

# EFFECT OF PARTIAL REPLACEMENT OF CEMENT BY HYPO SLUDGE ON STRENGTH CHARACTERISTICS OF CONCRETE

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## Abstract:

Paper mill sludge is a major economic and environmental problem for the paper and board industry. The material is a by-product of the de-inking and re-pulping of paper. The total quantity of paper mill sludge produced in the world is many million tones. The main recycling and disposal routes for paper sludge are land-spreading as agricultural fertilizer, producing paper sludge ash, or disposal to landfill. In functional terms, paper sludge consists of cellulose fibers, fillers such as calcium carbonate and china clay and residual chemicals bound up with water. The moisture content is typically up to 40%. The material is viscous, sticky and hard to dry and can vary in viscosity and lumpiness. It has an energy content that makes it a useful candidate as an alternative fuel for the manufacture of Portland cement. Paper production is a highly capital and labour intensive activity. Wood pulp is the fibrous material that results when wood is separated into its constituent fibers by chemical or mechanical means.

**Keywords:** Wood pulp, Fibres, Labour intensive.

## 1. INTRODUCTION

This paper mill sludge consumes a large percentage of local landfill space for each and every year. To reduce disposal and pollution problems emanating from these industrial wastes, it is most essential to develop profitable building materials from them. The quantity of sludge varies from mill to mill. The amount of sludge generated by a recycled paper mill is greatly dependent on the type of furnish being used and end product being manufactured. This study includes different concrete mixtures to determine the influence of hypo sludge derived from Rayalaseema paper mill Pvt.Ltd, plant near the northern bank of river Tungabhadra near Kurnool town Gondiparlla village in the State of A.P. use of hypo sludge in the construction industry is in the production of structural concrete. Hypo sludge contributes beneficial properties to the concrete while helping to maintain economy. The use of hypo sludge, the paper industrial waste in concrete formulations as a supplementary cementations material was tested as an alternative to traditional concrete. Hypo sludge contains, low calcium and maximum calcium chloride and minimum amount of silica. Hypo sludge behaves like cement because of silica and magnesium

properties. This silica and magnesium improve the setting of the concrete. Paper sludge consists of cellulose fibers, calcium carbonate and china clay and residual chemicals bound up with water. The new technology will offer the pulp and paper industry a practical and economical solution for waste disposal. It will also provide the concrete industry with a low-cost source of fibers to produce a better product for its customers. Government purchases of concrete could potentially decrease by one-third, equal to 20 million cubic yards of concrete annually. By avoiding that amount of concrete production, the industry's annual energy use and carbon dioxide emissions will be significantly reduced, which, along with keeping the mill sludge out of landfills, will be of significant benefit to the environment.

## 2. RELATED WORK

Fly ash is one of the types of coal combustion by-products .The use of these by-products offers environmental advantages divert the material from the waste stream, reduce the energy used in processing virgin materials, use of virgin materials, and decreases pollution. India is a resourceful country for fly ash generation with an annual output of over 110 million tones, but utilization is still below 20 % in spite of quantum jump in last three to four years. Availability of consistent quality fly ash across the country and awareness of positive effects of using fly ash in concrete are pre requisite for change of perception of fly ash from a 'A waste material' to 'A resource material.



Fig.1.Material

Although fly ash offers environmental advantages, it also improves the performance and quality of concrete. Fly ash affects the plastic properties of concrete by improving workability, reducing water demand, reducing segregation and bleeding, and lowering heat of hydration. Fly ash increases strength, reduces permeability, reduces corrosion of reinforcing steel, increases sulphate resistance, and reduces alkali-aggregate reaction. The paper mill sludge consumes a large percentage of local landfill space for

each and every year. Worse yet, some of the wastes are land spread on agricultural land or running off into area lakes and streams. Some companies burn their sludge in incinerators, contributing to our serious air pollution problems. To reduce disposal and pollution problems emanating from these industrial wastes, it is most desire to develop profitable materials from them. Keeping this in view, investigations were undertaken to produce low cost concrete by blending various ratios of cement with hypo sludge. So we take hypo sludge and fly ash for compare it with cement.

### 3. PROPOSED SYSTEM

Almost all grade of paper has some percentage of moisture. Moisture in paper varies from 2 - 12% depending on relative humidity, type of pulp used, degree of refining and chemical used. Most physical properties of paper undergo change as a result of variations in moisture content. Water has the effect of plasticizing the cellulose fiber and of relaxing and weakening the inter-fiber bonding.



Fig.2.Slump

The absorption and reflectance of certain bands of infrared and microwave radiation by paper are affected by its moisture content. The amount of water present in a sheet of paper is usually expressed as a percent. The amount of water plays an important role in calendaring, printing and converting process. Moisture control is also significant to the economic aspect of paper making. Water comes free. Poor moisture control can adversely affect many paper properties. The absolute moisture content is expressed as a % of the paper/paperboard weight. The sample is generally not conditioned while doing this test. Although the hypo sludge, fly ash hypo sludge fly ash and iron oxide of different types result in different rate of gain of initial strength, the strengths at later age tend to become similar. Therefore, a mix which results in comparatively lower strength at 28 days would have proportionately greater increase in strength at the later ages and vice-versa. The mix proportions themselves influence the rate of gain of strength, e.g., a concrete with lower water-cement ratio tend to attain high early strength. Therefore the further gain in strength at later ages is approximately smaller.

#### 4. ANALYSIS

There are several techniques for manufacturing construction any structure from fly ash, producing a wide variety of products. One type of fly ash brick is manufactured by mixing fly ash with an equal amount of clay, then firing in a kiln at about 1000 degrees C. This approach has the principal benefit of reducing the amount of clay required. More modern manufacturing processes use a greater proportion of fly ash, and a high pressure manufacturing technique, which produces high strength bricks with environmental benefits.

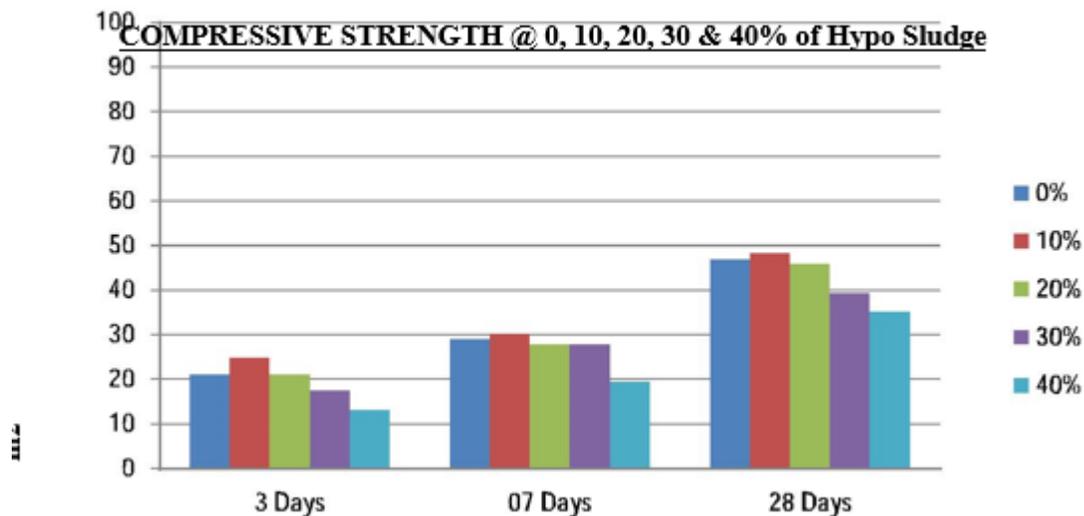


Fig.3.Comparison

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#### CONCLUSION

The 0% replacement of cement in M<sub>40</sub> grade of concrete gives compressive strength of 46.83 N/mm<sup>2</sup> and tensile strength of 4.68 N/mm<sup>2</sup> for 28 days. The 10% replacement of cement by hypo sludge in M<sub>40</sub> grade of concrete gives compressive strength of 48.28 N/mm<sup>2</sup> and tensile strength of 4.82 N/mm<sup>2</sup> for 28 days. The 30% replacement of cement by hypo sludge in M<sub>20</sub> grade of concrete gives compressive strength of 39.22 N/mm<sup>2</sup> and tensile strength of 3.92 N/mm<sup>2</sup> 28 days. Use of Hypo Sludge reduces the amount of cement content. Thus, the construction work with Hypo sludge in cement becomes environmentally safe and also economical.

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