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To Study the Effect on Mechanical Behavior of Fiber Reinforced Concrete Using Polyethene Terepathelte and Wood Ash

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Abstract: **The rapid urbanization and industrialization all over the world has resulted in large deposition of plastic waste. Disposal of plastic waste in an environment is considered to be big hazard due to its very low biodegradability and presence in large quantities. In order to minimize the problem, the proposed concrete which is made by adding plastics and wood in concrete and it may help to reuse the waste and to study the properties of concrete with plastics. In my work the effect of Polyethylene Terephthalate fibers and wood ash on the properties of concrete will be carried out. An experimental work has been carried out on the plastic fiber reinforced concrete with addition plastic fibers (0%,0.6%,1.2%,1.8%) and partial replacement wood ash (0%,6%,12%,18%,24%,30%) by cement in concrete. There is indicate that the compressive strength of design mix goes on increased by 34% as the percentage of pet fibers increases up to 1.8% with addition of wood ash upto 30% at 3.7, 28 days as compared to that of control mix, but after this there is marginal decrease in strength at by 20% as compared to Normal mix.**

Keywords: **Wood Ash, polyethylene terephthalate, Strength properties, concrete**

I. GENERAL

The concept of using fibers as reinforcement is introduced in ancient times. In the 1950s, the concept of composite materials and fiber-reinforced concrete was introduced. Fiber reinforced concrete (FRC) is concrete containing fibrous material which increases its structural integrity. It contains short discrete fibers that are uniformly distributed and randomly oriented. Fibers are usually used in concrete to control cracking shrinkage. They also reduce the permeability of concrete and thus reduce bleeding of water. The addition of fibers considerably improves the performance of concrete. The Plastic waste became the major source of environmental pollution, and hence an attempt has been made to utilize the plastic waste in improving the strength of the concrete. Because of mixing the plastic as a fibre, it can reduce the brittleness in concrete. PET bottles were cut into pieces randomly and add them by the weight of the cement. Concrete has low tensile strength and crack resistance. Its weaknesses could be enhanced with the addition of fiber. Longer fibres performed better than their shorter fibres, as observed in the other tests. With an increase in fibre volume fraction, the maximum crack widths were observed to undergo a reduction from 3 mm for the control mix to hairline cracks wide less than 0.5 mm for the panel cast with a mortar reinforced with 1% by volume 50 mm long deformed fibres [5].

WOOD ASH

Wood ash contains many minerals that can be separated out for further use. A major component is calcium carbonate, representing 25 or even 45 percent (depending on feedstock and burn conditions). Less than 10 percent is potash, and less than 1 percent phosphate; there are trace elements of iron, manganese, zinc, copper and some heavy metals. However, these numbers vary, as combustion temperature is an important variable in determining wood ash composition. All of these are, primarily, in the form of oxides. If we add the ashes to water, the soluble potassium and sodium salts will dissolve while the insoluble silica and calcium carbonate will settle to the bottom. We can then drain off the water (containing the "good stuff") and throw the insoluble material away. To separate the chlorides from the soluble carbonates, we will exploit the greater solubility of the carbonates in hot water. We will bring the liquid to a boil and continue boiling until enough water boils away for an insoluble precipitate to form. This is very likely a mixture of sodium and potassium chloride. From this point, we

will continue boiling until half of the remaining water is removed.

POLYETHYENE TEREPHTHALATE

It is a hard, stiff, strong, dimensionally stable material that absorbs very little water. It has good gas barrier properties and good chemical resistance except to alkalis. Its crystallinity varies from amorphous to fairly high crystalline [13]. Polyethylene terephthalate can be highly transparent and colorless but thicker sections are usually opaque and off-white. The strain-hardening response is always associated with high performance fibre reinforced composites in which coarse aggregates are completely eliminated. It was found that concrete in the presence of PVA fibres attained strain-hardening response with a drop in the load up to 50% of the peak load and the strain capacity of about 2% under direct tension. The post-cracking relation based on single fibre pull-out test closely matches the results of direct tension test [7]. The mechanical properties of polystyrene are low elongation at break and heat resistance, good electrical insulating features, not suitable for high centrifugal forces. The maximum usage temperature of these glasses are 75-80o C andits density ranges 1.05 gms/cm3 .

II. LITERATURE REVIEW

R.N.Nibudey,Dr.P.B.Nagarnaik(2013) This paper describes the performance of plastic fiber reinforced concrete(M30). An experimental work has been carried out on the specimens like cubes and cylinders which were casted in the laboratory and their behavior under the test was observed. The plastic fibers were added from 0.0%to3.0%.The compressive and split tensile strengths of concrete were determined after 28days of curing period. The test results were compared and the relationships between the observed and predicted strengths were given.

Ochi et al., (2014): investigated development of recycled PET fiber and its application as concrete-reinforcing fiber and described a method that can be used to produce concrete reinforcing PET fiber from used PET bottles. The issue of concern in the development of PET fiber was its alkali resistance and they encountered no problems when using these fibers in normal concrete. Sung Bae Kim et al., 2010: proved structural performance evaluation of recycled PET FRC. A procedure to recycle waste PET bottles is presented, in which short fibers made from recycled PET are used within concrete. To verify the performance capacity of recycled PET fiber reinforced concrete, it was compared with that of polypropylene (PP) fiber reinforced concrete for fiber volume fractions of0.5%, 0.75%, and 1.0%. The compressive strength, elastic modulus, and restrained drying shrinkage strain were computed experimentally. The test results show that compressive strength and elastic modulus both decreased as fiber volume fraction increased and cracking due to drying shrinkage was delayed in the PET fiber reinforced concrete specimens, compared to such cracking in no reinforced specimens without fiber reinforcement, which indicates crack controlling and bridging characteristics of the recycled PET fibers.

Rathbet (2015) The mechanical properties of polystyrene are low elongation at break and heat resistance,good electrical insulating features, not suitable for high centrifugal forces. The maximum usage temperature of these glasses is 75-80o C andits density ranges 1.05 gms/cm3. These glasses are inflammable and the general chemical resistance are salt solutions, non-oxidizing acids as well as alkaline and alcohols, fuel, etheric oils, strong oxidizing agents and aromatic substances lead to the formation of cracks. The concrete reinforced with circular PET fibers and long strips are having more ductile behavior and high concrete-PET adherence.

Swaptik Choudhary Mihir Mishra(2014) In this study with increasing industrialization, the industrial byproducts (wastes) are being accumulated to a large extent, leading to environmental and economic concerns related to their disposal(land filling). Wood ash is the residue produced from the incineration of wood and its products (chips, saw dust, bark) for power generation or other uses. Cement is an energy extensive industrial commodity and leads to the emission of a vast amount of greenhouse gases, forcing researchers to look for an alternative, such as a sustainable building practice. This paper presents an overview of the work and studies done on the incorporation of wood ash as partial replacement of cement in concrete from the year 1991 to 2012. The aspects of wood ash such as its physical, chemical, mineralogical and elemental characteristics as well as the influence of wood ash on properties such as workability, water absorption, compressive strength, flexural rigidity test, split tensile test, bulk density, chloride permeability, freeze thaw and acid resistance of concrete have been discussed in detail.

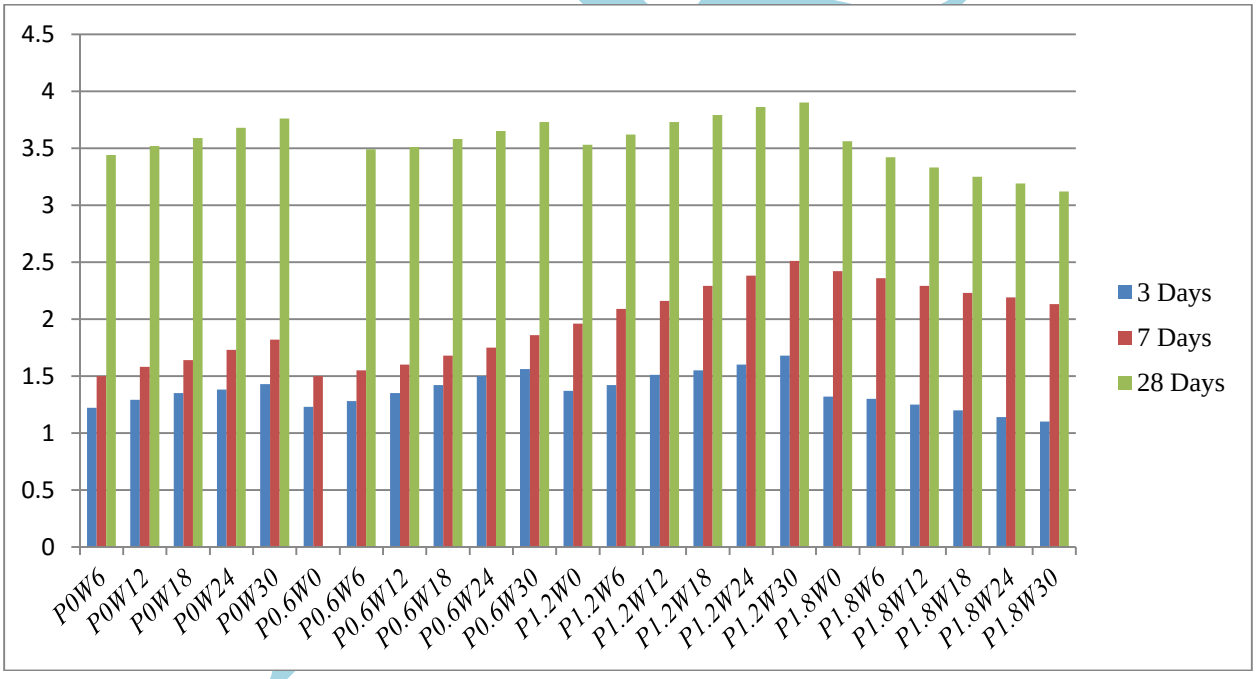
Prabagar Subramaniam,Kalya et al (2015) Utilization of wood ash as a partial substitution for cement is one of the promising method to increase the strength and thermal insulation for cement blocks. The present study focused to use wood ash as a partial replacement for cement material during sand cement block manufacturing. The concrete mixtures have been mixed with 10%, 15% 20% and 25% of wood ash as a partial replacement for cement with sand and tested for compressive strength, water absorption and heat release. Higher compressive strength was observed in the samples of 15% containing wood ash replacement material. All the samples other than 25% of wood ash replacement were shown lower water absorption and highest was found in 15% wood ash content. Slower heat release was observed in the samples of 15% and 20% of wood ash replacement after 21 days of curing time. Addition of 15% wood ash for the

manufacturing of concrete blocks was developed and these blocks meet standard limits.

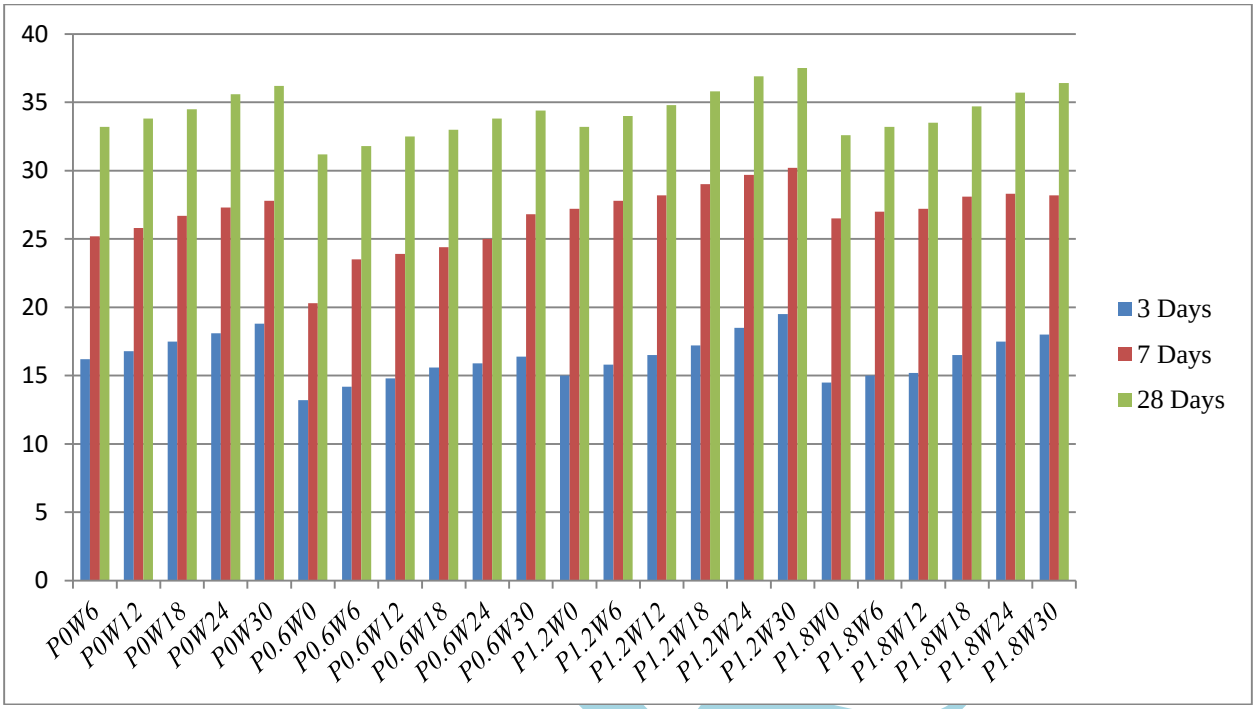
Y. Dinesh , Hanumantha Rao(2017) This paper deals with the possibility of using waste plastic as fiber in concrete by replacing 0.5%, 1% & 1.5% by weight of cement. The test specimens are made in the form of Cube, Cylinder and Prism. Compression, Split Tensile and Flexural test is carried out to find the strength of concrete. The studies were conducted on a M 25 mix and investigation process is being carried out as per recommended procedures by relevant codes. Finally the obtained results using FRC are compared with conventional concrete.

Rafat Sddiqueet al. (2017) discussed the effect of recycled and waste plastic on workability, density, compressive strength, splitting tensile strength. The post consumer plastic aggregates used to replace conventional aggregates and the compressive strength of concrete was in the range of 48 and 19 MPa. The splitting tensile strength was reduced by 17% at 10% at plastic aggregates, but ductile behavior of concrete was observed by them.

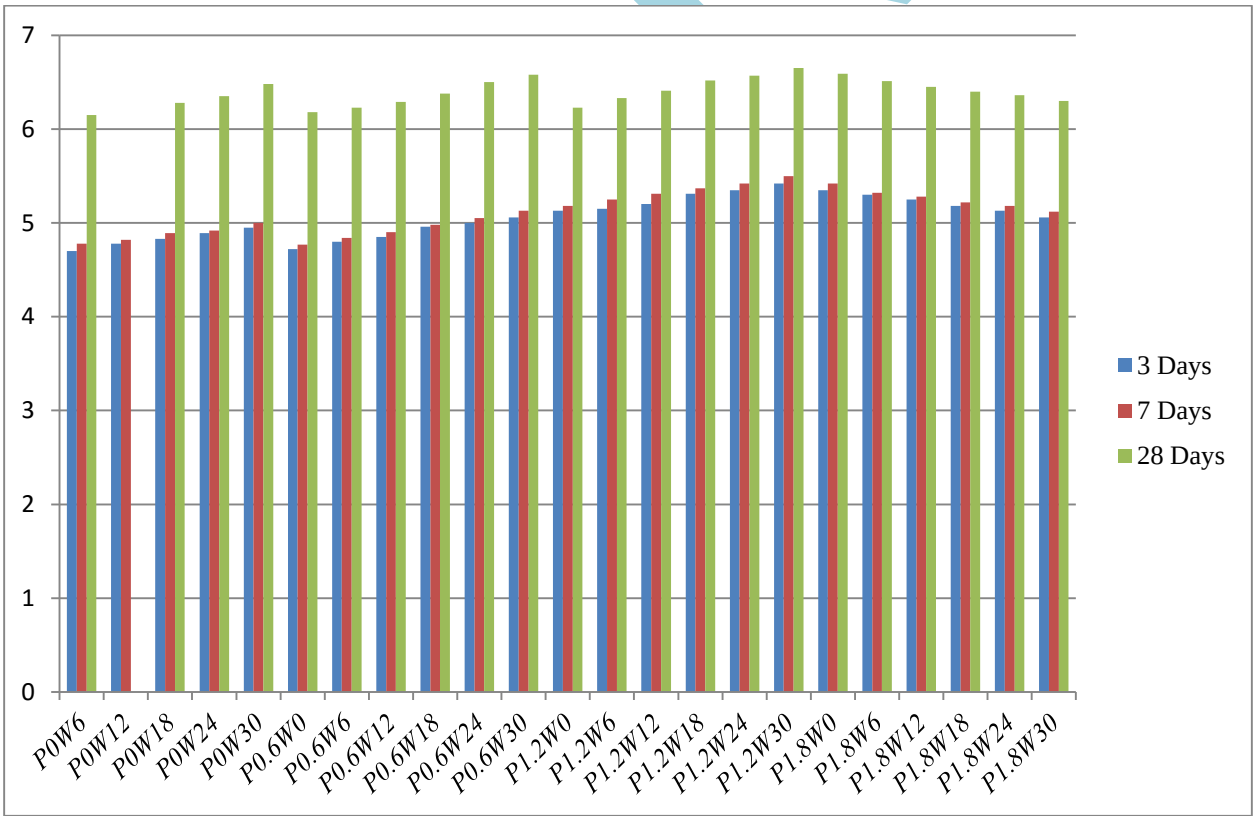
Mehnaza Akhter (2017) The present work deals with the results of experimental investigations on effect of Wood Ash on setting time and compressive strength of cement and concrete. Effect of Wood Ash on compressive strength of cement and concrete by using varying percentage of Wood Ash 0%, 10%, 20%, 30% and 40 % by weight of cement. In this paper Wood Ash as partial replacement of cement in concrete was used and its effect on properties of concrete were studied. Cubes of size 70.6 mm X 70.6 mm X 70.6 mm were used for compressive strength test of cement and cubes of size 150 mm X 150 mm X 150 mm for compressive strength test of concrete. All the specimens were water cured and testing is done for 7 days and 28 days. Results were observed and comparison of results of compressive strength of cement and concrete with wood ash with that of normal cement and concrete showed the significant improvements in the results of compressive strength. Optimum percentage of replacement of different agro waste is determine



Split Tensile Strength test Graph



Compressive Strength test Graph



Flexural Strength test Graph

III. CONCLUSIONS

1. The compressive strength results concluded that with increasing percentage of wood ash the strength of concrete increases. This may be due to finer particle size of woodash.
2. The result also concluded that with increasing percentage of wood ash the strength increases upto 30% replacement and there is marginal decline in strength above 30% replacement of wood ash.
3. The maximum value of compressive strength at 28 days obtained at 30% wood ash and 1.2 % of PET bottles which is 17.5 % higher that control mix.
4. The split tensile result shows similar result as that of compressive strength. The maximum value of split tensile strength for concrete containing 30 % wood ash and 0.6% PET bottles.
5. The result of flexural strength concluded that the maximum value of flexural strength at 28 days was obtained at containing 30 % wood ash and 1.2 % PET bottles.

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