

AN EXPERIMENTAL INVESTIGATION ON REPLACEMENT OF CEMENT WITH SODIUM POLYACRYLATE AND LIME STONE WASTE

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Abstract:

Lime waste is an industrial waste which is obtained from the lime stone polishing industry in the form. The waste is produced at Dhone and surrounding areas of Kurnool. Total waste produced by all industries may be approximately 2000 tones per week. This waste is easily carried away by the air and hence causing problems to human health and environmental pollution. The lime waste generated by the industry has accumulated over years, and it has been dumped unscrupulously resulting in environmental problem. Hence we are using lime waste as a cement replacement in different percentages and we have determined the compressive strength of concrete.

Keywords: Lime waste, Kurnool, Human health.

1. INTRODUCTION

With the enormous increase in the quantity of waste needing disposal, acute shortage of dumping sites, sharp increase in the transportation and dumping costs affecting the environment, prevents sustainable development. The waste disposal problem is becoming serious. As it is a fine material, it will be easily carried away by the air and will cause nuisance causing health problems and environmental pollution. The major effect of air pollution are lung diseases, inhaling problems, the people who are living in and around are suffering from these problems. In this present work, it is aimed at developing a new building material from the lime scrap, an industrial waste as a replacement material of sodium polyacrylate and partial replacement of cement. Moreover, Sodium polyacrylate is very expensive wasting a very expensive material is not good engineering practice and hence Sodium polyacrylate is replaced by some amount of lime waste in certain percentages. By doing so, the objective of reduction of cost construction can be met and it will help to overcome the environmental problem associated with its disposal including the environmental problems of the region. Sodium polyacrylate is a chemical polymer that is widely used in a variety of consumer products for its ability to absorb several hundred times its mass in water. Sodium polyacrylate is made up of multiple chains of acrylate compounds that possess a positive anionic charge, which attracts water-based molecules to combine with it, making sodium polyacrylate a super-absorbent

compound. Sodium polyacrylate is used extensively in the agricultural industry and is infused in the soil of many potted plants to help them retain moisture, behaving as a type of water reservoir. Florists commonly use sodium polyacrylate to help keep flowers fresh. For fast absorption a slight increase of sodium polyacrylate can be used for demonstration purposes. Sodium polyacrylate is used as a superabsorbent polymer in concrete. This study focused on the strength and shrinkage of concrete. If we concluded that the shrinkage of concrete due to loss of water to the surroundings is the cause of cracking both in the plastic and in the hardened stage. This type of cracking can effectively mitigated by slowing down the water loss. The superabsorbent polymers use in concrete has the potential to reduce concrete cracking.

2. RELATED WORK

The action of plasticizers is mainly to fluidity the mix and improves the workability of concrete, mortar or grout. Flowing concrete is also referred as self compacting concrete, collapsed slump concrete and flow concrete.

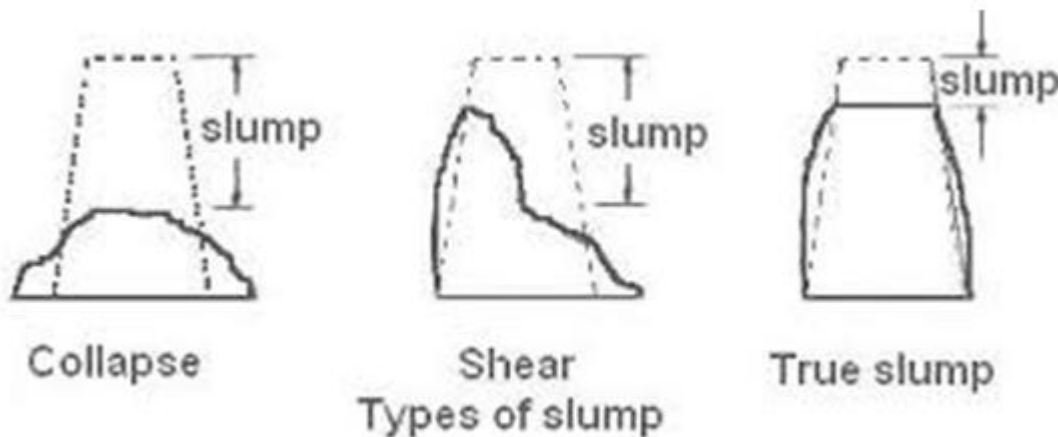


Fig.1.Slump Test

This is the concrete having a slump equal to 200mm or more, a compaction factor of 0.98. Plasticizing admixtures are added to a concrete mixture to make plastic concrete extremely workable without additional water and corresponding loss of strength which makes it ideal for use in ready mixed concrete where workability is an important factor especially in places of congested reinforcement like beam column junction, heavy rafts and machine foundation, foundation of heavy structures. Conplast SD110 disperses the fine particles in the mix, improving cement dispersion and compaction to maximize the strength obtained from the cement used. The improved performance can then be used to allow reductions in cement content without loss of performance. Controlled air entrainment maintains yield and improves surface finish while providing improved resistance to frost attack. Lechatlier apparatus is used for the determination of soundness of cement. It consists of a small split cylinder of spring brass of 0.5mm thickness, forming a mould 30mm internal diameter and 30mm high. On either side of split are attached two indicators with

pointed ends the distance from these ends to centre of the cylinder being 165mm. The mould should be kept in good condition with the jaws more than 0.5mm apart.

3. PROPOSED SYSTEM



Fig.2. Compaction factor apparatus

In the present investigation sodium poly acrylate has been used as replacement of cement up to a maximum of 20%. The compressive strength for different percentage of sodium poly acrylate and percentage increase or decrease in strengths with respect to M30 grade concrete listed in the table. By taking normal M30 grade as referring percentage, percentage of increase or decrease in compressive strength other percentage is calculated. Considering the normal M30 with zero percentage admixtures the compressive strength is 35.8 N/mm². When 0.1% replacement is used, the compressive strength is 42.2 N/mm². Considering 0.2% replacement, the compressive strength is 43.7 N/mm². And there is an increase in the strength 22.06 N/mm². With 0.3% replacement, the compressive strength is 44.8 N/mm² and there is a increase in strength 25.13 N/mm². With 0.4% replacement, the compressive strength is 38.1 and there is a little increase in the strength. However, 0.4% can be taken as optimum dosage which can be mixed in cement concrete for giving optimum possible compressive strength at any stage. In the present investigation Lime stone powder has been used as replacement of cement up to a maximum of 20%. The compressive strength for different percentage of sodium poly acrylate and percentage increase or decrease in strength with respect to M30 grade concrete listed in the table. By taking normal M30 grade as referring percentage, percentage of increase or decrease in compressive strength other percentage is calculated.

4. ANALYSIS

Considering the normal M30 grade with zero percentage admixtures the compressive strength is 36.2N/mm². When 5% replacement is used, the compressive strength is 43.1 N/mm² and increase in strength is 19.06 N/mm². Considering 10% replacement, the compressive strength is 44.5N/mm². And there is an increase in the strength is 22.92 N/mm². With 15% replacement, the compressive strength is 45.6 N/mm² and there is a increase in strength 25.96 N/mm² .With 20% replacement, the compressive strength is 38.1 and there is a little increase in the strength. However, 15% can be taken as optimum dosage which can be mixed in cement concrete for giving optimum possible compressive strength at any stage.

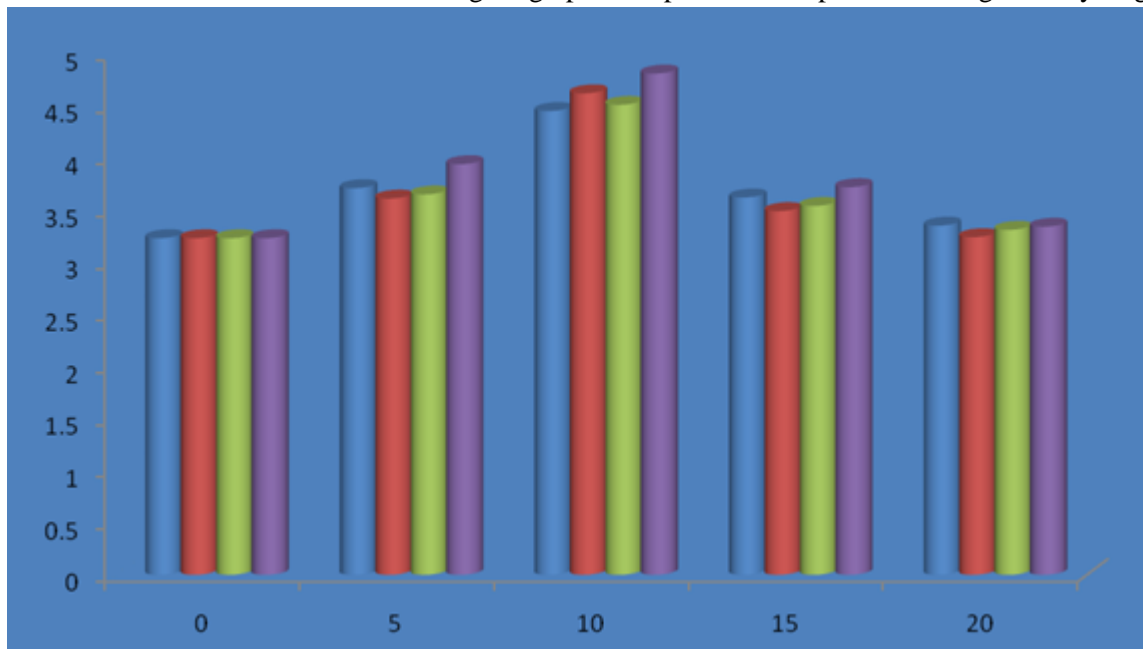


Fig.3. Comparison of graph

Due to the difficulties involved in conducting the direct tension test, a no. of indirect methods has been developed to determine the tensile strength. Splitting tests are well-known indirect tests used for determining the tensile strength of concrete, sometimes referred to as the splitting tensile strength of concrete.

CONCLUSION

The effect of different curing methods on mechanical properties of self compacted concrete is studied i.e. effect on Compressive, Flexural & Shear strength was studied. The following recommendations are suggested for the future research. Effect of change of molecular weight of PEGs on self curing capacity. The durability performance of SCSCCC such as resistances to corrosion, alkali-aggregate reaction, sulfate attack, and freezing and thawing should be investigated.

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