt [37]. For example, Yabuuchi et al., reported Fe and Mn-based positive electrode materials for rechargeable sodium

* Corresponding authors.
E-mail addresses: bhalchandrakakade.a@res.srmuniv.ac.in (B. Kakade), geetha.a@ktr.srmuniv.ac.in (A. Geetha).

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JOULE HEATING AND THERMAL DIFFUSION EFFECTS ON MHD RADIATIVE AND CONVECTIVE CASSON FLUID FLOW PAST AN OSCILLATING SEMI-INFINITE VERTICAL POROUS PLATE

C. Veeresh[a], S. V. K. Varma[a], A .G. Vijaya Kumar[b, **], M. Umamaheswar[c] and M. C. Raju[c]

[a] *Department of Mathematics, Sri Venkateswara University, Tirupati-517 502, A.P, India.*
[b] *Department of Mathematics, SAS, VIT University, Vellore-632014, TN, India.*
[c] *Department of Humanities and Sciences, Annamacharya Institute of Technology and Sciences(Autonomous), Rajampet-516 126, A.P, India.*

ABSTRACT

An analysis is performed to investigate the effects of Joule heating and thermal diffusion on unsteady, viscous, incompressible, electrically conducting MHD heat and mass transfer free convection Casson fluid flow past an oscillating semi-infinite vertical moving porous plate in the presence of heat source/sink and an applied transverse magnetic field. Initially it is assumed that the plate and surrounding fluid at the same temperature and concentration at all the points in stationary condition in the entire flow region. Thereafter a constant temperature is given to the plate hence the buoyancy effect is supporting the fluid to move in upward direction and is assumed that gravity is the only force which acts against to the flow direction. The governing flow is modeled in the form of partial differential equations with initial and boundary conditions. With suitable non-dimensional quantities the governing non-linear partial differential equations obtained in dimensionless form, which are solved numerically with finite difference scheme. Numerical results for non-dimensional velocity, temperature and concentration as well as the skin-friciton, the rate of heat transfer and the rate of mass transfer studied for different physical parameters. The results show that the solutal boundary layer thickness of the fluid enhances with the increase of Prandtl number and the temperature is increased by an increase in the heat source by the fluid. The central reason behind this effect is that the heat source causes an increase in the kinetic energy as well as thermal energy of the fluid. The momentum and thermal boundary layers get thinner in case of heat source fluids.

Keywords: *Casson fluid, MHD, free convection, thermal diffusion, Joule dissipation, heat and mass transfer*.

1. INTRODUCTION

The study of Casson fluid flow on MHD free convection flows with heat transfer past a porous plate is attracting the attention of many researchers. Casson fluid in one of such fluid, this fluid has distinct features and is quite illustrious recently. Casson fluid model was introduced by Casson in 1959 for the prediction of the flow behavior of pigment-oil suspension. So for the flow, the shear stress magnetic of Casson fluid needs to exceed the yield shear stress, or else the fluid behaves as a rigid body. This kind of fluids can be marked as a purely viscous fluid with high viscosity. Casson model is based on a structure model of the interactive behavior of solid and liquid phases of two phase suspensions. Some famous examples of Casson fluid include jelly, sauce, tomato, honey, soup and concentrated fruit juice. Human blood can also be treated as Casson fluid due to the presence of several substances such as fibrinogen, protein, globulin in aqueous base plasma and human red blood cell. In all of the above studies the solutions of Casson fluid are either obtained by using approximate method or by any numerical scheme.

There are many cases in which the exact analytical solutions of Casson fluid are obtained. Vajravelu and Mukhopadhyay (2013) studied diffusion of chemically reactive species in Casson fluid flow over an unsteady permeable stretching surface. Das et al. (1996) analyzed Casson fluid flow in a pipe filled with a homogeneous porous medium. Nadeem et al. (2013) considered MHD three-dimensional Casson fluid flow past a porous linearly stretching sheet. MHD flow of a Casson fluid over an exponentially shrinking sheet is addressed by Nadeem et al. (2012). Pramanik (2014) investigated Casson fluid flow and heat transfer past an exponentially porous stretching surface in the presence of thermal radiation. Hayat et al. (2012) discussed soret and Dufour effects on magneto hydrodynamic flow of Casson fluid. Mustafa et al. (2011) considered unsteady boundary layer flow of a Casson fluid due to an impulsively started moving flat plate. Numerical study of pulsatile MHD Non-Newtonian fluid flow with heat and mass transfer through a porous medium between two permeable parallel plates is addressed by Abdelna et al. (2006). Mukhopadhyay (2013) discussed effects of thermal radiation on Casson fluid flow and heat transfer over an unsteady stretching surface subjected to suction/blowing. Mukhopadhyay et al. (2013) considered Casson fluid flow over an unsteady stretching surface.

Shateyi et al. (2014) studied numerical analysis of MHD stagnation point flow of Casson fluid, heat and mass transfer over a stretching sheet. Boyd et al. (2007) discussed analysis of the Casson and Carreau-Yasuda non-Newtonian blood models in steady and oscillatory flows using the lattice Boltzmann method. Mernone et al. (2002) discussed a mathematical study of peristaltic transport of a

* Corresponding author. Email: vijayakumarag@vit.ac.in

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RESEARCH ARTICLE

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Investigations on the parameters limiting the performance of CdS/SnS solar cell

Ramya K.[1,2] | Ramakrishna Reddy K.T.[1]

[1] Department of Physics, Sri Venkateswara University, Tirupati 517502, India

[2] P.G. Department of Physics, Women's Christian College, Chennai 600006, India

Correspondence
K. Ramya, P.G. Department of Physics, Women's Christian College, Chennai 600006, India.
Email: drramya.physics@gmail.com

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Summary

Debutant analysis of the parameters impeding the efficiency of the CdS/SnS-based photovoltaic device is the chief novelty of the present report. We have developed thin-film heterojunction solar cells with the stacking sequence: glass/Al-doped ZnO/CdS/SnS/In. The two crucial issues, band offsets and cell studies, are discussed in detail. The band offsets at the CdS/SnS interface have been systematically evaluated by semidirect X-ray photoelectron spectroscopy. The calculated valance band offset (ΔE_v) and conduction band offsets (ΔE_c) are found to be 1.46 and −0.36 eV, respectively. The negative value of conduction band offset indicates that the junction formed is of type-II (staggered-type heterojunction). Electrical studies revealed power conversion efficiency of 0.32% with V_{OC}, J_{SC}, and fill factor as 170.61 mV, 7.26 mA/cm^2, and 0.26, respectively. The impact of the offset values on the cell studies is clearly elucidated. The reasons for the low efficiency are spotlighted. Collectively, this article gives the overview of the systematic approach undertaken to get obvious picture about the barriers that limit the conversion efficiency of the CdS/SnS-based solar cell and the measurements required for enhancing the efficiency of the SnS-based solar device.

KEYWORDS

heterojucntions, power conversion efficiency, semidirect XPS, staggered type

1 | INTRODUCTION

The increasing demand for the renewable sources of energy and limited availability of the fossil fuels paved a new way for the solar cell technology. The direct way of conversion of solar energy to electrical energy is photovoltaics (PVs). Thin-film heterojunction (HJ) solar cells represent an alternative to standard silicon-based solar cells in the view of the cheaper production than crystalline Si.[1] Recent trends of thin-film solar cells were developed on polycrystalline CdTe and CIGS. Although CIGS cells broke ~23% efficiency barrier in the laboratory specimens and reached 15.7% in industrial modules,[2-4] it was predicted to face supply shortages in long run and usage of the PV technology with low "environmental load" avoiding the Te and Se compounds are of interest in the case of CdTe. Based on this forecast, the major challenge for the solar cell technology is to provide cost-effective, nontoxic, sustainable, and abundant materials in the PV cell usage. In this context, a simple binary absorber material, tin monosulfide (SnS) whose constituent materials are nontoxic, abundantly available with a direct band gap of 1.3 eV is selected as an absorber layer in our solar cells. Although, SnS could be prepared by number of vacuum and nonvacuum techniques,[5-12] in our present work, absorber (SnS) films were prepared by thermal evaporation technique to obtain adhesive, uniform, and high-quality films. In the view, that a novel

RESEARCH ARTICLE OPEN ACCESS

Soret And Dufour Effects On Mhd Boundary Layer Flow Of A Chemically Reacting Fluid Past A Moving Vertical Plate With Viscous Dissipation

E. Manjoolatha [1*], A. Neeraja [2] M. Prasannalakshmi [3], and N. Bhaskar Reddy [4]
[1.] *Dept. of Mathematics, Annamacharya Inst. of Tech & Science, Tirupati, AP, India*
[2.] *Dept. of Mathematics, Aditya College of Engineering, Surampalem, AP, India*
[3.] *Dept. of Mathematics, Sree Vignana Deepthi Degree College, Chittoor, AP, India*
[4.] *Dept. of Mathematics, Sri Venkateswara University, Tirupati, AP, India*
Corresponding author: E. Manjoolatha

ABSTRACT
The object of the present paper is to investigate the Soret and Dufour effects on a steady free convection boundary layer flow of a viscous, incompressible electrically conducting and chemically reacting fluid past a low-heat-resistant sheet moving vertically downwards, by taking viscous dissipation into account. The governing equations are transformed into a set of ordinary differential equations by using similarity transformation and the resultant equations are solved numerically using the fourth order Runge-Kutta method along with shooting technique. The effects of various governing parameters on the velocity, temperature, concentration, skin-friction coefficient, Nusselt number and Sherwood number are shown in figures and tables and discussed in detail.
Key words: Boundary layer flow, Chemical reaction, Soret and Dufour effects, Viscous Dissipation, Vertical plate.

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I. INTRODUCTION

Boundary layers formed across vertical surfaces are a common engineering problem in industry. Some practical areas of application include chemical coating of flat plates, hot rolling, wire drawing, metal and polymer extrusion processes. Many chemical engineering processes like metallurgical and polymer extrusion involve cooling of molten liquid. Some polymer fluids like Polyethylene oxide and polyisobutylene solution in cetane have better electromagnetic properties and can be regulated by external magnetic fields. A comprehensive review on the subject has been made by many authors including Nield and Bejan[1], Ingham and Pop [2,3], Bejan and Khair [4], Trevisan and Bejan [5] and Sakiadis [6]. Postelnicu [7] numerically studied the influence of magnetic field on heat and mass transfer by natural convection from vertical surfaces in porous media by considering the Soret and Dufour effects while Anghel et al.[8] analyzed the Dufour and Soret effects on free convection boundary layer over a vertical surface embedded in a porous medium. Furthermore, Alam and Rahman [9] also investigated the Dufour and Soret effects on mixed convection flow past a vertical porous flat plate with variable suction. Free convection on a vertical plate with uniform and constant heat flux in a thermally stratified micropolar fluid was presented by Chang and Lee [10] whilst Vajravelu et al.[11] and Crane [12] investigated the convective heat transfer on a stretching sheet. Also, Gupta and Gupta [13], Kays and Crawford[14], Ibrahim and Makinde[15,16] made significant contributions to the subject by considering various aspects of the problem of heat and mass transfer on stretching sheets.

Anwar et al. [17] conducted a network numerical study on laminar free convection flow from a continuously-moving vertical surface in thermally-stratified non-Darcian high-porosity medium. Makinde [18] earlier on presented computational results on boundary layer flow with heat and mass transfer past a moving vertical porous plate. The effect of thermal radiation on heat and mass transfer of a variable viscosity fluid past a vertical porous plate permeated by transverse magnetic field was reported in Makinde and Ogulu [19].

In all the above papers viscous dissipation is neglected. But when the motion is under strong gravitational field, or flow field is of extreme size, the viscous dissipative heat cannot be neglected.

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Signed Edge Domination on Rooted Product Graph

[1]C. Shobha Rani, [2]S. Jeelani Begum and [3]G.S.S. Raju

[1]Department of Mathematics,

Madanapalle Institute of Technology & Science,

Madanapalle, India.

charapallishobha@gmail.com

[2]Department of Mathematics,

Madanapalle Institute of Technology & Science,

Madanapalle, India.

sjbmaths@gmail.com

[3]Department of Mathematics,

JNTUA College of Engineering,

Pulivendula, India

rajugss@yahoo.com

Abstract

Let G be a rooted product graph of path with a cycle graph with the vertex set V and the edge set E. Here P_n be a Path graph with n vertices and $C_m(m \geq 3)$ be a cycle with a sequence of n rooted graphs $C_{m1}, C_{m2}, C_{m3}, - - -, C_{mn}$. Then by $P_n(C_m)$ we denote the graph obtained by identifying the root of C_{mi} with the ith vertex of P_n. We call $P_n(C_m)$ the rooted product of P_n by C_m and it is denoted by $P_n \circ C_m$. Every ith vertex of P_n is merging with any one vertex in every ith copy of C_m. So in $G = P_n \circ C_m$, P_n contains n vertices and C_m contains (m-1) vertices in each copy of C_m. In this paper we discuss some results on rooted product graph of path with a cycle graph.

Key Words: Rooted product graph, signed dominating functions, signed domination number.