

STUDY ON STRENGTH OF CONCRETE CONTAINING EFFLUENT TREATMENT PLANT WASTE

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Abstract - In recent years many resembles have tried to use different materials into concrete and it have been successful. Leaving the waste material to the environment directly cause environmental problem. Waste can be used to produce new products or can be used as the admixtures so that natural resources are used more efficient and the environment is protected from waste deposits. Large quantities of sludge and are produced in India and disposed of by landfilling or dumping in and around sites. The creation of non-decaying waste materials, combined with a growing consumer population has resulted in a waste disposal crisis leading to an economic and environmental problem. These wastes that produced today will remain in the environment for hundreds, perhaps thousands of years. The magnitude of environmental problems like air, surface and ground water pollution and economic problem like landfilling maintenance cost etc. is very high for both these wastes.

In this study, waste ETP sludge powder have been used as a replacement to the concrete ingredient i.e. cement and the mechanical properties like compressive strength, Split tensile strength and flexural strength will be measured. For checking strength of replacement of cement by ETP sludge waste powder, the cement is replaced at 5%, 10%, 15% and 20% and ETP sludge waste powder having particle size of 90 micron was used.

Key Words: Sludge, ETP, CETP, TNPCB, High strength concrete,

I. INTRODUCTION

The huge amount of industrial by-products or wastes which is becoming a major problem for client for increasing environmental pollution & generation of a huge amount of unutilized resources. With a view to the above, this research is aimed at finding out utilization of such things/ materials/ industrial by-products for value added applications & also helps to solve the environmental problems. The present piece of my research work aims at, to provide a valued input/utilization to industrial by-product/ waste. It is envisaged to create a new composite material which can be derived from the already existing non degradable and hazardous waste materials. The new

composite material is a combination of Ordinary Portland cement and Dyeing Industry Effluent Treatment plant Sludge (DIETPS). It is the method of extracting wealth from the waste. Textile industry produces waste at a rate of 70-90g/ person equivalent/ day.

As per Tamil Nadu State Pollution Control Board (TNPCB) records, there are about 830 large units engaged in textile industrial processes These industries have established eight Common Effluent Treatment Plants (CETPs) and many individual Effluent Treatment Plants (ETP), which are subjected to treat about 75,000 m³ of effluent per day generated by textile industries. On the other hand, the sludge that retained due to the solids separation process in the treatment plants create lot of environmental problems due to lack of disposal methods

SCOPE OF THE INVESTIGATION

- To study the effect on workability and strength properties of concrete mix with varying percentage replacement by textile sludge.
- To find out the optimum percentage of cement replacement by textile sludge for which the concrete yield superior mechanical properties.
- To reduce the quantity of wastes dumped into the land; this improves the quality of land
- To reduce the demand of construction materials in future generation
- To make effective utilization of the textile sludge

OBJECTIVES OF THE STUDY

- To study about the performance of the new composite material using industrial specific wastes.
- To explore the utilization of textile sludge for the possibility as replacement of cement in building materials.

- To assess the mechanical properties of concrete containing textile sludge.
- To assess the durability properties of concrete containing textile sludge
- To reduce the use of conventional building materials and saving the environment from environment pollution.

II. LITERATURE REVIEW

GENERAL

The main purpose of these literature collections is to provide the information about the work that has been conducted around the world in the field of study. In this chapter a brief review of literature about the utilization of textile sludge in various construction materials are reported and discussed.

UTILIZATION OF TEXTILE SLUDGE AS CONSTRUCTION MATERIAL

Chandrasekaran K et.al (2001) has carried out the studies on management of sludge from hosiery knitwear dyeing wastewater treatment plants and reported that the bricks made from 10% sludge and 90% clay soil is suitable for use in construction of load bearing walls.

Palanivelu K et.al (2001) studied the characteristics of sludge generated from Common Effluent Treatment Plant (CTEP) and Effluent Treatment Plants (ETP) put by the textile industry. They determined the leach ability of the sludge by Toxicity Characteristics Leaching Procedure (TCLP) and German Leach method.

Balasubramanian J et.al (2005) has studied the potential reuse of textile effluent treatment plant (ETP) sludge in building materials. The physio-chemical and engineering properties of a composite textile sludge sample from the southern part of India. The water absorption percentage of tiles is less than the maximum of 10%.

Reddy babu G (2005) conducted the feasibility study of usage of sludge from sand beneficiation treatment plant in the production of bricks. At 5% to 10% of replacement, the quality of bricks is superior to the brick made from brick earth alone and can be used for superior work of permanent nature.

Hilary Nath et.al (2006) has produced block bricks from the primary sludge generated in the garment washing process.. Thus by using textile sludge as a material land pollution, dust pollution and the space required for storage are reduced.

Jewaratnam et.al (2006) did a detailed work on sludge from a waste water treatment plant, the sludge in this work was dried and powdered and added to clay in various proportions. The fired samples were evaluated for the thermal conductivity and sound barrier characteristics were evaluated.

Ramesh Kumar et al (2009) have done extensive study on dye effluents in Perundurai. Colouring of hosiery fabric takes place in the presence of high concentration of sodium sulphate or sodium chloride (30 – 75 kg/m³) in dye solutions.

Safiuddin et al (2010) investigated the potential use of various solid wastes for producing construction materials. The investigation is based on the compressive review of available literature on the construction materials including different kinds of solid wastes. Their investigation shows the applications of solid waste based construction materials in real construction, and identifies the research needs.

III. MATERIALS TO BE USED

INGREDIENTS OF CONCRETE

Concrete is a construction material composed of Portland cement and water combined with sand, gravel, crushed stone, or other inert material such as expanded slag or vermiculite. The cement and water form a paste which hardens by chemical reaction into a strong, stone-like mass. The inert materials are called aggregate, and for economy no more cement paste is used than is necessary to coat all the aggregate surfaces and fill all the voids. The concrete paste is plastic and easily moulded into any form or trowel to produce a smooth surface. Hardening begins immediately, but precautions are taken, usually by covering, to avoid rapid loss of moisture since the presence of water is necessary to continue the chemical reaction and increases the strength. Too much water, however, produces a concrete that is more porous and weaker.

CEMENT

Cement is a binding material in concrete. In this study, we used Ordinary Portland Cement (OPC) for our entire experimental works. Many tests were to be conducted to cement like specific gravity, consistency, initial and final setting test, fineness test.

FINE AGGREGATE

Manufactured sand is an alternative for river sand. Due to fast growing construction industry, the demand for sand has increased tremendously, causing deficiency of suitable river sand in most part of the world. Due to the depletion of good quality river sand for the use of construction

COARSE AGGREGATE

It is a construction component made of rock quarried from ground deposits. They are irregular in shape. Coarse aggregate maximum size of 20 mm have to be used in concrete.

SLUDGE

Initially sludge is a waste material collected in the effluent treatment plant. It's mostly collected from the industries like textile industries, paper manufacturing process, and solid waste treatment plants, etc. The sludge has a roughly 30 % moisture content. The sample of the sludge will be dried at the temperature of 105 °C until the net weight will be constant. The dried sample is grinded in a rice grinder and it is sieved in 90 microns sieve. pH value is 9.4. Specific gravity is generally in the range of 2.2 to 2.3

WORK TO BE CONTINUED

- The basic properties of cement, fine aggregate, coarse aggregate and ETP Sludge should be found out.
- Workability test for concrete should be found out and test on hardened concrete such as compressive strength, flexural strength and split tensile strength should be found out.
- The results of concrete containing ETP sludge and conventional concrete should be compared.

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