Experimental Study on Eco-Concrete using Natural Admixtures

S.Mani Raj, C.Karthick Raja, M.Karuthapandi, Ms V.Saranya
Sethu Institute of Technology

Abstract

This project leads to the retired traditional concept of additional admixture of concrete. Our project helps the construction industry towards the sustainable development. Portland cement was first used in place of lime during the nineteenth century due to the easy use, quick setting and compressive strength. The rapid development of construction industry lead to huge utilization of cement, this leads to emission of greenhouse gas (CO_2) into environment and that causes the global warming. To reduce the emission of CO_2, the supplementary cementatious material was introduced and vast investigation is going on over those materials. In the ancient times they had utilized the materials like egg, blood, animal fat, cactus extract in the concrete as admixtures. Generally the admixtures having specific characteristics as accelerating, retarding, air entraining and water reducing abilities. In this study we utilized the ancient admixture such as egg albumen ,jaggery powder, egg shell & aloe vera .Concrete with natural admixtures provides greater qualities such as stickiness, ease of applications, breathability, moisture resistance, natural antiseptic, self- healing, durability, low thermal conductivity, incombustible, solar production, harmonious balance.Traditional ECO CONCRETE not only improves the strength but also proves its durability for centuries

I. INTRODUCTION

Building materials can be generally categorized into two sources, natural and synthetic. Natural building materials are those that are unprocessed or minimally processed by industry, such as lumber or glass. Synthetic materials are made in industrial settings after much human manipulations, such as plastics and petroleum based paints. Both have their uses.

Mud, stone, and fibrous plants are the most basic building materials, aside from tents made of flexible materials such as cloth or skins. People all over the world have used these three materials together to create homes to suit their local weather conditions.

In general stone and/or brush are used as basic structural components in these buildings, while mud is used to fill in the space between, acting as a type of concrete and insulation.

A basic example is wattle and daub mostly used as permanent housing in tropical countries or as summer structures by ancient northern peoples.

Concrete is a composite building material made from the combination of aggregate (composite) and a binder such as cement. The most common form of concrete is Portland cement concrete, which consists of mineral aggregate (generally gravel and sand), portland cement and water.

After mixing, the cement hydrates and eventually hardens into a stone-like material. When used in the generic sense, this is the material referred to by the term **concrete**.

For a concrete construction of any size, as concrete has a rather low tensile strength, it is generally strengthened using steel rods or bars (known as rebars). This strengthened concrete is then referred to as reinforced concrete.

In order to minimise any air bubbles, that would weaken the structure, a vibrator is used to eliminate any air that has been entrained when the liquid concrete mix is poured around the ironwork. Concrete has been the predominant building material in this modern age due to its longevity, formability, and ease of transport.

II. REALTED WORK

Abalaka A.E, “Comparative Effects of Cassava Starch and Simple Sugar in Cement Mortar and Concrete”, ATBU Journal of Environmental Technology, 4, (1), 2011, pp 13-22. Simple white sugar and cassava starch were used at concentrations of 0 to 1% by weight of cement cured at 3,7,14,28 days using ordinary portland cement . Maximum compressive strength recorded for cassava starch and simple white sugar occurred at 0.05% and 0.06% with at 28 days respectively

Bazid Khan and BulentBaradan, "The Effect of Sugar on Setting –Time of Various type of Cements", Science Vision, 8(1), 2002, pp 71-78.Setting time of cement retarded by incorporation in cement under all conditions of curing .setting time is increased by increasing a sugar content (0.15%) –(0.3%).0.15 % sugar content acted as a optimum sugar content for retarding and setting.

Mihai P and bogdanros¸ca, "characteristics of concrete with admixtures", Fasc. 4, 2008, pp 49-53.- Through this study, admixture gives workability even in the places of low slump value. Concrete added with admixtures gives the higher consistency than the normal concrete

Oyekan G.L and O.A Oyelade, "Crushed Waste as a Partial replacement of Cement in Normal Concrete Production with Sugar added as an Admixture" the weight of sugar content and crushed glass were 0.05% and 5-25% of weight of concrete. Mix proportion: 1:2:4.compressive strength of concrete cube obtained at 28 days of curing was 28.15N/mm2.

RetnoSusilorini M.I, Prasaja Putra KresnoAdhi S, ArdyHaryono, "Sugar Based Admixture for Promising „Green Concrete Technology" - Improving Concrete Beam Performance with Sugar Based Admixture 0.03% of Cement Weight". Dosage of cement was 0.05% of cement weight to increase the concrete performance. Compressive strength of concrete specimens was 30Mpa. This project was a breakthrough of green concrete technology.

HanifiBinici et al. reported that replacement of egg shell powder in sand that leads to reduction in the compressive strength and flexural strength of cement mortar. But it has high resistance to radiation effect.

III. PROPOSED SYSTEM

This project leads to the construction of eco concrete which is mainly based on the traditional concept used in olden building structures. Additional admixtures jaggery powder and eggshell used instead of cement and fine aggregate which increases the bonding and stability. Egg and aloe Vera were used instead of water which increases workability and initial setting time.

IV. MATERIALS

The materials used for making eco concrete are cement, aggregates, jaggery powder, egg albumen, egg shell and aloevera.

A. Jaggery powder

Fig 1Jaggery powder

Jaggery is product of the sugar cane. jaggery will be act as a retarding agent in concrete. Jaggery will increase the initial setting time of concrete, the use jaggery will enhance the bonding property of concrete and strength of the concrete. in this project I used jaggery about 2% weight of cement.

Jaggery is extracted from palm tree and it has a very good medicinal properties and a good drinks in the summer season and it has very good bonding characteristics. The famous sweet called 'karuppatti' was prepared from this jaggery water .It has good binding property for making mortar and concrete mixing. In the olden days the palaces of kings are constructed by using jaggery water is extremely good for making the structures as thermally insulated.

B. Egg albumen& Egg shell

FigNo2 (a) Egg shell powder

Egg shell used as a fine aggregate in concrete which is made up of calcium increasing the strength of concrete. Eggshell has a cellulosic and contains amino acids. It is expected to be bio-sorbent and it was reported that large amounts of egg shells are produced in some countries, as waste products and

disposed in landfills annually. Egg is used as a binding material and increasing the setting time of concrete.

The egg albumen of about 100 to 150ml used the use of egg albumen in concrete will increase the workability of concrete and also it will enhance the strength of concrete in early stage of concrete. Egg white is another name of egg albumen

C. Aloe Vera

Fig No 3 Aloe vera

Aloe Vera is a perennial plant of the xanthorhoeaceae family .it is also placed by most sources in the lilliaceae family.it is cultivated around the world.aloe contains over 400 different species. Aloe primarily contains 98% of water, minerals, sugars,lignin,saponins,enzymes.it is used for stability and bonding in mortar

V. PROCEDURE

1.The flexural strength of concrete is determined by casting cylinders of size 150x300 mm .after curing the strength of the concrete is determined.

2.The modulus of rupture depends on the dimension of prism or beam and type of loading

3. The system of loading used in finding out the flexural tension is central point loading and third point loading. In central point loading, the maximum stress will come below the point of loading where the bending moment is maximum

4. In case of symmetrical two point loading , the critical crack may appear at any section , not strong enough to resist the stress within the middle third, where the bending moment is maximum.

VI. CONCLUSIONS

These are the experimental results obtained from the investigation,

1. Workability of the concrete is increased with the increase in replacement.

2. Higher replacement is increases the initial setting time of a concrete due the use of increase in cementitious materials in concrete.

3. The density of the concrete is decreased with the use of higher percentage of cementitious materials in concrete.

4. The investigated results shows that concrete attains more than 100% strength up to 30% of replacement and 90% of compressive strength is achieved at 40% and 50% substitute.

5. The split and flexural strength of the concrete is decreased in the increase of % of replacement.

6. Addition of cementitious materials reduces the cost of concrete production.

7.Economic point of view the percentage of cement replacement and fine aggregate replacement saves money.

8.From this replacement we can conclude that release of carbon dioxide while manufacturing of cement is reduced with the use of cementitious material in concrete.

9.Early strength of the concrete is increased with the use of natural admixtures. 10. Workability of the concrete is improved with the use of egg white in concrete.

12. Bonding property of the concrete is increased with the use of jaggery in concrete