

# A REVIEW STUDY ON THE USE OF HYPO SLUDGE IN THE RIGID PAVEMENT

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**Abstract:** Present day's development of solid structures has been expanded because of which we need lot of cementing materials has been increased. Usage or useful transfer of waste materials from the enterprises or from alternate sources plays a crucial part in worldwide level to lessen the natural contamination according to the earth approaches of the separate nations. Reuse of process completed materials leads in the decrease of pointless land filling/dumping. Hypo sludge is a mechanical preparatory waste produced from the harsh pop procedure of paper making and other particular assembling ventures. The paper presents the overview of published work on utilization of hypo sludge with high performance concrete, exploring its pozzolanic properties, mechanical properties like compressive strength, splitting strength, modulus of elasticity, water absorption test, sorptivity and cost analysis are presented.

**Keywords:** Hypo sludge, Sludge management, Waste utilization, mechanical properties

## 1. INTRODUCTION

In developing countries such as India, where diversified projects for industrialization in conjunction with rapid urbanization are vigorously embarked upon to improve the standard of living, the major problem is environmental pollution by the increasing generation of domestic and industrial waste. The pulp and paper industry generates a considerable amount of wastewater from various processes in the production of pulp and the manufacture of paper. Primary and secondary treatment of this wastewater results in the production of considerable quantities of sludge.

The disposal of business wastes may be a drawback of increasing importance throughout the planet. Sludge from paper mills and ash from the combustion of coal in thermal power plants square measure made in massive quantities in most industrial nations of the planet these days. Due to the large usage of paper, and electrical energy requirements constitute one of our most serious environmental problems. Paper mill sludge has substantially little usage as a material that can be employed in other industrial applications.

It was predicted that a global shift in paper and paperboard production would result in the Asia-Pacific region emerging as a major producer of paper mill sludge. Global production of paper mill sludge was predicted to rise over the next 50 years by between 48 and 86% over current levels. The nature of waste generated from parental industries is mainly depends on the raw materials used in different unit processes. These wastes generated from the industrial sources contain a large number of ingredients, some of which are toxic.

## 2. LITERATURE REVIEW

**LENIN SUNDAR M et al** conducted the study on the Flexural Behavior of Concrete Using Waste Paper Sludge Ash. In this investigation, Hypo sludge Concrete was made by usual ingredients of Cement, Fine aggregate, Coarse aggregate and water and Hypo Sludge at various replacement levels (10, 20, 30 and 40 percent) of weight for M20 mix. Keeping all this view, the aim of investigation is the study on behaviour of concrete while adding of waste with different proportions of Hypo sludge in concrete by using tests like compression strength, split tensile strength and Flexural Strength of the Beam. Compressive Strength of the cubes and Split Tensile strength for the Cylinders have been determined. Based on the results Beam has been casted and placed for curing to determine the flexural properties of the Beam. Comparison of Results Has Been Done. Testing Of Concrete Cubes With Various Methods Like Compression and Split Tensile Test Has Been Done For Both Cubes. For 10% of Hypo sludge Concrete, The Compression Strength and Split Tensile Strength Has Been Increased, So Upto 10% Cement Has Been Replaced by Hypo sludge By Replacement of Hypo sludge. It is observed that in flexural strength of M20 grade concrete the strength of concrete has increased with 10% replacement of hypo sludge with cement as compare to conventional concrete and with 20% replacement it is slightly decreasing or we can say it as equivalent but with 30% its start decreasing in strength.

**Dr. Jayesh kumar Pitroda et al** studied the Gainful Utilization of Fly Ash and Hypo Sludge in Concrete. This research work describes the gainful utilization of the fly ash (Class-F) and hypo sludge in concrete production as partial replacement of cement by weight. The cement has been replaced by fly ash (Class-F) and hypo sludge accordingly in the range of 0% (without fly ash and hypo sludge), 5% + 5%, 10% + 10%, 15% + 15% and 20% + 20% by weight of cement for M-40 mix. Concrete mixtures were produced, tested and compared in terms of compressive strength and flexural strength to the conventional concrete. These tests were carried out to evaluate the mechanical properties for the test results for compressive strength and flexural strength up to 90 days are taken. Based on limited experimental investigations concerning the compressive of concrete, the following conclusions are drawn: (a) For grade of concrete M40 10% hybrid mix (fly ash and hypo sludge) replacement with cement gives the design strength at 28 days. (D5)

(b) For design mix M40 grade concrete up to 10% replacements gains early strength at 7 days and required strength of 66% at 14 days age. Average increase in strength from 28 to 90 days for grade M40 with an optimum replacement of cement with a hybrid mix (fly ash and hypo sludge) (10%) found to be 5.03%.

(c) Hybrid mix (fly ash and hypo sludge) samples up to 10% replacement gains required flexural strength at 28 days and beyond 10% replacement there is less in strength.

**Dharani .N et al** studied on the mechanical properties of concrete with industrial wastes. During the present study, an attempt had been made to study the mechanical properties of concrete in which Hypo sludge and Copper slag were as a replacement material for cement and fine aggregate respectively. Replacement percentage used during this study was 10%, 20% and 30% of Hypo sludge for cement. Fine aggregate was replaced with 30%, 40% and 50% of Copper slag. Compressive strength of cubes was found on 7th, 28th and 56th days. Split tensile strengths of the cylinders were found on 28th and 56th days. Flexural strengths of prism specimens were found on 28th day. It has been found that usage of Hypo sludge and Copper slag as a replacement material has beneficial effects on the Mechanical properties of concrete.

**Mehtab Alam et al** conducted the study on use of hypo sludge in cement concrete. A large quantity of this is contributed by paper industry where three kinds of wastes are generated, i.e. , fibrous sludge called reject which is biodegradable, Hypo sludge, solid wastes generated during calcium hypo chlorite generation and Lime sludge, generated during causticisation of green liquor. The hypo sludge and lime sludge are purely chemical wastes and require large spaces of landfill for their disposal. Limited land fill sites augment the disposal problems of these wastes.

Use of these wastes in cement concrete can not only solve the problem of their disposal but economize the concrete by partially replacing cement. Response to various loads and durability of such concretes might be prime concern of construction engineers, structural designers and owner of the structure. Therefore, a scientific experimental study of such concretes is inevitable.

This paper presents the test results of chemical and physical analysis investigating the utilization of hypo sludge, lime sludge and fly ash in cement concrete. Chemical analyses have been conducted, to evaluate optimum proportions of these materials to be used in concrete following direct enumeration method. Study shows some important parameters such as workability, cube strength, stress-Strain characteristics (cylinder), modulus of elasticity and failure patterns for M20 (1:1.5:3) mix with 10%, 20%, 30%, 40% cement replacement with hypo sludge and comparison with that of conventional cement concrete.

**Dr P.Velumani et al** conducted the study on addition of hypo sludge in concrete. in this investigation, preliminary steps have been executed so as to confirm the doable utilization of hypo sludge as an ancillary cementitious material in suitable proportions. In this study, a preliminary outcome has been arrived by observing the strength and basic durability parameters of mortar cubes by adding hypo sludge with weight of cement taken and the results were interpreted. Based on the outcomes it was concluded that 10% addition of hypo sludge with cement reveals reasonable outcome with respect to the strength and durability aspects. The hardened mortar blocks were evaluated for the parameters like compressive strength, water absorption and block density.. The compressive strength in sludge-cement blocks after 28 days of curing were tabulated and compared for 10, 20 % sludge addition with cement. The control gave the strength of 33.79 after 28 days of water curing. It was observed that the strength for mortar cubes at 10 % of replacement was increased. The replacement up to 10% of sludge gives satisfactory strength requirement as per IS 1489-1991 and the test results indicate that the hypo sludge can be further explored for its applications in concrete and other construction resources. Moreover, it also finds a path for an enhanced solidification method for the solid waste generated in industries.

## CONCLUSION

Based on various literature reviews study, Following conclusions are drawn:

1. Experiments reveal that as the percentage of hypo-sludge in the mix increases the compacting factor decreases.
2. Sludge based concrete shows better performance in strength properties compared to conventional concrete.
3. Use of hypo sludge in concrete can save the paper industry disposal costs and produces a 'greener' concrete for construction.
4. Hypo sludge helps to some extent in preserving the environment as its application reduces the requirement of cement's raw material.
5. It economises the cost of concrete.
6. Environmental effects from wastes and residual amount of cement manufacturing can be reduced through this research.
7. Potential use of industrial waste and by-product make green concrete leading to preservation of natural resources and contribution towards reduction.
8. The concrete with inclusion of hypo sludge can be used for the high value application as it has both improved engineering as well as durability parameter.
9. This research concludes that hypo sludge can be innovative supplementary cementitious Construction Material but judicious decisions are to be taken by engineers.

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