Chapter 13
Print ISBN: 978-93-90149-42-1, eBook ISBN: 978-93-90149-13-1

A Unified 3-R Outlook for Interior Water Treatment

K. Neetha Delphin Mary[1*], N. Muralimohan[2] and P. Vijayalakshmi[3]

DOI: 10.9734/bpi/crdc/v2

ABSTRACT

Water is critical for all life on the planet. Rapid industrialization and urbanization has caused India to face a water crisis since it has only 4 percent of the world's water resources. In order to resolve the crisis, India has to look for alternative water resources which may include rainwater harvesting, grey water and sewage reuse and desalination. Grey water is defined as waste water generated from the bathroom, laundry and kitchens. Nearly 70 percent of the water used in households results in grey water which can be treated using simple technology and reused. Reuse of grey water reduces the fresh water requirements and reduces the amount of sewage sent to treatment plants. An integrated approach is needed to manage the water and waste water treatment so that water supply is kept clean and waste water is recycled for beneficial use in agriculture and industry. Water and energy are important resources in the 21st century. Water is required to supply energy and energy is required to supply water. The reclamation of wastewater can contribute significantly to the conservation of water and energy resources. Wastewater reclamation and reuse can relieve water scarcity. Reclaimed wastewater can be substituted for natural water. Wastewater is now extensively recognized as an important source of water in water-scarce countries. In recent years not only the threats of improper grey water management have been recognized; there is an increasing international recognition that grey water reuse, if properly done, has a great potential as alternative water source for purposes such as irrigation, toilet flushing, car washing and others. The economic value of grey water from households and small communities is often underestimated. In terms of nutrients, grey water may largely replace commercial fertilizers. For many low-income households, food is the main total daily cost factor. Grey water-irrigated gardens and crop trees develop favorably if certain irrigation rules are followed. Use of treated grey water for irrigation thus contributes to a more balanced food diet and relieves the household budget.

Keywords: Grey water; irrigation; reclamation; electro-oxidation; electro-coagulation.

1. INTRODUCTION

1.1 Grey Water

Waste water generally is made of black water and grey water. Grey water also known as sullage is non-industrial waste water generated from domestic processes such as washing dishes, laundry and bathing (Fig. 1). Grey water comprises 50-80% of residential waste water. Grey water is distinct from black water in the amount and composition of its chemical and biological contaminants (from faces or toxic chemicals).Grey water gets its name from its cloudy appearance and from its status as being neither fresh nor heavily polluted. Essentially, any water, other than toilet wastes, draining from a household is grey water. Although this used water may contain grease, food particles, hair and any number of other impurities, it may still be suitable for reuse [1,2,3].

1.2 Composition of Grey Water

The composition of grey water from its various sources is clearly illustrated in (Table 1).

[1]Department of Civil Engineering, SRS College of Engineering and Technology, Kuppanur, Salem-636 122, Tamil Nadu, India.
[2]Department of Civil Engineering, K.S.R College of Engineering, Tiruchengode, Namakkal-637 215, Tamil Nadu, India.
[3]Department of Environmental Science, Tamil Nadu Pollution Control Board, Chennai, India.
**Corresponding author: E-mail: neethak81@gmail.com;*

Chapter 14
Print ISBN: 978-93-90149-02-5, eBook ISBN: 978-93-90149-08-7

Restoration of Koolipalayam Reservoir by Using Bioclean STP Technology in Tirupur District, Tamilnadu

S. Mohan[1], N. Muralimohan[2*] and P. Tamilchelvan[3]

DOI: 10.9734/bpi/etert/v5

ABSTRACT

This study revealed a poor situation for the lack of water bodies and the available water bodies being polluted by dying unit effluents and other harmful industrial effluents being let out into the available water source due to lack of waste disposal units. The demand for water in and around Tirupur region is very high as the water bodies are very few in number even the available water bodies are being polluted by dying unit effluents and other harmful industrial effluents being let out into the available water source due to lack of waste disposal units. This Kollipalayam reservoir has been a home for several inland and migratory birds for centuries. The water source is the Nallar River, flowing from the Avinashi big Tank and few sewage canals, carrying the effluents and sewage from Tirupur town. Eventually the water level has never come down due to the above sources. The flora and fauna of this tank attracts as many as 135 species of birds from all over. Inland birds like Spot-billed Pelicans, Painted Storks, and etc. It also brings in a huge number of species from other parts of the World during the winter. Starting from November, every year, various birds flock in to kollipalayam reservoir and spend their winter and leave back to their home by the end of March. Bio-Ozolyte Technology has been implemented to treat and restoration the water in the reservoir. In this technology involves three treatments they are biological treatment, Ozone treatment and Anoyte treatment. This study strongly recommends increases the dissolved oxygen level in the water and makes the water favorable for existence of organisms and fit for usage. If this reservoir is restored, all water demands in and around Tirupur can be met.

Keywords: Kollipalayam resrvoir; restoration; biodiversity; bioclean STP; bio-ozolyte; anoyte treatment.

1. INTRODUCTION

1.1 General

Lakes are the important water resources which support millions of people, but due to rapid urbanization and industrialization, many thousands of lakes adjacent to urban center has already been closed. The remaining lakes are most useful for holding domestic waste water and dumping of solid wastes and debris [1,2].

Rapid industrial development, urbanization and increase in agricultural production have led to freshwater shortages in many parts of the world [3]. The water resources of the basin remain almost constant while the demand for water continues to increase. The utilizable water resources of India are stimulated to be 1123 BCM is surface water resources and 433 BCM is ground water resources [4].

Wastewater from different industries possess different characteristics and discharging of the effluents without proper treatment into streams, rivers or an land will lead to serious consequences. There are

[1]*Deparment of Civil Engineering, Mahendra Engineering College, Namakkal, Tamilnadu, India.*
[2]*Deparment of Civil Engineering, K.S.R College of Engineering, Tiruchengode, Tamilnadu, India.*
[3]*Deparment of Civil Engineering, Muthayammal College of Engineering, Namakkal, Tamilnadu, India.*
**Corresponding author: E-mail: muraling83@yahoo.co.in;*

Chapter 12
Print ISBN: 978-93-90149-42-1, eBook ISBN: 978-93-90149-13-1

Feasibility Studies on Removal Efficacy of Treatment of Textile Effluent Using Natural Coagulants in Erode District

N. Muralimohan[1*] and T. Palanisamy[2]

DOI: 10.9734/bpi/crdc/v2

ABSTRACT

An explorative investigation was conducted for the feasible use of natural coagulants in the treatment of textile effluent in Erode district of Tamil Nadu (India). In this article, three natural coagulants namely *Moringa oleifera*, *Tamarina indica*, *Strychonomous potatorum* of 10, 20, 40, 60 and 80 mL dosages were used to spot the suitable one as primary coagulant. Floc formation in coagulation process had been studied in the laboratory scale to determine the optimum dosage of natural coagulants. Pre and post treated textile wastewaters with natural coagulants were considered to evaluate the percentage removal efficiency on the major pollutants of concern in textile effluent such as pH, turbidity, TSS, TDS, COD and BOD. Influence of settling time of natural coagulants on the removal of physiochemical characteristics of textile effluent was studied. From the observed results, the natural coagulant *Moringa oleifera* gives better removal efficiencies with respect to turbidity, TSS, TDS, COD and BOD and appears to be suitable for textile effluent treatment in Erode district, when compared with *Tamarina indica* and *Strychonomous potatorum*. The surface morphology of the untreated textile effluent and treated textile effluent with optimum dosage of *M. oleifera*, *T. indica* and *S. potatorum* were observed by means of SEM analysis.

Keywords: Moringa oliefera; Tamarina indica; Strychonomous potatorum; textile effluent.

1. INTRODUCTION

India is the world's second major manufacturer of textiles and garments after china. The textile and garment industry in India is one of the oldest manufacturing sectors in the country and is currently it's largest. The textile and garment industry fulfils a pivotal role in the Indian economy. Especially Tamilnadu is famous for dyeing, knit wearing, silk sarees, RMG, surgical textiles and for blankets. Erode district in Tamilnadu is situated at the centre of the South Indian peninsula between 11°19.5" and 11°81.05" North latitude and 77°42.5" and 77°44.5" East longitude. Recently, it was observed that Erode district in Tamilnadu were experiencing severe environmental problems due to textile dyeing, leather tanning, paper and pulp processing, sugar manufacturing industries, *etc*.

Textile industry involves wide range of raw materials, machineries and processes to trick the required shape and properties of the final product. The main cause of generation of this effluent is the use of huge volume of water either in the actual chemical processing or during re-processing in preparatory, dyeing, printing and finishing. Textile wastewater pollutants are generally caustic soda, detergents, starch, wax, urea, ammonia, pigments and dyes that increase its BOD, COD, solid contents and toxicity [1]. The treatment methods of waste-water include activated carbon adsorption, oxidation, chemical coagulation/flocculation, electrochemical methods, membrane techniques [2,3] and biological treatment processes are frequently used to treat textile effluents. These processes are generally efficient for Biochemical oxygen demand (BOD) and suspended solids (SS) removal, but they are largely ineffective for removing color from the wastewater [4]. Depending on the waste-water

[1]*Department of Civil Engineering, K.S.R. College of Engineering, Tiruchengode-637 215, India.*
[2]*Department of Civil Engineering, National institute of Technology Karnataka, Surathkal-575025, India.*
**Corresponding author: E-mail: muraling83@yahoo.co.in;*

Chapter 6
Print ISBN: 978-93-90149-56-8, eBook ISBN: 978-93-90149-01-8

Comprehensive Study on Removal Efficiency of Strychonomous Potatorum and Alum as Blended Coagulant for Treatment of Textile Effluent

N. Muralimohan[1*], P. Sudha[1] and T. Palanisamy[2]

DOI: 10.9734/bpi/etert/v4

ABSTRACT

An explorative investigation was conducted for the viable utilization of Strychonomous potatorum seed powder and alum as a blended coagulant for the treatment of textile mill effluent. In this article, natural coagulant Strychonomous potatorum (SP) and conventional Coagulant Alum $Al_2(SO_4)_3$ of 10, 20, 40, 60 and 80 mg/L dosages were used. Different proportions of SP: $Al_2(SO_4)_3$ like 0:0 (P0), 10:90 (P1), 20:80 (P2), 30:70 (P3), 40:60 (P4), 50:50 (P5),60:40 (P6),70:30 (P7), 80:20 (P8) and 90:10 (P9) were used in Pre and post treated textile mill effluents. Formation of floc during coagulation process has been studied in the laboratory extent to ascertain the optimum dosage of blended coagulants and to estimate the percentage removal efficiency of major pollutants in textile mill effluent such as turbidity, TSS, TDS, COD and BOD. when compared with other dosage, from the observed results, the blended coagulant SP: $Al_2(SO_4)_3$ of 40:60 dosage ratio offers better removal efficiencies with respect to turbidity, TSS, TDS, COD and BOD and it has been suggested as an appropriate dosage for the treatment of textile mill effluent.

Keywords: Alum; Strychonomous potatorum; textile mill effluent.

1. INTRODUCTION

Waste water disposal is the major setback being face by developing countries, like India. Currently, only about 10% of the generated waste water is treated and the remnant is discharged into water bodies. India is the world's second largest producer of textiles and garments after China. Textile dyeing processes are among the most environmentally unfriendly industrial Processes, because they produce colored wastewaters that are heavily polluted with dyes, textile auxiliaries and chemicals [1]. Wastewater generated by different production steps of a textile mill have a high pH, temperature, detergents, oil, suspended and dissolved solids, dispersants, leveling agents, toxic and non biodegradable matter, color and alkalinity. Important pollutants in textile effluent are mainly recalcitrant organics, color, toxicants and surfactants, chlorinated compounds (AOX) [2]. In the past several decades, many techniques have been developed to find an economic and efficient way to treat the textile wastewater. The treatment methods of industrial wastewater include activated carbon adsorption, oxidation, chemical coagulation/flocculation; electrochemical methods, membrane techniques [3] and biological treatment processes are frequently used to treat textile effluents. These processes are generally efficient for Biochemical oxygen demand (BOD) and suspended solids (SS) removal, but they are largely ineffective for removing color from the wastewater [4]. But coagulation-flocculation is the most common chemical treatment method used for Decolourization and to achieve maximum removal of COD and TSS [5,6]. Moreover Colloid particles are removed from industrial wastewater via coagulation and the flocculation processes by using many inorganic, synthetic organic polymers and naturally occurring coagulants [7,8].

Aluminium salts are the most widely used coagulants in water and wastewater treatment all over the world. However, the studies by several workers have raised doubts about introducing aluminum into

[1]*Department of Civil Engineering, K.S.R. College of Engineering, India.*
[2]*Department of Civil Engineering, National institute of Technology Karnataka, India.*
**Corresponding author: E-mail: muraling83@yahoo.co.in;*

CONTENTS

Section I
INVITED PAPERS

Section 2
CONTRIBUTED PAPERS

Theme 1: Advanced Cementitious Materials

Theme 2: Alternate Aggregate Materials

Theme 3: Geopolymer Concrete

Theme 8: Ground Improvement Techniques

Theme 9: Construction Management

Theme 10: Transportation Engineering

Mechanical Properties on Self Compacting Geopolymer Concrete By Replacement of GGBS And Bottom Ash

Priyadharsini.M[1] Karthick.P[2], Revathi.V[3],
[1] PG Student, [2]Asst.Professor, [3]Professor, Department of Civil Engineering
KSR College of Engineering, Tiruchengode

ABSTRACT: Self-compacting Geopolymer concrete represent one of the most outstanding advances in concrete technology. Self compacting concrete is a flowing concrete mixture that is able to consolidate under its own weight. The highly fluid nature of SCC make it's suitable for placing in difficult situation and in section with congested reinforcement. The paper studies are carried out of self compacting concrete in which cement is replaced by Ground Granulated Blast Furnace Slag and Bottom Ash in various proportions. The proportion of GGBS:BA in which cement is replaced as 100:0, 75:25, 50:50, 25:75, 0:100. The workability properties such as filling ability, passing ability and resistance to segregation were assessed using slump flow, T-50 slump flow, V funnel ability according to EFNARC were satisfied. Super plasticizer MASTER SKY GLENIUM B233 is used to maintain workability with constant water binder ratio. The result concludes, compressive strength of concrete increase at the percentage G100:B0, G75; B25 at 64.8 MPa, 52.6 MPa give higher strength both passing and filling ability were achieved.

Keywords: Self Compacting Geopolymer Concrete, Bottom Ash, Ground Granulated Blast furnace Slag, Sodium Hydroxide, Sodium Silicate, Super plasticizer Master sky GLENIUM 8233.

1.INTRODUCTION:

Concrete is the world's most versatile, durable and reliable construction material. Large quantities of Portland cement are required for concrete. The consumption of Ordinary Portland Cement causes pollution to the environment due to the emission of CO_2. Self- compacting concrete is required to flow and fill special forms under its own weight, it shall be flowable enough to pass through highly reinforced areas, and must be able to avoid aggregate segregation. Based on the literature reviews were kasi reddy mallikarjuna reddy [1] ash based SCGC replaced with 0 to 100% of GGBS. The specimen was cured both oven and ambient curing. Hence the result shows that adding the GGBS to fly ash based SCGC, the strength properties are increased. Ambient temperature curing for 28days specimen has high strength compared to oven cured specimen at 70℃ for 7days.T.H.Patel [2] fly ash is replaced with 10-50% by cement and GGBS also replaced with 10-50% by cement. Hence the result 10% of fly ash gives better result and 30% of GGBS higher strength and increase workability. E.Sreenivasulu [3] these paper study the replacement of F_{10} G_0, $F_{10}G_5$, $F_{10}G_{10}$.Mechanical property of compressive strength at 28days $F_{10}G_{10}$ increase the strength and maintain the flowing ability, filling ability.

2. MATERIAL USED:

i) Ground Granulated Blast Furnace Slag:

GGBS has essential silicates and alumino silicates of calcium. GGBS is obtained from JSW Cement Company. The specific gravity of GGBS IS 2.7 and light grey was used.

ii) Bottom Ash:

BA was collected from Mettur thermal power plant, Salem. As it was coarse when obtained, it was ground to a practice size of less than 45micron to increase its surface area as well as reactivity. The specific gravity of BA was 2.50 respectively.

iii) Fine Aggregate:

Locally available M sand was used as fine aggregate in this work. The fine aggregate in geopolymer concrete plays a major role in workability and stability of the mix proportion. The M sand passing through 4.75mm and retained on 300microns were used to achieve minimum void ratio and the physical properties like specific gravity, water absorption, fineness modulus are given below

Table1: Test Result on Fine Aggregate

S.NO	DESCRIPTION	TEST RESULT	RELEVANT IS CODE PRACTICES
1	Specific Gravity	2.77	IS2386(Part I)-1963
2	Fineness Modulus	3.74 (Zone-II)	IS2386(Part I)-1963
3	Water Absorption	0.8%	IS2386(Part III)-1963

A Study on Precast Concrete Technology

K. Ashwath[2], D. Kanagaraj[1],
[1]P.G.Student, [2]Assistant Professor, Department of Civil Engineering,
KSR College of Engineering, Tiruchengode, Tamilnadu, India.

ABSTRACT
In this study we have carried out a detailed study on various concepts of precast, gone through a number of literature and found the facts associated with it. We have taken one precast building as a case and compared it with traditional Cast in-situ method. Here we have made cost analysis as well as feasibility check on basis of costing, duration and quality. For more practical study we have visited ongoing and finished construction sites of Precast and cast in-situ, gathered required information. From this analysis, it is remarkably seen that the duration of construction is much lesser than the traditional method and also the cost of precast building is almost the same as that of the traditional method considering the material and labor escalation charges. From all this study we can conclude that the precast concrete system is economical than conventional cast in place method but still there are some conditions which we have to take care of while using precast, those include volume of the construction, distance between site and manufacturing unit, type of building etc.

KEY WORDS: Precast concrete, Rate analysis, Time, Man Power.

1. INTRODUCTION

Ancient Roman builders made use of concrete and soon poured the material into moulds to build their complex constructions such as culverts, and tunnels [1]. Now a day various construction systems such as Slip Form, Tunnel Forming, Pre-Engineering, Precast, etc., are widely adopted in public buildings as well as in private building projects [2]. The standardization and mechanization has brought a substantial change in the development of the construction industry worldwide over last few decades. Recently in India use of precast in building construction is increasing rapidly. Precast concrete is well known technology in which structural elements i.e. Columns, Beams, Shear Walls, Staircases, etc., which are manufactured in factories are used for fast construction [3]. The concept of precast (also known as "prefabricated") construction includes those buildings, where the structural components such as Columns, Beams, Shear Walls, Slabs and Staircases are produced in plants/factory (controlled environment) in a location may away from the building at the site itself. In this method concrete is prepared, poured in formwork and cured in controlled environment [4]. In this method quality of concrete can be assured because concrete is prepared and cured in controlled environment. Then the casted elements are transported to site by using various logistics equipments for erection or assembly work [5,6].

1.1. OBJECTIVE OF THE STUDY

- Construction of similar building elements wherein there could be a huge repetition of moulds resulting in increased productivity and economy in cost by using precast concrete.
- To explore problems of implementation of precast building technology
- To study different stages and process involved in precast concrete construction of commercial, industrial and residential sectors.
- To compare the cost and time between precast concrete and cast-in-place concrete.
- To explore future opportunities in precast concrete construction.

2.1. LITERATURE STUDY

Akash Lanke et al., (June 2016) [1] carried out a thesis to analyze the design, cost and time of precast and RCC buildings. Apart from these factors various other minor factors such as speed of construction, quality control, environmental conditions, labor resources, durability, connection, size, shape etc are also considered for the analysis. The cost and duration are compared as major factors. one building is chosen as a case study and Design is done for the same building as a precast building and Traditional Cast in-situ building. From this analysis It is remarkably seen that the cost of precast building is significantly reduces & duration of construction is also much lesser than traditional method. From all this study we can be conclude that the precast concrete system is economical than conventional cast in place method but still there are some conditions which we have to take care of while using precast, those are quantity of construction, Distance of site from manufacturing unit, Type of building etc.

Dinesh Kumar et al., (April 2015)[4] conducted a research so as to study the present situation of the precast construction industry in India. In his study two main factors are considered which are cost and time. For this research purpose data collection is done in the form of questionnaire survey and from this survey the present

Structural Behavior of Concrete Beam with Basalt FRP Rods and Basalt Powder

M.Lavanya[1], Mr.B.Suresh[2], Dr.G.Dineshkumar[3], Mrs.G.Gokila[4]
[1]PG Student, [2,4]Assistant Professor, Department of Civil Engineering, K.S.R. College of Engineering, Tiruchengode, Tamil Nadu, India
[3]Assistant Professor, Department of Civil Engineering, Vaagdevi College of Engineering, Warangal, Telangana, India, Email:lavanyacivillogin@gmail.com[1]
Contact No: 6379794078[1]

Abstract:
A desire to upgrade the structural integrity and life of the concrete structures has brought about new developments in the area of concrete technology. Basalt is a new emerging material, gaining popularity recently and is made from basalt rock. Due to the limited amount of research on the use of basalt for structural applications, further investigation are still required to provide confidence in the use of basalt materials in the reinforced concrete structures. In this proposed work, the ordinary concrete is replaced with partial replacement of basalt powder as cement replacing material and basalt rod as a reinforcing material. The effect of basalt powder on the strength of concrete for M30 grade has been studied by varying the percentage of basalt powder in concrete. Basalt powder was varied by 0%, 5%, 10% and 15% by volume of concrete. The specimens were casted to evaluate the strength of the concrete and the optimum dosage level of basalt powder content was found. By using the optimum level of basalt powder, the beam was casted with and without basalt FRP rod as a partial reinforcing material to evaluate structural behavior of the reinforced beam and the results was compared respectively.

Keywords: Basalt FRP rod, Basalt powder, Reinforced concrete beam, Load carrying capacity, Deflection

1.Introduction

Concrete structures are usually reinforced because plain concrete has strong limitations to resist tension. One of the familiar reinforcing material is steel; it suits well as reinforcement but it is susceptible to various attack such as corrosion and other environmental attacks. Fiber Reinforced Polymer (FRP) have over the past years became an interesting choice as a reinforcement for concrete and it represent a potential solution to this situation. There are various types of FRP rods available in the market such as, Carbon FRP rods, Glass FRP rods, etc. Basalt Fiber Reinforced Polymer (BFRP) rod which is a new material to structural design that made from basalt rock has light weight and have tensile strength, over twice as high as steel. Due to the large width of crack in beams reinforced with basalt bars compared to reinforced concrete beams, it is necessary to give minimum amount of reinforcement, to reduce the width of crack in bending [1]. The experimental study is to determine the bond dependent coefficient (Kb) and the structural performance of BFRP in concrete beams. The results were showed as typical bilinear behavior for strain and deflection until failure and with low reinforcement ratios showed sharp increases in strains and deflection at cracking and the axial stiffness significantly affected the behavior of BFRP-RC beams [2]. The flexural strength of beams is improved largely whereas axial load carrying capacity of columns for basalt reinforced specimens is less than that of steel reinforced specimen [3]. The compressive strength and flexural strength of IPC were around 80% of those of OPC. The crack patterns in basalt reinforced IPC beam were found to be similar to control beam and the maximum crack width of basalt reinforced beam was approximately 2times that of control beam [4]. Mineral admixtures generally improve rheological properties of fresh concrete. They improve cohesion and reduce the tendency for segregation. These materials may also reduce the hydration of heat and improves the long term properties of hardened concrete [5].

From the literature review, it was observed that the basalt FRP rod with minimum reinforcement will reduce the crack in bending, showed sharp increase in strains and deflection at cracking. The flexural strength of beams is improved largely whereas axial load carrying capacity of basalt FRP rod is less than the steel rod in the reinforced concrete structures. And the use of mineral admixtures can improves cohesion and reduces segregation of the concrete.

2. Experimental investigation:

The experimental program is to study the structural behavior of the beam with partial replacement of cement with basalt powder and replacement of steel with basalt FRP rods used as partial reinforcing material.

Proc. Second International Conference on Civil, Structural & Environmental Engineering "ICSEE-2019" , K.S.R.College of Engineering , Tiruchengode, Tamilnadu, India , 15th March 2019

Experimental Investigation on Raw and Thermally Treated Clay Based Geopolymer Concrete

R.Priyanka[1] V.Revathi[2]

[1]Department of Civil Engineering, Mookambigai College of Engineering, Pudukkottai, Tamilnadu, India.

[2]Department of Civil Engineering K.S.R. College of Engineering Tiruchengode ,Tamilnadu, India.

[1]Emai:priyanka.rajsaroja@gmail.com

ABSTRACT

In the emerging technological world, the conventional materials and methods are changing every day and approaching the goal of achieving highest utility and benefits to the human community. Keeping this in mind, geopolymer concrete was first produced in the early part of 1970s with metakaolin and later with fly ash. This material undergoes polymerization with aluminosilicates materials in the presence of highly alkaline solution and hardens by thermal curing. In this paper an attempt is made to utilize clay in the form of raw clay and calcined clay as aluminosilicate materials with alkaline solution (Sodium silicate + Sodium hydroxide).This research work is comprising of all important mechanical strength tests, physical and chemical properties, Diffusion characteristics of chloride and modern corrosion testing such as impressed voltage tests and Tafel slope extrapolation techniques to understand clearly the behavior of geopolymer with respect to corrosion of steel when embedded in clay based geopolymer. All the test data are presented neatly and discussed in details.

1. INTRODUCTION

Clays of different kinds potentially and abundantly available on earth crust. These clays are not properly utilized by the civil engineering community because of the reason that the present civil engineers do not have proper understanding of material. This lack of understanding caused a gap in developing modern construction materials. By X ray fluorescence analysis it is understood that there is no much difference between a raw clay and the fly ash in oxide composition. However the presence of few organic materials in raw clay has some harmful effect when used with both in Ordinary Portland Cement (OPC) and geopolymer. This effect is more pronounced in OPC concrete rather than in geopolymer. Therefore the thermal treatment of clay at high temperature will certainly eliminate the organic material, in addition to modifying these silicate particles.

In this research work raw and treated clays from various places were used for preparation of geopolymer concretes, in addition to geopolymer made with fly ash .From this study it is found that clays either raw or thermally treated helped enormously for the formation of geopolymer concrete which provided very high strength compared to geopolymer made with fly ash and ordinary cement concrete. Irrespective of the place of collection and type of clays, the clay based geopolymers found to perform extra-ordinary better than OPC concrete as well as geopolymer based on fly ash, in mechanical strengths, corrosion tests and other durability test. This indicates improved microstructure and formation of crystals in the pores, voids and fissures. This helps greatly to reduce the diffusion characteristics of chlorides and thereby the durability is increased against corrosion.

Making geo polymer concrete with clay presents may advantages compared to concrete mate with ordinary Portland cement (OPC). Geo polymer possess fast setting and hardening, excellent bond strengths, long term durability and better fire and acid resistance[2,3]. And therefore it has many industrial applications also [4]. Apart from these, the geo polymer concretes are produced by low energy consumption and low emission of Co_2 [5, 6] which certainly makes the product as a 'Green Materials' [7, 8]. Variety of alumino silicate minerals are examined by many researchers to establish such alumino silicate materials as potential material for producing geo polymer [3] .It has been established that calcined minerals provide a potential source for making geopolymer [9] it has ever proved that the calcined clay provides best results due to change of phase from crystalline to amorphous [10] proof of record for Indian clays are missing. The activator alkaline solution is sodium silicate with sodium hydroxide solution. Composition variation of this alkaline solution usually general setting and hardening process of geopolymer. higher content of sodium silicate and sodium hydroxide provide the higher mechanical strength.[1] it is also found that very high p^H or alkalinity of the solution affect the geo polymer properties adversely [13]. It has been suggested [14] that the molar ratio of (Na_2O / Al_2O_3) must be unity. Presence of Na_2O, Al_2O_3 and SiO_2 plays a major role for the transformation of phases from crystalline to amorphous [15]. Increase in Fe_2O_3 in clay cause darkness of the raw clay. Higher content of Fe_2O_3 will be dark grey and low Fe_2O_3 will present lighter or white clay. Therefore , in this research work, raw clay as obtained from the natural sources are treated in muffle furnace to heat it to 900˚c for one hour used for making geo polymer concrete. The curing temperature of the geo polymer concrete also plays a major role for development of strengths [1, 16, and 17].

Proc. Second International Conference on Civil, Structural & Environmental Engineering "ICSEE-2019" , K.S.R.College of Engineering , Tiruchengode, Tamilnadu, India , 15th March 2019

Experimental Investigation on Bagasse Ash and GGBS in Geopolymer Concrete

Vinotha.S[1] Thomas Eucharist.A[2], Revathi.V[3],
[1] PG Student, [2]Asst.Professor, [3]Professor, Department of Civil Engineering
K.S.R. College of Engineering, Tiruchengode.
[1]vinothacivil23@gmail.com,

Abstract:

Concrete is most widely and extensively used construction material in all over the world. Around the world, there are lot of researches going on about effective utilisation of waste materials to save environment from pollutions like Carbon dioxide emission and Global Warming which caused also by cementitious materials. Disposal of waste material is difficult in every fields and its effective use is emerging one. It is understood that geopolymer cement is better than Ordinary Portland Cement. Also, it can effectively reduce CO_2 emission. In the present study, the effective use of Sugarcane Bagasse Ash and Ground Granulated Blast Furnace Slag in geopolymer mortar mix was studied and these materials are naturally occurring industrial wastes and by-products that are less energy intensive. They are also called as pozzalonas materials which are combined with silica and alumina content that exhibits cementitious properties. Trial mixes were made to find potential mix in Sugarcane Bagasse ash-Ground Granulated Blast Furnace Slag in geopolymer mortar. The obtained results indicate that the optimum mix proportion for geopolymer mortar prepared with this binder was found at 10M, 12M, 14M NaOH with 75% and 100% Ground Granulated Blast Furnace Slag as binder content in the mix was conducted under ambient curing temperature condition.

Keywords: GGBS, Sugarcane Bagasse Ash, Molarity concentration, NaOH, Sodium Silicate, Geopolymer Mortar.

1. INTRODUCTION

Concrete is probably the most extensively used construction material in the world and due to these the environment sustainability is at the stake in both terms of damage and CO_2 emission during cement manufacture. According to B.V. Rangan [1], that the cement production will increase from about 1.5 billion tons in 1995 to 2.2 billion tons in 2010. If the waste material ashes are reused instead of disposal, there will be a great reduction in the environmental pollution [2]. Several efforts are made to reduce the utilisation of Portland cement in concrete in order to address the global warming problems. For overcome these above challenges geopolymer concrete technology which is said to be a most fastest developing field of research in function were introduced. This involves the usage of supplementary cementing materials like fly ash, silica fume, ground granulated blast furnace slag, rice husk ash and metakaolin as an alternative binder to Portland cement.

Subsequently, the geopolymer technology proposed by Davidovits (1998) shows considerable promise for application in concrete industry as an alternative binder to the Portland cement (Duxson et al, 2007). In terms of global warming, the geopolymer technology could significantly reduce the CO_2 emission to the atmosphere caused by the cement industries as shown by the detailed analyses of Gartner (2004). Geopolymers are inorganic by-product materials, which are rich in silicon (Si) and aluminium (Al) and these polymerisation Monomers and other silicon and aluminium hydroxide condense to form rigid chain reaction with the application of mild temperature and forms of nets of oxygen bond under ambient room temperature. The source binders are either natural or by-product material. Which can be chosen based on its availability, material cost, application. Alkaline liquids are either sodium or potassium based. According to Rashidah Mohamed Hamidi [3], that the concentration and effect of alkaline solutions are tested for maintaining geopolymerisation in concrete. The

geopolymerisation process involves the usage of alkaline liquid is in the combination of sodium hydroxide (NaOH) or potassium hydroxide (KOH) with sodium silicate or potassium silicate.

Due to the strong chemical base reaction with high amount of sodium hydroxide & Sodium Silicate, the temperature of freshly prepared mix is also high [4]. Several waste materials that have been investigated in the production of alkali- activated binders. In some developing countries, it could be interesting to combine selected ashes such as blast furnace slag or fly ash from industrial wastes as typical precursors. According to Pradip Nath [5], the variation of the amount of alkaline activator affects the compressive strength of mix. This investigation mainly based on utilization of Bagasse ash (SBA) and Ground granulated blast furnance slag (GGBS) in geopolymer concrete. In such way, sugarcane bagasse ash is one of these options and are recently accepted as a Pozzolanic material which is obtained as a by-product of the sugarcane industries. Its application will depend on the combustion conditions of sugarcane bagasse, it means, on the physical and chemical properties of SBA. Comparing to OPC binders, alkali-activated materials present greater resistance to acidic attack due to higher alkalinity of the pore and lower CaO/SiO_2 ratio in the alkali-activated systems. However

Proc. Second International Conference on Civil, Structural & Environmental Engineering "ICSEE-2019" , K.S.R.College of Engineering , Tiruchengode, Tamilnadu, India , 15th March 2019

Fly Ash Based Geopolymer Mortar Made With Sea Water

Hema. P[1], Revathi. V[2]
[1]Department of Civil Engineering, V.S.A.School of Engineering, Salem, India
[2]Department of Civil Engineering, K.S.R. College of Engineering, Tiruchengode, India
[3]Email:[1]hemaprabakarancvl@gmail.com

ABSTRACT
The present study describes the study made on fly ash based geopolymer mortar made with sea water. The combination of sodium silicate solution and sodium hydroxide solution was chosen as alkaline liquid. The molarities of NaOH were taken as 8M, 10M, 12M and 14M. The specimens were heat-cured at 60°C for 24 hours. From the results, it was found that fly ash based mortar mixed with sea water enhances the strength than it was prepared with potable water.

KEYWORDS— Geopolymer, fly ash, alkaline liquid, heat-curing, sea water

1. INTRODUCTION

Concrete is one of the most widely used construction materials. The demand of concrete is increasing day by day to satisfy the need of development of infrastructure facilities. The production of Portland cement not only consumes the significant amount of natural resources but also liberates a large amount of carbon dioxide and other greenhouse gases. It is estimated that one ton of CO_2 is released into the atmosphere for every ton of OPC produced. [1].

Joseph Davidovits has attempted to eliminate the use of Portland cement with the new advent of geopolymer technology for the binder in concrete. Geopolymer binder is one of such alternative binder to cement which is synthesized by mixing aluminosilicate material and high alkali solutions. Geopolymers are made from source materials with silicon (Si) and aluminium (Al) content and thus cement can be completely replaced by marginal materials like fly ash. It is an innovative material and suitable alternative to conventional Portland cement for use in transportation infrastructure, construction and offshore applications [2].

The performance against acid resistance was good when using fly ash and GGBS in GPC A study on fly ash based geopolymer concrete with potassium based alkaline activators indicated that the compressive strength was increased with the increase in the molarity of NaOH [3]. With the increase of alkaline liquid to fly ash ratio strength decreases and alkaline liquid to fly ash ratio less than 0.3 was very stiff [4]. The strength of oven cured geopolymer concrete stated that longer curing time improved the polymerization process resulting in higher compressive strength of geopolymer concrete [5]. Split tensile strength of geopolymer concrete increased as percentage of steel fibre increased and curing under normal sunlight yielded strength of 16 N/mm^2 [6]. Heat cured fly ash based geopolymer concrete has an excellent resistance to sulphate attack, salt attack and acid attack as compared to ambient curing [7-8].

Abd Allah et al (2017) has reported that sea water can be used as mixing water in the GGBS and metakaolin combination source material geopolymer concrete [9]. In this context, the present study has made an attempt to carry out experimental work on fly ash based geopolymer mortar made with sea water

2. EXPERIMENTAL INVESTIGATION

2.1. Materials

The following materials were used to produce fly ash based geopolymer mortar with sea water.
Low calcium class F type fly ash specific gravity 2.21
Sodium hydroxide (98% purity in pure form)
Sodium silicate solutions (8M, 10M, 12M and 14M)
Fine aggregate (fineness modulus 2.61)

2.2. Mix Proportion

The ratio of fly ash to sand was selected as 1:3. In the present study on fly ash based geopolymer mortar, the alkaline liquid to binder ratio was selected as 0.35, 0.4 and 0.45. The molarity of the sodium hydroxide solution was kept as 8M, 10M, 12M and 14M. In addition, the ratio of Na_2SiO_3/NaOH was considered as 1.5. The alkaline liquid to binder ratio was selected as 0.35. The molarity of the sodium hydroxide solution was ranged from 8M to 14M. was NaOH solution was made with sea water and also with potable water. The mix proportion arrived for fly ash based geopolymer mortar is given in Table 2.1.

EXPERIMENTAL STUDY ON STABILIZATION OF SOIL USING RICEHUSK ASH

P. Balaji[1], M. Boopathi[2], G. Arvind[3], B.Suresh[4]
[1-3]PG Student, [4]Assistant Professor, Department of Civil Engineering,
K.S.R. College of Engineering, Tiruchengode, Tamil Nadu, India
Email:balajiparameshwaran.bp@gmail.com[1]; Contact no: 8220588503[1]

ABSTRACT
This paper investigates the stabilizing effect of the rice-husk ash on soil. The rice-husk ash was collected and powdered form for suitable addition to the soil in varying proportions namely 0%, 2.5%, 5%, 7.5% and 10% by the weight of the soil sample throughout. Consequently the moisture content, specific gravity, particle size distribution, and Atterberg limit tests were carried out to classify the soil. Soil stabilization can be explained as the alteration of the soil properties by chemical and physical means in order to enhance the engineering quality of the soil, its resistance to weathering process and soil permeability. Various tests were carried out on the soil with and without addition of rice-husk ash. The result showed the improvement in the maximum dry density values on the gradual increase in addition of rice-husk ash. This paper deals with the complete analysis of the improvement of soil properties and stabilization using rice-husk ash.

1. INTRODUCTION

Soil stabilization is the process of the alteration of the geotechnical properties to satisfy the engineering requirements. Numerous kinds of stabilizers were used as soil additives to improve its engineering properties. A number of stabilizers, such as lime, cement and fly ash, depend on their chemical reactions with the soil elements in the presence of water. However, soil stabilization using rice-husk ash involves advantages and disadvantages [1, 2]. This study provides details of advantages and disadvantages inherent to ash treated soil, proposing an alternative material was discussed

Soil stabilization is the alteration of soils to enhance their physical properties. Stabilization can increase the shear strength of a soil and control the shrink-swell properties of a soil, thus improving the load bearing capacity of a subgrade to support pavements and foundations [3].

Soil stabilization can be utilized on roadways, parking areas, site development projects, airports and many other situations where sub-soils are not suitable for construction [4]. Stabilization can be used to treat a wide range of sub grade materials, varying from expensive clays to granular materials. This process is accomplished using a wide variety of additives, including lime, fly-ash, and Portland cement [5,6]. Other material by products used in stabilization includes lime-kiln dust (LKD) and cement-kiln dust (CKD) of soil.

2. MATERIALS AND METHODS

2.1. Location of Study Area

The soil sample was collected from Salem location. The type of soil is clay soil.

2.2. Materials

The rice husk ash are collected as admixture and added to the soil and test is conducted. Chemical characteristics of rice husk ash powder are given below Table 1 respectively.

TABLE 1: Content in % weight

Oxide	Sio_2	Fe_2O_3	CaO	MgO	K_2O	Na_2O	P_2O_5	Al_2O_3
Percentage	93.4	0.06	0.31	0.35	1.4	0.1	0.8	0.06

2.3. Method of Testing

The collected sample was stabilized with rice-husk ash. The soil was adding with ash by 0%, 2.5%,5%, 7.5% and 10%.

The laboratory tests carried out on the soil sample includes grain size distribution Sieve Analysis, Specific Gravity Atterberg's Limits, Standard proctor compaction test, Unconfined Compression Test, California Bearing Ratio (CBR) Test.

Proc. Second International Conference on Civil, Structural & Environmental Engineering "ICSEE-2019" , K.S.R.College of Engineering , Tiruchengode, Tamilnadu, India , 15th March 2019

Influence of M-Sand in Hybrid Fibre Reinforced Concrete by using Steel and Jute Fibres

S.K. Harshini[1], Dr.P. Sudha[2],
[1]P.G. Student, [2]Associate Professor, Department of Civil Engineering,
K.S.R. College of Engineering, Tiruchengode-637 215.

ABSTRACT:
The concept of using fibres to improve the characteristics of construction materials in concrete (reinforced concrete) as well as increase strength and ductility. This study investigated the development of M20 grade concrete and enhancement in efficient properties of hybrid fibres such as Steel and Jute fibres.Performance of Conventional concrete is enhanced by the additional of fibers in concrete. Adding a single type of fibre into concrete has limited functions, so many current researches are oriented to the development of hybrid fibre in concrete to obtain better mechanical properties. The main reason for steel and jute fibre used in concrete matrix is to improve the ductility and to provide crack resistance and crack control. This investigation is to study the properties like Compressive strength, Tensile strength and Flexural strength of fibre reinforced concrete with varying fibre content of 0.5%, 1.0% & 1.5 % by weight of cement.

1. INTRODUCTION

The river sand has been used mainly as fine aggregate in theconstruction of pavements and other structures. Due to the rapidgrowth of the infrastructural development in the world compelsthe demand for river sand. Also as the supply of suitable naturalsand material near to the part of construction is becomingexhausted, the cost of the sand is increasing. Hence a replacementmaterial to river sand is needed and the finer materials from crushingoperations are more suitable materials as substitute materials.Since the supply of river sand is limited and its continuous supplyis not guaranteed, use of manufactured sand (M-Sand) as an alternativeto river sand has become inevitable. ICAR (The internationalCenter of Aggregates Research) research project work was showedthat concrete can successfully be made using unwashed M-sandwithout modifying the sand. With the use of manufactured sandin concrete there was increase in flexural strength, improved abrasionresistance, increased unit weight and lowered permeability [9].

As a new green building material used for replacing naturalsand, manufactured sand (also called as machine-made sand, artificialsand or crushed-stone sand) has become important inresearches, productions and engineering applications of premixed concrete. With the progressive application, manufacturedsand has been used from partially to completely replacing the natural sand in concrete and the limitation of stone powder inmanufactured sand has changed to an approved proper content [14].

Construction of high-rise buildings, long span bridges, and offshorestructures has made steel fibers important in improvingthe properties of concrete such as strength, toughness, energyabsorption capacity, and durability. The addition of steel fibers inhigh performance concrete (HPC) can improve the brittle behaviorand the energy absorption capacity. Hence, steel fiberreinforced concrete plays a significant role in developing modernconcrete technology, which represents a new class of constructionconcrete. In recent years, extensive research performed to explorethe use of steel fiber in producing high strength fiber reinforcedconcrete (HSFRC). The comparison between mechanical propertiesof high strength fiber reinforced concrete has been presented[13].

In the case of geopolymer, the use of fibre to improve the brittlenessis comparatively new compared to conventional concrete.There have been a few studies carried out in the area of fibre reinforcedgeopolymer (FRG). For example, Genesa et al. studied thebasic properties of steel fibre reinforced geopolymer (SFRG) withfibre volume fractions varying from 0.25 to 1.0% and a concretestrength of 40 MPa. They found increases in both compressiveand splitting tensile strengths of about 8.51% and 61.63%, respectively,in SFRG with the fibre volume fraction at 1% [10].

These days, several fibres, such as steel, synthetic, and naturalfibres are used for the development of the fibre reinforced cementcomposites. Nevertheless, the natural fibres including jute haverecently attracted the attention of scientists and technologists forthe development of the green and sustainable cement composite. An extensive research has been executed to improve the ductility,flexural strength and fracture toughness of cement compositeby reinforcing with natural fibre. The most importantreason for the use of natural fibres as fibre reinforcement is theirabundant availability, low-cost, low-density and environmentalfriendliness [1].

Confinement of Concrete by Basalt Fiber Fabric Wraps By Varying L/D Ratio, Geometry and Grades of Concrete

Madhuraa S[1], Gokila G[2], Dr.G.Dineshkumar[3]
[1]Post Graduate Student, Civil Engineering, K.S.R College of Engineering, Thiruchengode, Nammakal (dt).
[2,]Assistant Professor, Civil Engineering, K.S.R College of Engineering, Thiruchengode, Nammakal (dt).
[3]Assistant Professor, Civil Engineering Vaagdevi College of Engineering,Warangal, Telangana, India,

Mail id: madhuraacivil@gmail.com[1],gokilacivil2010@gmail.com[2],gdkcivil@gmail.com[3]

Abstract:
The main aim of this research is to investigate the success of basalt fiber fabric wrapping for improving the compressive strength of concrete members. In this paper, we have considered cube, cylinder and prism shaped specimens of different dimensions with three different mixes were considered. As per IS recommendations, the effect of grade of concrete on compressive, mix design were carried out. The specimens were wrapped with 3 layers and it is cured for 28 days. The specimens were wrapped to analyze the compressive strength in various conditions by comparing it with normal concrete specimen without wrapping. Then the results obtained from the wrapped and unwrapped specimens shows, increase in compressive strength with increase in number of layers of wrapping.

Keywords: Basalt fiber, Wrapping, Confinement, Compressive strength, Structural repair and Strengthening.

1. Introduction

Fiber Reinforced Composite materials are being considered for application to the damaged buildings due to their low weight, easy handling of materials and rapid implementation[1]. This technology involves a method of refining, blending and compounding natural fibers from cellulosic waste streams to form a high- strength fiber composite material in a polymer matrix[2]. FRC is high-performance fiber composite achieved and made possible by cross- linking cellulosic fiber molecules with resins in the FRC material matrix through a proprietary molecular re-engineering process, yielding a product of exceptional structural properties[3].

1.1 Structural Damage due to Earthquake

Earthquakes are a severe structural hazard that causes vibrations in the structures due to the ground shaking. Other destructive effects on structures due to an earthquake are sliding away from their foundations and their horizontal or vertical movements that may make the structures unsafe. An earthquake is an abrupt movement or tremor of the earth's crust that is initiated below or at the surface. The earth's surface is moving continuously in a slow motion, due to which the plates at the surface also move along the globe[4]. With the movement of the plates, they rub against each other or spread apart, and at a certain point the strain developed exceeds the capability of the plates to withstand more forces and they break, causing an earthquake. At the construction joins, the bending moments and shear forces are maximum. During earthquakes, the structural damages are mostly seen at the joints[5]. The diagonal cracks at the joints are due to the insufficient shear reinforcement in the structures. Rehabilitation and retrofitting strategy must reduce these deficiencies from the structures.

Figure 1: Failure at Construction Joint

1.2 Corrosion Problems in India

The commonly used construction material is Cement Concrete reinforced with steel bars. One major blemish with this is its vulnerability to environmental attack that will severely reduce the strength. In humid conditions, atmospheric moisture trickle through the concrete cover and reaches the steel reinforcement. Due to the process of rusting, steel bars gets expand and forces the concrete cover out resulting in spalling of concrete cover [6]. This revel the reinforcements to direct environmental attack and it accelerates the rusting process. Due to this, it weakens the concrete structure to a higher degree. Due to the rusting process, the cross sectional area of steel

Experimental Investigation on Durability Properties of Quaternary Blended Cement Concrete Incorporated With Glass & Carbon Hybrid Fiber

Muthukumaran. S[1], Dr. Muralimohan. N[2] & Dr. Sudha. P[3]

[1] Assistant Professor, Department of civil Engineering, Mother Terasa College of Engineering, Pudukottai, India

[2,3] Associate Professor, Department of Civil Engineering, K.S.R College of Engineering, Erode. India

[1,2,3]Email: s.muthukumaran42@gmail.com, Muraling83@yahoo.co.in , Sudhame07@gmail.com

Contact No. : 8489884673 [a], 8754666728[b], 9943672232[c]

ABSTRACT

A lot of work has been done on replacement of cement with supplementary cementitious materials like Fly ash, Rice Husk Ash, Lime Powder, Silica fume etc. Fibre Reinforced Concrete (FRC) consists of high strength fibre embedded in a cementitious matrix. The addition of hybrid fibre enhances the tensile strength, flexural strength, ductility and energy absorption of the concrete members. This paper presents the experimental investigations carried out to study the Strength and durability properties of quaternary blended cement concrete with glass fibre and carbon hybrid fibres. The objective of this study aims to characterize the optimum percentage of quaternary system involving replacement of cement with fly ash, Lime Powder and Rice Husk Ash with glass fibre and carbon hybrid fibres. The Glass and Carbon hybrid fibres are added with different combinations in the ratio of minimum 0.5% to maximum 2% to the weight of cementitious material on M30 grade of concrete.

INTRODUCTION

The advancement in Science, technological and industrial revolution has resulted in the environmental pollution. To avoid pollution, there is an increasing interest in the utilization of waste materials. In the case of construction industry there has been a growing trend towards the development and the use of waste as supplementary cementitious materials. The common pozzolanic agents from industry and agricultural by product such as fly ash, Rice husk ash are becoming active areas of research. It also leads to reduction in cost and negative environmental effect. Blending of a large amount of waste materials such as fly ash, silica fume, rice husk ash (RHA), etc. is being done in large extents in the manufacture of cement and cementitious products Kathirvel.et al 2013[1].

The replacement of cement by supplementary material results in savings of the materials and reduces the emission of CO_2 in the atmosphere, since the production of one ton of cement produces approximately one ton of CO2 in the atmosphere. Pozzolanic materials react with calcium hydroxide during hydration reaction and forms calcium silicate hydrate. This can reduce the size of the pores of crystalline hydration products, make the microstructure of concrete more uniform and improve the impermeability and durability of concrete. These improvements can lead to an increase in the service life of a concrete structure.

The RHA is a super pozzolan since it contains amorphous silica in cellular microstructure and has about 85% to 90% silica content and has proven to be a valuable material for making highly durable

Proc. Second International Conference on Civil, Structural & Environmental Engineering "ICSEE-2019" , K.S.R.College of Engineering , Tiruchengode, Tamilnadu, India , 15th March 2019

Treatment and Reuse of Greywater at Household Level-A Review

Neetha Delphin Mary.K[1], Dr.Murali Mohan N[2] , Dr.Vijayalakshmi. P[3]

[1]Assistant Professor, Department of Civil Engineering, SRS College of Engineering & Technology, Kuppanur, Salem-636 122, Tamilnadu, India.

[2]Associate Professor, Department of Civil engineering, K.S.R College of Engineering, Tiruchengode, Namakkal-637 215, Tamilnadu, India.

[3]Scientist, Environmental Science, Tamilnadu Pollution Control Board, Chennai

[3]Email:neethak81@gmail.com; Contact No. : 91593-84847

ABSTRACT

India is facing a water crisis and by 2025 it is estimated that India's population will be suffering from severe water scarcity. Although India occupies only 3.29 million km2 geographical areas which form 2.4% of the worlds land area, it supports over 15% of world's population with only 4% of the world's water resources. With increased population growth and development, there is a need to critically look at alternative approaches to ensure water availability. These alternative resources include rainwater and bulk of water used in household will emerge as grey water and contain some minerals, organic waste materials dissolved and suspended in it. When this is allowed to flow out this will join the sewage and bacteriological contaminants, resulting in a sewage stream. It is possible to intercept this grey water, at the household level, treat it so that it can be recycled for garden washing and flushing purposes. The issue of greywater management – which is defined as all sources of domestic wastewater excluding toilet wastewater – is gaining more and more importance, especially in developing countries where improper wastewater management is one of most important causes for environmental pollution and fatal diseases. In recent years not only the threats of improper greywater management have been recognized; there is an increasing international recognition that greywater reuse, if properly done, has a great potential as alternative water source for purposes such as irrigation, toilet flushing and others.

KEYWORDS: Grey water, Reuse, Irrigation. Waste water Management, Sand Filters, Electro- Oxidation, Electro-Coagulation

1. INTRODUCTION

A. Grey water

Grey water is all wastewater that is discharged from a house, excluding black water (toilet water). This includes water from showers, bathtubs, sinks, kitchen, dishwashers, laundry tubs, and washing machines (Figure. No: 1). It commonly contains soap, shampoo, and toothpaste, food scraps, cooking oils, detergents and hair. When properly managed, grey water can be a valuable resource from which horticultural and agricultural growers as well as home gardeners can benefit from. Grey water makes up the largest proportion of the total wastewater flow from households in terms of volume. Typically, 50-80% of the household wastewater is grey water. If a composting toilet is also used, then 100% of the household wastewater is grey water .Not all grey water is equally "grey". Kitchen sink water, laden with food solids and laundry water that has been used to wash diapers is more heavily contaminated than grey water from showers and bathroom sinks. Therefore, different grey water flows may require different treatment methods that would render the water suitable for reuse. Grey water reuse reverse the non-sustainable tendency of increasing surface and groundwater extraction to satisfy the rising demand of fresh water, some changes must be done in order to decrease potable water consumption as well as wastewater production without compromising the comfort requirements on use. [1]

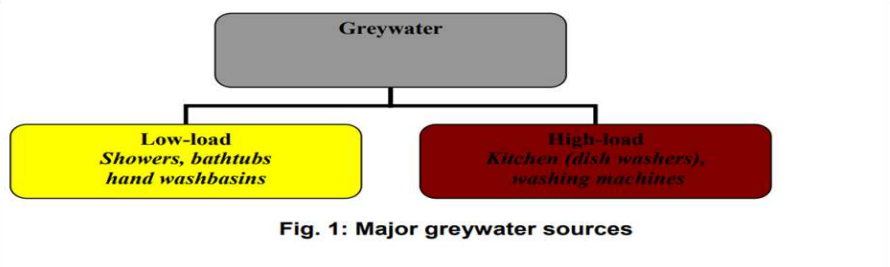

Fig. 1: Major greywater sources

Proc. Second International Conference on Civil, Structural & Environmental Engineering "ICSEE-2019" , K.S.R.College of Engineering , Tiruchengode, Tamilnadu, India , 15th March 2019

A Case Study on "Performance of Water Quality in around Namakkal districts in Tamilnadu

Tamilchelvan. P[1], Dr.Muralimohan. N[2]

[1]Assistant Professor, Department of Civil engineering,

Muthayammal College of Engineering, Rasipuram-637 408, Tamilnadu, India

ptamilchelvan@gmail.com

[2]Associate Professor, Department of Civil engineering,

K.S.R College of Engineering, Tiruchengode, Namakkal-637 215, Tamilnadu, India

muraling83@yahoo.co.in

ABSTRACT:

This case study paper is aimed to identify environmental and health impacts of untreated or inadequately treated wastewater effluents. The quality of wastewater effluents is responsible for the degradation of the receiving water bodies. Due to use of contaminated water, human population suffers from water borne diseases. In this paper Namakkal in around areas ground water pollution to agriculture soil due to the natural shale value of heavy metals in soil system Water is one of the vital needs of all living beings. The quality of water usually described according to its physical, chemical and biological characteristics. Hence it becomes necessary to find the suitability of water for drinking, irrigation and Industry purpose. The reuse of treated effluent (for agriculture and as supplement for drinking water needs) is currently receiving attention as a reliable water source. Parameters that may be tested include temperature, pH, turbidity, salinity, nitrates, TDS, Cations, Anions and phosphates. In extension, recreational water users and anyone else coming into contact with the infected water is at risk. In order to comply with wastewater legislations and guidelines, there is a need for adequate treatment before discharge. This can be achieved through the application of appropriate treatment processes, which will help to minimize the risks to public health and the environment. To achieve unpolluted wastewater discharge into receiving water bodies, careful planning, adequate and suitable treatment, regular monitoring and appropriate legislations are necessary.

Keywords- *Ground water, drinking water*, *Municipal wastewater, Water quality parameters, Namakkal districts.*

1. Introduction

Ground water, surface water (rivers, streams and ponds), atmospheric water (rain-water, snow and hail) and springs are the main source of water available to the people in general. The qualities of these water bodies vary widely depending on the location and environmental factors. The major source of ground water is precipitation that infiltrates the ground and moves through the soil and pore spaces of rocks. Other sources include water infiltrating from lakes and streams, recharge ponds and waste-water treatment system [1]. As ground water moves through soil, sediment and rocks, many impurities such as disease-causing micro-organisms are filtered out. Many water resources in developing countries are unhealthy because they contain harmful physical, chemical and biological agents. To maintain a good health however, water should be safe to drink and meet the local standards and international standards to taste, odour and appearance. Now required as much importance as water quality According to WHO, about 80% of all the diseases in human beings are caused by contaminated water. Once the groundwater is polluted, its quality cannot be renovated by stopping the pollutants from the source [2,3]. It is therefore vital to regularly monitor the quality of groundwater. Groundwater pollution by heavy metals has been given much attention due to their low biodegradability and toxic effects. The water from the sources *viz.*, streams, falls, lake, hand pump, open well and bore well are contaminated with domestic, agricultural and industrial wastes and likely to cause water related diseases6. Similarly, Bullard7 inferred that polluted surface water always results in an unhealthy socio-economic environment. In this study, physicochemical parameters are determined to draw a conclusion on the quality of water whether it is good or unfit for drinking purpose. [4,5]

2. Literature Review

The extensive literature review was carried out by referring standard journals, reference books and conference proceedings. The major work carried out by different researchers is summarized below. Another author [6] focused on the hydrochemistry of groundwater in the Jaipur city to assess the quality of groundwater for determining its suitability for drinking and agricultural purposes [7]. The calculated values of SAR, RSC and percentage sodium indicate that the water for irrigation uses is excellent to good quality. US Salinity diagram was

A Study of Factors Influencing Quality of Construction Projects

Gowthaman.M[1], Dr. M.Logesh Kumar[2]
[1]P.G. Student, [2]Assistant Professor, Department of Civil Engineering,
K.S.R. College of Engineering, Tiruchengode, India.
E Mail: gowthaman0106@gmail.com, logeshcivil@gmail.com
Contact No: 9442575891, 9994753635.

ABSTRACT
The construction industry plays a vital role in the economy. The construction industry is complex in its nature because it comprises large numbers of parties' owners (clients), contractors, consultants, stakeholders, and regulators. Despite this complexity, the industry plays a major role in the development and achievement of society's goals. The need for achieving quality of the finished product in the building construction is very important.
Quality is an essential element for sustainability and customer satisfaction. Quality in its simplest from can be defined as 'meeting the customer expectations', or 'compliance with customer specification'. No matter what definition we follow for quality, it becomes very complex when we try to put it into actual practice. This study is intended to provide clients, project managers, designers, and contractors with necessary information needed to better manage the quality of a construction building projects by identify the factors that affect process quality of construction projects and to rank them by degree of importance.

1. INTRODUCTION

The construction industry plays a vital role in the economy. The construction industry is complex in its nature because it comprises large numbers of parties as owners (clients), contractors, consultants, stake holders, and regulators. Deposit this complexity; the industry plays a major role in the development and achievement of society's goals.
Quality has become a very popular subject in recent years due to conceptual changes in the industry Quality and quality systems are topics which have been receiving increasing attention worldwide. The product in any industry should be manufactured to a required standard, one that provides customer satisfaction and value for money. The need for achieving quality of the finished product in the building construction is very important. The high cost of buildings makes it necessary to ensure quality of the finished product. Quality is an essential element for sustainability and customer satisfaction. In construction projects, quality performance is considered as vital for client satisfaction. This study is intended to provide clients, project managers, designers, and contactors with necessary information needed to better manage the quality of a construction building projects by indentify the factors that affect process quality of construction projects and to rank them by degree of importance.
In this study, it will be studied the factors affecting the quality performance of construction projects. It can be used to measure performance in construction projects. This will be a key component of any organization move towards achieving best practice in order to overcome the quality performance problem in the construction projects.

2. QUALITY MANAGEMENT IN CONSTRUCTION

The construction industry is typified by highly differentiated, fragmented and loosely structured system. Developing a quality system is the first step towards improving quality in construction industry. A quality system consists of the following.

- Quality policy
- Organization structure
- Procedures
- Processes
- Training
- Quality manual

3. OBJECTIVES

The objectives of the present study are as given below

- To identify and evaluate various factors affecting the quality performance of construction projects and to rank them by degree of importance

Proc. Second International Conference on Civil, Structural & Environmental Engineering "ICSEE-2019" , K.S.R.College of Engineering , Tiruchengode, Tamilnadu, India , 15th March 2019

A Study of Delay Management, Cost Overrun and Risk in a Construction Projects

[1]P.Kowsalya, [2]Dr.M.Gunasekaran

[1] P.G,.Student, [2]Associate Professor, Construction Engineering and Management, Department of Civil Engineering, K.S.R. College of Engineering, Tiruchengode, India.

Mail id: gunasanjay07@gmail.com

ABSTRACT :

The construction industry is one of the industrial sectors with the lowest rates of fulfilment of contract deadlines, especially in developing countries. A survey on time performance of different types of construction projects in Saudi Arabia was conducted to determine the causes of delay and their importance according to each of the project participants, i.e., the owner, consultant and the contractor. The field survey conducted included 23 contractors, 19 consultants, and 15 owners. Seventy three causes of delay were identified during the research. 76% of the contractors and 56 % of the consultants indicated that average of time overrun is between 10% and 30% of the original duration. The most common cause of delay identified by all the three parties is "change order". Surveys concluded that 70% found that 45 out of 76 projects considered were delayed. Factor analysis and work with the variables that can be identified and measured in the initial phase of the project, i.e., during the feasibility study, demonstrate that the physical characteristics of the apartments and the construction project are the primary causes for variations in construction delays. The main aim of this paper was to find out the main causes of delay in Building construction projects. To minimize delays in construction projects it has been identified that the top three effective methods of minimising construction delays includes: site management and supervision, effective strategic planning, and clear information and communication channel. Analysis performed on eight factors' scores highlighted the influence of five significant factors on managing cost overruns. And the objective of this study is to identify the major causes of construction delays, its effects and minimising delays in construction projects. This study is carried out based on literature reviews and questionnaire survey.

KEYWORDS: construction delay, risk, delay mitigation, consultants, clients, cost overrun and contractors.

1. INTRODUCTION

The construction industry is one of the main sectors that provides important ingredients for the development of an economy. The construction industry is the tool through which a society achieves its goals of urban and rural development. However it is becoming more complex because of sophistication of the construction process itself and the large number of parties involved in the construction process, i.e., clients, users, designers, regulators, contractors, suppliers, subcontractors and consultants. Modern construction parties are characterised by new standards, advanced technologies, multi party participation and frequent owner-desired changes. Coupled with this state are inherent uncertainties and complexities in the physical, financial, and economic environment in which most projects are performed. Such conditions have made completing projects on schedule and on budget a difficult task to accomplish, often leading to claims on cost compensations and time extensions. This eventually leads to delay in the completion of the project.

Delay could be defined as the time over run either be on completion date specified in a contract or beyond the date that the part is agreed upon for delievery of a project. It is slipping over its planned schedule and is considered as common problem in construction projects. Delay in construction project is considered one of the most common problems causing a multitude negative effect on the project and is participating parties. Therefore it is essential to identify the actual cause of delay in order to minimize and avoid the delays and their corresponding expenses.

Delays in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased cost and contract termination. The part is experiencing damages and the part is responsible for them in order to recover time and cost. However in general delay situation are complex in nature. A delay in an activity may not resulting in the same amount of project delay. A delay caused by a party may or may not affect the project completion date and may or may not cause damage to another party. A delay may occur concurrently with other delays and all of them may impact the project completion date .

Delays caused by the client such as late submission of drawings and specifications, frequent change orders and inadequate site information generates claim from both main contractors and sub contractors which many times entail lengthy court proceedings with huge repercussions. Delays caused by contractors can generally be

A Study on Equipment Maintaince and Its Management in Large Construction Companies

[1]Narmatha A, [2]Dr.M.Gunasekaran
[1] P.G,.Student, [2]Associate Professor, Construction Engineering and Management,
Department of Civil Engineering,
K.S.R. College of Engineering, Tiruchengode, India.
Mail id:gunasanjay07@gmail.com

ABSTRACT
The project discusses in brief about collecting data from any two well established construction companies in INDIA. The data regarding equipment details like planning, selection, Work schedule and it control, Economic and commercial considerations of the Equipment, the Economical value of construction equipments should also be taken into consideration. The details about ownership cost, operating cost, precaution and safety of the equipment, i.e. various types of maintenance records are of immense value. The data regarding layouts of workshop and its section of both the construction companies are studied. The Do's and Don'ts and the precautionary measures for maintenance of equipments are to be taken into account in establishing and managing the maintenance functions of equipment in both the construction companies. After completing the collection of the data and making required entries in various records for both the companies, they were compared for the following parameters (i) Usage and availability of the equipments, (ii) The Overall maintenance cost, (iii) Maintenance cost of each equipment. After comparing, a modern methodology namely FAILURE MODE EFFECT ANALYSIS (FMEA) has been introduced as a tool for carrying out maintenance cost of equipments FMEA is applied for a Tower Crane, Concrete Mixers and motor graders to know its functions, severity, causes and effects of the failure based on all these criteria, the Risk Priority Number (RPN) for these equipments is observed. That increase in RPN value increase the failure causes.

KEYWORDS: Tower Crane, maintenance, Work schedule, Planning.

1. INTRODUCTION

The advent of heavy construction equipment and the approach of large construction company of converting the construction sector to a more mechanized and in turn an organized sector has made it mandatory for maintaining the fleet of equipment to perform to its optimum.

Since machinery and equipment which have became a integral part of any construction activity, plants and machineries now constitute a substantial portion of the construction cost in a project (in tune of 10 to 30 percent of total project cost depending upon the extent of mechanization), has maintained to turn the Project into profit making center for any organization, because the cost of maintenance of any equipment is in tune of 200 to 250 percent of cost equipment it has become imperative for going in for maintaining the equipment during its expected Life cycle. Equipment maintenance is a science because it involves scientific and technical know how of different machineries for identical problem, it may require different action or process. We need equipments for technical and speedy construction and at the same time for economical and timely completion of project.

2.LITERATURE REVIEW

1. Ali A. Shash and Shuaib Ghazi (2001) Construction equipment constitutes a major resource for a contractor. This paper presents the results of a survey performed to unfold the practices followed by contractors in Saudi Arabia in managing their construction equipment. It was possible to find that contractors in Saudi Arabia follow practices similar to those followed by top contractors in the USA. They were found to identify needs, evaluate alternative proposals quantitatively and qualitatively, and make decisions to acquire equipment. During its useful life, contractors maintain accurate records and subject equipment to preventive and scheduled maintenance programs. The contractors also use several economic analysis techniques to determine the economic life, pricing, rate of returns, accounting, etc. of equipment. This information and other parameters are used in equipment replacement evaluation.

2. **David J. Edwards**, **Gary D. Holt**, (2009) A literature review is presented in the subject of construction plant and equipment management (CPeM) to: delineate the subject; consider its development over recent years; and identify principal themes within it. The paper aims to close the gap in knowledge, by using these objectives as a mechanism to observe how research themes relate to primary CPeM

Study on Strength Properties of Concrete with Partial Replacement of Basalt Powder as Cement Replacement Material

Gomathi.C[1] , Gokila. G[2], Dineshkumar. G[3]
[1]PG student of Structural Engineering, [2]Assistant prof., Department of civil Engineering,
KSR College of Engineering, Tiruchengode, Namakkal
[3]Assistant prof., Department of civil Engineering,
gomathi111996@gmail.com, gokilacivil2010@gmail.com

ABSTRACT
Concrete is most widely used man made construction material in civil engineering applications. Among the total co2 content in the world 7% of it generated by the cement industry. Every ton of cement production releases nearly one ton of CO_2 to atmosphere. Then the production of cement polluted the environment, thought it has abutment benefits. The pollution effect on environment can be minimized by increasing the usage of basalt powder in our construction industry. Present study has been undertaken to study the effect of basalt powder on cement concrete on the basis of compressive, split tensile, flexural strength and thereby reduce the environmental problem by proper utilization. In this phase, concrete of M30 grade is considered experiments conducted on concrete cubes with and without addition of basalt powder as 0%, 5%, 10% and 15% by weight of cement in concrete. The results suggest that concrete made with addition of 10% of basalt powder gives more strength compared to all other mixes. The mechanical characteristics of concrete were determined for optimum addition of basalt powder. Workability of concrete by replacing the basalt powder is to be evaluated.

KEYWORDS: Cement, Basalt Powder, Durability, Structural behavior, Strength.

1. INTRODUCTION

Concrete is most widely used as a construction material due to its specialty of being cast in any desirable shape [1]. For the last few decades the construction techniques have been modernized with focus on high strength, dense and uniform surface texture, more reliable quality, improved durability, and faster construction. One of the recent advancement in construction industry is replacement of material in concrete. The amount of cement production emits approximately equal amount of carbon dioxide into the atmosphere [2]. Natural resources are slowly decreasing because continuous production of huge quality of cement on daily basis. Therefore additional burden has credit an opportunity to utilize the supplementary materials. As there are different wastes coming from the industries and these waste becoming problem to dispose. Hence, we can use those wastes as the constituents of concrete by replacing or partially replacing the cement, sand or aggregates which makes cost reduction, energy savings and production of environment, economical and finally conserves the natural resources. Sustainability in concrete production can be achieved by innovation in substitution of materials used in the constructions [3]. And the mineral admixtures also used in the concrete to increase the strength of structures.

The basalt powder also considers as the one of the mineral admixtures and it also increase the durability of concrete. In this study basalt powder is replaced as cement,So we reduce the usage of cement in the construction[4]. And basalt powder also produced the same strength compared with cement using concrete. It is waste powder from the asphalt mixture production. In asphalt mixture production the mineral aggregate is dried in the temperature of 200 degree Celsius [5]. The waste powder is leaves from the dryer after crushing. And the fine material is treated as a waste powder. And it can be estimated 27-35 thousands of waste powder has been per year in Kuyavian-Pomeranian Voivodeship in Poland [6].

2. OBJECTIVE

To determine the properties of materials and mix proportion of concrete.To study the mechanical properties of concrete with and without addition of basalt powder in concrete for cement replacement material.To study the optimization of basalt powder is to be derived.

Development of Cost Effective Utility Blocks Using Lime Rich Chicken Eggshell Powder Infused Cement Concrete

Shameer Rizwan.B[1], Sargunan.K[2], Senthilkumar.S[3]
[1]PG student, [2].Assistant Professor (Ph.d), [3]. Professor Ph.D, Department of Civil Engineering,
K.S.R College of Engineering, Tiruchengode, Namakkal, Tamilnadu, India
shameerrizwanb@gmail.com

ABSTRACT
Concrete is widely used for the construction of buildings, road, bridges etc, which is the backbone of the development of infrastructure. Hence concrete is the cardinal material for construction. Major replacement studies and experiments were done for coarse and fine aggregate. Here we undergo replacement for cement with the egg shell powder and incinerated egg shell powder. Egg shell is a poultry waste which nearly has the similar properties of limestone present in cement. Replacement of egg shell powder with cement by the measure of 10, 20, 30, 40% by weight and all other parameters of items are kept constant [1,2,3]. Workability, compression and split tensile strength, flexural strength test was conducted and compared with the conventional concrete. All the test was investigated after 7, 14, 28 days of standard curing. Hence this paper undergoes a study of properties of concrete with partial replacement of Egg shell powder and Incinerated Egg shell powder.

INTRODUCTION
Concrete is a very strong and versatile mouldable construction material. It consists of cement, sand and aggregate (e.g., gravel or crushed rock) mixed with water. The cement and water form a paste or gel which coats the sand and aggregate. When the cement has chemically reacted with the water (hydrated), it hardens and binds the whole mix together. The initial hardening reaction usually occurs within a few hours. It takes some weeks for concrete to reach full hardness and strength. Concrete can continue to harden and gain strength over many years. The construction Industry is the second largest industry of the country after agriculture. It makes a significant contribution to the national economy and provides employment to larger number of people. Construction activity is an integral part of country's infrastructure and industrial development and is poised for further growth on account of industrialization, urbanization, economic development and people's rising expectations for improved quality of living. Energy plays a crucial role in growth of developing countries like India. In the context of low availability of non-renewable energy resources coupled with the requirements of large quantities of energy for Building materials like cement, the importance of using industrial waste cannot be under estimated.
The primary objective of this study was to understand the possibilities of use of ESP and IESP in concrete. Investigations were systematically conducted on performance of ESP and IESP concretes in terms of strength properties like compressive strength and splitting tensile strength, flexural strength test[5,6]. The conventional and ESP and IESP replaced concretes were tested for 7, 14 and 28 days.

EXPERIMENTAL PROGRAM
Ordinary Portland cement of grade 53 confirming to IS 12269-1987, River sand confirming to grading zone III of IS 383-1970 as fine aggregate, well graded coarse aggregate passing through 20mm sieve confirming IS 383-1970 and Egg shell powder procured from local industry is grained and sieved to the required size is used for the experimental study.

MATERIALS USED
- ✓ Cement
- ✓ Fine aggregate
- ✓ Coarse aggregate
- ✓ Water
- ✓ Egg shell powder

Cement

Table 1 Physical Properties of Cement

S.No	Properties	Relevant Is Code	Result
1.	Standard Consistency Test	IS 4031(Part IV):1988	33%
2.	Fineness Test	IS:4031(Part III):1988	5%
3.	Specific gravity	IS:4031(Part II):1988	3.15
4.	Initial setting time	IS:4031(Part V):1988	38 min
5.	Final setting time	IS:4031(Part III):1988	380 min

2.5 Water

The water used in all mixes and curing of the specimens was potable pipe water available in the K.S.R. College laboratory meeting the requirements of IS: 456-2000.

2.6 Mix Design for M30 Grade Concrete

The control mix was designed to make M30 grade of concreteas per BIS 10262-2009. The OPC was replaced by MPC in the mixes in the range of 0% to 20% with 5% interval. The mix without MPC is considered as control mix. The details of mix proportions are given in Table 2.5.

Table 2.5 Mix proportion of materials

Materials	Cement	Fine aggregate	Coarse aggregate	Water
Quantities (kg/m^3)	330	789.7	1206.9	150

2.7 Compressive strength Test

Cubes of size 150 mm cubes as per BIS 516- 1959 (Reaffirmed 2004) were cast to determine compressive strength of MPC concrete. It was tested at 7, and 28, days. Three cubes were cast for each mix and the average compressive strength was taken. The cube specimen was placed in compression testing machine. The maximum load applied to the specimens was recorded and the appearance of the concrete and any unusual features in the type of failure was noted. The measured compressive strength of the specimen was calculated by dividing the maximum applied load to the specimen during the test by the cross sectional area.

2.8 Split Tensile Strength Test

Concrete cylindrical specimens having 300 mm length and 150 mm diameter were cast and tested for split tensile strength. The cylinder specimen is placed horizontally between the loading surface of the compression testing machine and the load is applied until the failure of the cylinder, along the vertical diameter. Narrow packing strips of suitable materials such as plywood are placed between the specimens and loading platens of the testing machine the packing strip is soft enough to allow distribution of the load over a reasonable area to prevent large contract area. Then the load is applied until the failure of the cylinder, along the vertical diameter.This is an indirect test to estimate the tensile strength of concrete. Splitting tensile strength tests were carried out at the age of 7 days, and 28 days, on the concrete cylinder specimens of size150 mm diameter and 300 mm height as per IS: 5816-1970. For each mix, three identical specimens were tested at each age.

2.9 Flexural Strength Test

The flexural strength of concrete was determined using 150 mm x 150 mm x 700 mm unreinforced beams as per BIS 516-1959 (reaffirmed 2004). The prism is placed in universal testing machine and the load is to be applied without shock until the specimen fails and the maximum load applied to the specimen during the test was recorded. The appearance of the fractured faces of the concrete and any unusual features in the type of failure was noted.Flexural Strength test was carried out at the age of 7 days on the prism specimen. For each mix,three identical specimens were tested at each age.

3. RESULT AND DISCUSSIONS

3.1 Compression strength of MPC Concrete

The compressive strength results of MPC based concrete are furnished in Table 3.1.The test results reveal that increase of MPC content from 5% to 15% improved the compressive strength. Beyond 15%, the compressive strength of MPC concrete tends to decrease. Therefore, the optimum amount of MPC content in concrete is 15%. At the age of 28 days, the compressive strength of MP15 is higher by 6.05% han control concrete, CM.

Table 3.1 Compressive Strength Test results

S.No	Mix ID	Compressive Strength of Concrete (MPa)	
		7 days	28 days
1	CM	26.45	39.45
2	MP5	26.93	39.95
3	MP10	27.16	41.01
4	MP15	27.36	41.84
5	MP20	27.26	38.03

Experimental Analysis of the Use of Coconut Shell as a Course Aggregate in Concrete

G.Tamilarasi [1], G.Vairamani [2], Dr.R.Lavanya [3]
[1]*Assistant Professor, Department of Civil Engineering, KSR College of Engineering, Tiruchengode*
E-Mail ID - tamilmuruganv@gmail.com
[2]*Lecturer, Department of Civil engineering, Thiagarajar Polytechnic College, Salem*
E-Mail ID: gvairamani2015@gmail.com
[3] *Lecturer, Department of Civil Engineering, Thiagarajar Polytechnic College, Salem*
E-Mail ID - lavanyakannanr@gmail.com

ABSTRACT
The cost of conventional building materials increasing every day and it is a major factor affecting constructions. This has necessitated research to find alternative materials of construction so that the availability of materials made easy for construction. In this study, a alternate building material, the coconut shell is used as light weight aggregate in concrete. The properties of coconut shell and coconut shell aggregate concrete is examined and the use of coconut shell aggregate in construction is tested. Conventional coarse aggregate in concrete will be partially used so as to control the quality of concrete. While natural material in coconut shell as a coarse aggregate, it will be investigated to replace the natural coarse aggregate in concrete. The project paper aims to analyse the compressive strength characteristics with partial replacement for M30 grade concrete. The project also aims to show that the Coconut shell aggregate is a potential construction material and it simultaneously reduces the environment problems.

KEYWORDS – Coconut shell,, Coarse aggregate, Codes and Standards, Mechanical properties.

OBJECTIVE OF THE PAPER

The main objective is to encourage the use of these agricultural waste products as construction materials in low-cost housing. In this studies, M30 concrete mixes with different combination of natural material content namely 25%,50% and75%.Three sample specimen will be prepared for each concrete mixes[1]. The parameters will be tested are compressive strength, tensile strength, modulus of elasticity

INTRODUCTION

Concrete is the widely used number one construction material in the world. Concrete manufacturing involve consumption of ingredients like cement, aggregates, water and admixtures. Among all these ingredients, aggregates form the major part. The high demand for concrete in the construction using normal weight aggregates such as granite gets drastically reduced from the natural stone deposits and this has damaged the environment, thereby causing ecological imbalance[2]. Hence it is needed to explore and to find out suitable replacement to substitute the natural stones and makes the concrete as sustainable and environmentally friendly construction material.

The crushed stone and sand are the components that are usually replaced with light weight aggregates. Lightweight concrete is typically made by incorporating natural or synthetic lightweight aggregates' or by entraining air into a concrete mixture. Natural organic waste materials are used for making lightweight concrete. Some of the lightweight aggregate used for lightweight concrete productions are pumice, perlite, expanded clay or vermiculite, coal slag, sintered fly ash, rice husk, straw, sawdust, cork granules, wheat husk, oil palm shell and coconut shell[3].

Coconut shell is grown in more than 90 countries worldwide and India occupies the premium position. India is the third largest producer of coconut products in the world. Coconut trees are widely cultivated in the southern states of India, especially in the Kerala and Tamilnadu. Coconut shells get accumulated in the mainland without being degraded for around several decades. Disposal of these coconut shells is therefore a serious environmental issue[4].

In this juncture, the study on use of coconut shell as a substitute or replacement for coarse aggregate in concrete, is gaining importance in terms of possible reduction of waste products in the environment and finding a sustainable alternative for non-renewable natural stone aggregates.

MATERIALS USED

The constituent materials used in this investigation were produced from local sources.

Cement: OPC 53 grade conforming to IS – 12269 - 2009

Fine Aggregate: Well graded river sand passing through 4.75mm

Coarse Aggregate: Crushed blue granite of maximum size 20mm

Coconut shell: Freshly discarded coconut shells collected from market and oil mill

Properties of Concrete with Partial Replacement of Coarse Aggregate by Rubber Tyre

Gayathri R[1], Alex Rajesh A[2], Senthil Kumar S[3]
[1] PG Student, [2] Asst.Professor, [3] Professor, Department of Civil Engineering
K.S.R College of Engineering, Tiruchengode

ABSTRACT

Concrete is one of the most widely used construction material all over the world. In which coarse aggregate also plays a vital role, due to various usage soon it will reach the demand like fine aggregate. To overcome this problem it has to be replaced by various materials which should satisfy the strength properties. One such material is waste rubber tyre. All over the world more than 1000 million tyres where manufactured and only 7% are recycled, 11% were burned for fuels and 5% were exported. The remaining 77% are sent to landfills or illegally dumped. The dumped tyre causes pollution in environment, soil and land. These tyres can be reused as a partial replacement of coarse aggregate in various cases like non-load bearing structures. Rubber has good damping and vibrating characteristics, hence can be use in various structures. These replaceable concretes are used in special circumstances such as non- load bearing structures, noise reduction, earthquake resistance structures, foundation for machines and railways. It is replaced by rubber in various percentages of 5, 10, 15, 20%. Properties such as compressive, split tensile and flexural strength were made.

Key words: Waste rubber tyre, compressive, split tensile, flexural strength test.

1. INTRODUCTION

Rapid growth in industry and use of vehicles and production of tyre is also increased day by day. Due to increase in production wastage of tyre is also increased which causes hazards to environment [1]. To get rid of these defects in environment the waste tyre can be recycled or reused in various cases. One such method is replacing waste rubber instead of coarse aggregate [2,3]. Waste rubbers can be used in four ways and are chipped tyre, crumb tyre, slit tyre and shredded tyres [4-6]. Chipped rubber can be used instead of coarse aggregate and crumb tyre can be used instead of fine aggregate. In this project, reuse of waste rubber tyre in concrete as partial replacement of coarse aggregate [7]. Different partial replacement of chipped rubber by volume of coarse aggregate are cast and tested for compression strength, split tensile strength and flexural strength [8,9]. In this paper, the study is to evaluate some fresh and hardened properties of concrete produced by replacing natural coarse aggregate by chipped tyres [10]. Due to the partial replacement of natural aggregate by tyre the reduction in weight is also occurred [11]. It is mainly used in panels that require low unit weight, rail-roads to fix rails to the ground, roofing tiles etc. It also improves the qualities such as light weight, elasticity, heat insulating properties, high resistance to abrasion, durability, absorbing the shock and vibration etc [12-13].

2. MATERIALS PROPERTIES

2.1 Properties of Rubber Tyre

A typical rubber consists of 24 to 28% of carbon black, 40 to 48% of natural rubber and 24 to 36% of synthetic rubber. The used rubber tyres are collected from the remoulding shops and cleaned for further use [14]. These rubber tyres are cut into chipped aggregate of maximum nominal size more or equal to 20mm. These tyres are sieved and the rubbers are collected for replacement work [15]. Various test where done and the result obtained for chipped rubber aggregates are shown table 2.1.

Fig 2.1 Chipped rubber tyre of size 20mm

Table 2.1 Properties of rubber tyre

S.No	Description	Test Result
1	Specific Gravity	1.193

PROPERTIES OF CONCRETE WITH REPLACEMENT OF FINE AGGREGATE BY GRANULATED BLAST FURNACE SLAG

Gowtham. V[1], Alex Rajesh. A[2], Senthil Kumar. S[3]
[1]PG Student, [2]Asst.Professor, [3]Professor, Department of Civil Engineering,
K.S.R College of Engineering, Tiruchengode.

ABSTRACT
The present study deals with use of granulated blast furnace slag (GBFS) as a sand substitute in concrete. The use of GFBS will reduce environmental problems related to the fine aggregate mining and waste disposal of slag. The percentage of GBFS was replaced for 0%, 20%, 40%, 60%, 80% of natural sand for the standard w/c ratio of 0.45 is considered. Demands for natural sand in concrete are increasing day by day. GBFS is one of the by product from steel in manufacturing industries. This waste is in the form of blast furnace slag is usually damped in the ground of the industries and they cause harmful effect to environment. Laboratory tests include compressive strength, tensile strength, and flexural strength of conventional concrete and concrete with replacement of fine aggregate by GBFS.

Keywords: concrete, compressive strength, tensile strength, flexural strength, granulated blast furnace slag,

1. INTRODUCTION

The advancement of concrete technology can reduce the consumption of natural resources and reduces the pollution of the environment. Now a day's huge amount of slag generated from various iron manufactured industry. The waste slag form cause a great impact on environment and humans. Blast furnace slag is by product of steel industries. The molten slag has a composition of 40% silicon dioxide and 39.3% calcium oxide, which is closely to the chemical composition of river sand. Research shows that blast furnace slag gives large pozzolanic reaction and improved the bond between the paste and aggregate. It reduce the use of natural sand and cost of making concrete [1-2]. After the molten iron tapped off the remaining molten slag, which mainly consist of siliceous and aluminous residues, is then rapidly water-quenched, resulting in the formation of a glassy granulate. This glassy granulate is dried and ground to the required size is known as granulated blast furnace (GBFS). The possibility of GBFS for partial replacement as fine aggregate was carried out by Jyoti R. Mali, et al [3]. Ahmed Mohmed Ahmad Blash and Vara Lakshmi Vara Lakshmi [4] reported that the more than 7.8 million tons of blast furnace slag is produced in India. Alternative materials such as recycled aggregate, iron ore tailing waste and copper slag waste, were used in the concrete production was experimented by Ugama and Zine Kiran Sambhaji [5-6].

2. MATERIAL

Cement

Ordinary Portland cement of 53 grade confirming to IS: 8112-1989 was used in this study. The physical properties were tested and results are given in Table 2.1

Table 2.1 Properties of Cement

S.No	Description	Test Results
1	Specific gravity of cement	3.15
2	Fineness of cement	1.17
3	Standard consistency of cement	30%
4	Setting time Initial setting time Final setting time	 33 min 310 min
5	Soundness of cement	2.2 mm

Fine Aggregate

Fine sand available nearby crusher was used as fine aggregate in concrete. The physical properties such as specific gravity, the water absorption and fineness modulus were determined and the results are given in Table 2.2.

Mechanical Properties of Normal and High strength Concrete Made with Types of Coarse Aggregates

Vishalakshi, K.P[1] and Revathi, V[2] Sivamurthy Reddy, S[3]

[1, 2] Department of Civil Engineering, K.S.R.College of Engineering, Tiruchengode, ,Tamilnadu, India.

[3]Dept. of Civil Engineering, GITAM University, Bengaluru Campus,

Email: *vksteelvisa068@gmail.com; revthiru2002@yaahoomail.com; sarakinti.sivamurthy@gitam.edu*

ABSTRACT

As an important component of concrete, aggregate has significantly influence on normal and high strength concrete. In this paper, the effect of aggregate types on the strength properties of normal and high strength concrete with target compressive strength of 20,40,60 MPa were investigated. Concrete specimens were prepared with four different types of aggregates, namely limestone, pink granite, grey granite and anorthosite. Tests conducted include compressive strength, split tensile strength and flexural strength. The test result reveals that strength of grey granite was higher than other types of aggregate studied. This work suggested that normal and high performance concrete can be made by evaluating sources of aggregate and it could be used for the preferable grade of concrete.

KEYWORDS: Aggregate types, normal strength concrete, high strength concrete

1. INTRODUCTION

In concrete structures, coarse aggregate play an important role in strength parameter. Aggregate are essential in making concrete into an engineering material. They give concrete its necessary property of volumetric stability. Aggregates exhibit an important influence on concrete by providing rigidity to the material that is necessary for engineering use. Significant improvements in the workability of the fresh concrete are contributed by proper choice of aggregates and that aggregate influences highly important properties of the hardened concrete as well, volume stability, unit weight, resistance to destructive environments, strength, thermal properties etc.(1-3). Aggregate properties have profound influences which need to be realized and acknowledged.

The effect of using crushed quartzite, crushed granite, limestone, and marbles coarse aggregate on the on the mechanical properties of high-performance concrete. The study revealed that the strength, stiffness, and fracture energy of concrete for a given water/cement ratio depend on the type of aggregate (4). Meanwhile, effect of three types of coarse aggregate, quartzite, granite, and river gravel on the compressive strength of concrete were studied. The outcome of the study indicated that highest compressive strength at all ages was noted with concrete made from quartzite aggregate followed by river gravel and then granite aggregate (5). Besides, an attempt was made to use basalt, limestone and gravel as coarse aggregate to produce normal and high-performance concrete. The research work demonstrated that for high performance concrete at 28 days, basalt produced the highest strength, whereas gravel gave the lowest compressive strength. Normal strength concrete made with basalt and gravel gave similar compressive strength while the concrete containing limestone attained higher strength (6). Further, the effects of quantity and particle size distribution of coarse aggregate on the compressive strength of concrete were examined. Three types of coarse aggregates were mixed in four different proportions for concrete production. The result exhibits that for strength varied depending upon the sources of the aggregates, especially high strength concrete can be made by evaluating new sources of aggregate with beneficial strength and stiffness (7). In the study of using low quality aggregates calcareous, dolomitic and quartzitic limestone and steel slag in concrete revealed that strength of steel-slag aggregate concrete was more than that of crushed lime stone aggregate. Whereas lowest strength was noted with calcareous limestone aggregate concrete. Three modes of failures were identified within the paste matrix, at the paste-aggregate interface and within the aggregate. Moreover, the quality of aggregate significantly influences the mode of failure of concrete under compression (8-10). The effect of size of coarse aggregate affects the compressive strength of concrete. In high strength concrete 10 mm and 5 mm size of aggregate gives higher compressive strength of other type concrete (11). The strength of concrete may be reduced when the size of coarse aggregate exceed 15 mm due to the weak interfacial zone between the aggregate and the cement paste (12). Furthermore, basalt, sandstone, Eocene and Devonian crushed limestone as coarse aggregates were used to understand the mechanical behavior of both normal- and high-strength concrete. The compressive strengths of Devonian limestone and basalt concretes were the highest compressive strength of concrete. This may be due to higher compressive strength of rock which contributes higher compressive strength of concrete especially for high strength concrete (13). However, use of locally