

Utilization of Brine Sludge in Cement Concrete as Partial Replacement of Fine Aggregate

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Abstract— In order to make concrete industry sustainable, the use of waste materials in place of natural resources is one of the best approaches because natural resources are not unlimited therefore, they must be carefully consumed. Brine sludge is waste from paper waste industry which is obtained while whitening the paper. In this research brine sludge has been partially replaced by fine aggregate in cement concrete upto 20% at an interval of 5% and its slump value along with compressive strength has been evaluated. Grade of concrete used is M40.

Keywords: brine sludge, concrete, fine aggregate, paper waste

I. INTRODUCTION

Recycling of waste product is a great way to dispose of industrial waste because the waste can be reused to make new product. Material such as glass and aluminum can be recycled and used in manufacturing other products. If there is industrial waste which can't be recycled in our planet, waste is seen everywhere. Therefore recycled is best way to make our planet green. Brine sludge is also obtained from paper industry likely as hypo but the basic difference between these two is their process of obtaining. Brine sludge is a waste of chlorine-alkali manufacturing industry is generated during the chlorine and caustic soda production through the electrolysis of brine. But the hypo is obtained by using calcium hypo chlorite in final stage of paper production for bleaching solid waste generated during calcium hypo chlorite.

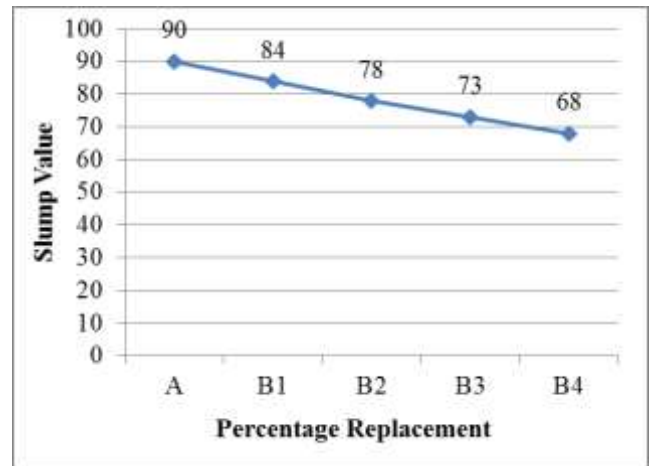
II. METHODOLOGY

In this research brine sludge is collected from Amlai paper mill, cement used in this research is OPC of grade 43, sand collected from local area is used as fine aggregate and crushed aggregate is used coarse aggregate, as per IS 10262 :2009 mx design of grade M40 has been done. 15*15*15cm cube is casted for experimental work and curing is done at room temperature. Mix designation is given in table 1 below,

S.No.	Mix Name	Fine Aggregate	Brine Sludge
1.	A	100%	0%
2.	B1	95%	5%
3.	B2	90%	10%
4.	B3	85%	15%
5.	B4	80%	20%

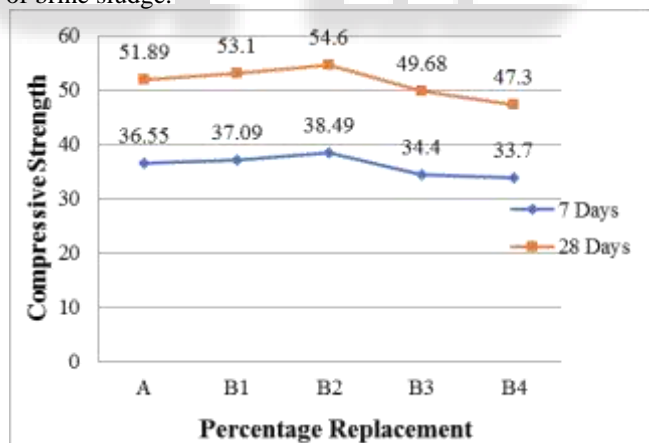
Table 1: Mix designation of concrete containing brine sludge

III. RESULT & DISCUSSION



Graph 1: Result of Slump cone test containing brine sludge as fine aggregate.

Workability of concrete in terms of slump value, result shows that workability of concrete decreases with increase in brine sludge. It has been observed that mix A i.e. conventional concrete mix contains 0% brine sludge possess slump value of 90 mm, at 5% mix brine sludge slump value decreases to 84 mm and it goes decreases to 68 mm at 20% replacement of brine sludge.



Graph 2: Result of compressive strength test containing Brine Sludge

0 % replacement the compressive strength of concrete is similar to the mean target strength of M40 grade of concrete but as fine aggregate was replaced by brine sludge the compressive strength increased up to 10 % replacement i.e. 54.6 N/mm². But further increase in brine sludge content i.e. at 15% the compressive strength was decreased i.e. 49.68 N/mm² and was similar to the mean target strength but at 20% replacement of 1!@\$% resulted into further decreased compressive strength i.e.47.3 N/mm². So, the optimum compressive strength of brine sludge concrete was at 10% replacement i.e. 55.6 N/ mm².

IV. CONCLUSION

As per the results obtained based on the characteristics of materials say, Workability & Compressive Strength Test on M40 grade concrete mix, made of different mixes such as 5%, 10%, 15% and 20% replacement levels of paper mill waste considered for the study, the following conclusions are listed below;

- With the addition of waste paper sludge, there was a slight reduction in the workability because the sludge absorbs more water than fine aggregate hence reduce the workability.
- The compressive strength of concrete cube increased up to 10% replacement of brine sludge after 28 days curing and for 5% replacement brine sludge compared to reference mix of M40 concrete but further increase in Brine Sludge reduces the strength to normal at 15% and further decreased at 20%.
- The most suitable mix proportion is the 5% and 10 % replacement of Brine sludge to fine aggregate.

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