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REPLACEMENT OF M20 GRADE CEMENT WITH RICE HUSK ASH

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Abstract:

Rice husk is a waste product of rice mills. Each tone of paddy can generate 0.2 tonne of husk. This is a highly reactive pozzolanic admixture. The fineness is of the order of 50-60 m2/gm. The inclusion of rice husk ash in concrete affect various aspects of concrete. As a part of the composite that forms the concrete mass, Rice husk ash acts in part as fine aggregate and inpart as a cementitious component. This experimental study will verify the strength and performance adequacy of the alternate of using rice husk ash as a partial replacement of cement in M20 grade concrete with the same material. Concrete mixtures were prepared with cement replacement levels of 0%, 5%, 10%, and 15% by rice husk ash.

Key Words: Cement Concrete, Rise husk, compression test, tension test, ultrasonic pulse velocity test.

1. INTRODUCTION

Conventional concrete has some deficiencies too, though its remarkable, flexibility and ability to redistribute stress etc. Its permeability to liquids, and subsequent corrosion of reinforcement, its low freeze-thaw resistance, and quite poor resistance to sulphate attack are some other major deficiencies. The idea of mixing more than one material is to obtain a composite is not new, structural "light weight aggregate concrete" can be produced by replacing blue metal with sintered pulverized fly ash, expanded shales, clays and slates, foamed slag and pumice. The inclusion of rice husk ash in concrete affect various aspects of concrete. As a part of the composite that forms the concrete mass, Rice husk ash acts in part as fine aggregate and in part as a cementitious component. It influences the rheological properties of the fresh concrete, the strength, finishing, porosity and durability of hardened mass and the cost. The selection of cementitious materials and the optimization of the proportions of the ingredients are more of art than pure science. The traditional methods of mix proportioning discussed to be modified based on strength requirements. High strength can be produced by reducing the water-cement ratio below that normally used for ordinary concrete. Samples of concrete mixtures prepared with cement replacement of 0%, 5%, 10%, 15% by RHA. In current worldwide markets and increasing accentuation on quality, requirement for concrete having high strength with affordable cost has increased numerous fold. Over the past decades, research on concrete has entered broad- based areas of activities to enhance the concrete performance. The reason behind this is not only to the vast range of applications that concrete offers, but also due to its great affordability, strength, durability, and versatility. Numerous method has been applied and different kinds of concrete has been introduced like, Self -Compacting Concrete(SCC) was introduced that enhances the durability of the concrete, high strength concrete(HSS) was introduced that provide ultra-high strength. But

such concrete is rarely available and high cost. The need to reduce the high cost of Ordinary Portland Cement with the desirable characteristics some materials has to be modified. From the intensified research into locally available products and reduction in cost partial replacement of the OPC with rice husk ash is proven to be effective fulfilling requirement.

2. RELATED WORK

Research is always deliberated glancing concrete properties. It is envisioned that the minimum contain of the RHA as a partial replacement found to be not worthy enhancing the strength as well more amount of the RHA decreases its compressive strength value. P. Mehta (1992), studied that RHA contains silica in amorphous and highly cellular form that improves workability and stability, and it decreases the development and impermeability as well as durability in strengthening zone. Rukzon and Chidaprasirt (2000) studied that the strength of the Mortar with the partial replacement of RHA will gain 10 percent more after 7 days and 20 percent after 28 days comparing with regular concrete. Mehta and Pirth (2000) investigated that the use of the rice husk ash as a replacement material reduce the temperature in the high strength mass concrete. Ganesan et al (2007) studied that the concrete with partial replacement of cement with rice husk ash and he concluded in his study that concrete with replacement of 15% of rice husk ash showed an almost compressive strength. Rice Husk Ash is the ash that is obtained by burning the rice husk until it gets reduced by 25%. The Rice Husk for the research was obtained locally. These Husk then were deliberated until fine ash is being produced. These ashes were sieved by the 600 micron where further impurities are being minimized. The sand that was used for the research work was obtained locally that fulfills the requirement provided by Indian Standard 383 1970.The purity of the sand was analyzed glancing the code provided by Indian Standard.

3. METHODOLOGY

The compaction factor value decreases as the percentage of the rice husk ash increases in the concrete mixes. The decrease in the value of compacting factor shows that the concrete is less workable. The increase in the percentage of the rice husk ash proves that the more water is requiring making the mix more workable.The compression strength of the concrete mix increases with replacement of rice husk ash up to 10% after that the gradually decrease in the compressive strength is noted. The maximum strength is shown by the RT-1 mix having 5% rice husk ash and gives the value of compressive strength 36.54 MPa. The value of compressive strength of mix RT-2 is less than the mix RT-1 but more than RT-0 (conventional mix) with value 34.81. The gradual decrease in compressive strength is noted and the value of RT-3 mix is 27.23 and RT-4 is 19.15 and RT-5 is 14.49. The RT-1 mix shows increment in strength with 5.04% and the mix RT-2 shows increment in strength with 3.94% after this mix all mixes shows a gradually percentage decrement 21.79,29.67, 24.33, for RT-3, RT-$, RT5 mix respectively.

The concrete with 5% rice husk ash shows the maximum tensile strength than other replacement value after the mix RT-1 the continuous decrease in tensile strength is noted the mix having 10% replacement i.e. RT-2 is gives the value less than the RT-1 but its gives the slightly more value than the conventional mix RT-0. From the curve we conclude that 10% RHA can replaced. After the RT2 mix the value goes on decreases as we increase the content of RHA. The mix RT-3, RT-4, RT-5 shows the %decrease in the tensile strength

-8.03%, -12.45%, -38.2%respectively. Similarly, the 28 days' strength of the concrete mixes shows an increment up to RT-2 and the RT-1 shows the highest tensile strength value. The other mixes give a continuous decrease in the value of the tensile strength of the concrete mix. the % decrease value shows that the value of the tensile strength is decrease but less than the 7 days' strength. The % decrease in the mix RT-3, RT-4, RT- 5, is -17.39%, -17.24%, and 8.64% respectively.

4. ANALYSIS

The flexure strength of the rice husk ash concrete shows the increment in the strength of the RHA concrete the 7 days' flexure strength of RT-0 mix is 2.38 and the RT-1 gives the increment in the strength i.e.2.95 and after that all the mixes gives the decrease in the flexural strength and give the liner down of the curve. And the 28 days' flexural strength give good result and the strength of the RT-1 i.e. 5% replacement and RT-2 i.e. 10% replacement of rice husk ash gives the increment in the strength of the concrete mix as

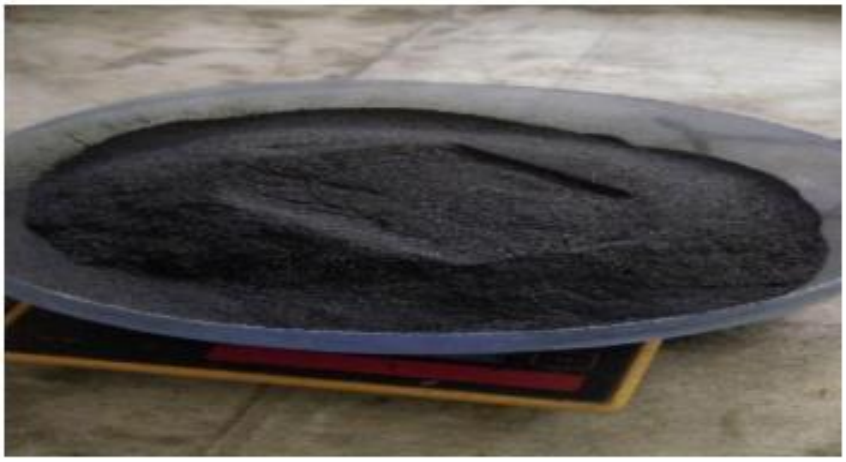

Fig.1.Properties

compare the strength of the mix RT-0 the value 4.45 and the both mixes increase values as 4.61 and 4.53 respectively for 5 and 10% replacement and the flexure strength of the other mixes gives the decrease in the value after the 10% replacement. Hence we can say that the rice husk ash can use as the replacement martial at the maximum replacement of 10% from the concrete mix. And the replacement of more rice husk ash than 10% tends to decrease in the flexural strength of the concrete mix. tends to increase the compressive strength and durability of the concrete. Usage of the fine rice husk ask reduces the temperature as compared to the normal opc temperature. As per the researcher observation is was found that proper proportionate ration RHA can reduce the initial setting time and also it obtains its maximum strength with a few days. RHA depends mainly on silica content, silica crystallization phase, and size and surface area of ash particles. Rice husk usage benefits are briefed in many literatures, very few of them deals in their real life. In current worldwide markets and increasing accentuation on quality, requirement for concrete having high strength with affordable cost has increased numerous fold. Over the past decades, research on concrete has entered broad- based areas of activities to enhance the concrete performance. The reason behind this is not only to the vast range of applications that concrete offers, but also due to its great affordability, strength,

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FLEXURE STRENGTH OF DIFFERENT RICE HUSK ASH CONCRETE MIX (N/mm2)				
MIX	7 Days		28DAYS	
	Flexure Strength	Increase/Decrease in Strength	Flexure Strength	Increase/Decrease in Strength
RT-0	2.38	0	4.45	
RT-1	2.95	23.94%	4.61	3.59%
RT-2	2.15	-27.11%	4.53	-1.73%
RT-3	1.65	-23.25%	3.48	-23.17%
RT-4	1.36	-21.24%	2.23	-35.91%
RT-5	1.2	-11.00%	1.8	-23.88%

Fig.2.Table

durability, and versatility. Numerous method has been applied and different kinds of concrete has been introduced like, Self -Compacting Concrete(SCC) was introduced that enhances the durability of the concrete, high strength concrete(HSS) was introduced that provide ultra-high strength. But such concrete is rarely available and high cost. The need to reduce the high cost of Ordinary Portland Cement with the desirable characteristics some materials has to be modified. From the intensified research into locally available products and reduction in cost partial replacement of the OPC with rice husk ash is proven to be effective fulfilling requirement.

CONCLUSION

Analysis of rates for cement concrete (M-25) mix containing 100% cement and for mixes with 10 % partial replacement of cement with rice husk ash is to be done based on prevailing market rates. The cost of rice husk ash is negligible. The rice husk ash is found free from the industry where the rice husk is used as a fuel that's why we take only the transportation cost of the rice husk ash. On comparing it with conventional concrete it is found that concrete utilizing 10% rice husk ash as partial

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