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Investigation on Properties of Concrete as Partial Replacement of Coarse Aggregate and Sand using Polypropylene Fiber with Foundry Sand for Rigid Pavement

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ABSTRACT

This investigation presents a comprehensive review on various aspects Polypropylene Fiber Reinforced Concrete concerning the behavior, applications and performance of Polypropylene Fiber Reinforced Concrete. Various issues related to the manufacture and strength of Polypropylene Fiber Reinforced is also discussed. There are many forms of industrial by-products and waste materials. The use of such materials in concrete not solely makes it economical, but also helps in reducing disposal considerations. WFS are major byproduct of metal casting trade and with success used as a land filling material for several years. In a trial to use the WFS in construction materials, analysis has being applied for its potential utilization in creating concrete as partial replacement of fine combination.

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INTRODUCTION

Polypropylene Fiber can also be used as fibers. The disposing of waste plastic is causing environmental pollution. study the strength of concrete by partial replacement of coarse aggregate and fine aggregate using Polypropylene Fiber with foundry sand as partial replacement of sand for Rigid Pavement.

Manufacturing of Foundry Sand

Aluminum, copper, brass and bronze produce the rest. The 3,000 foundries in the United States generate 6 million to 10 million tons of foundry sand per year. While the sand is usually used multiple times among the manufacturing plant before it becomes a by-product, only 10 % of the manufacturing plant sand was reused. The sands from the brass, bronze and copper foundries are usually not reused. Whereas actual numbers aren't available, the most effective estimate is that around ten million a lot of foundry sand will beneficially be used annually.

Waste Plastic Polypropylene Fibre

Fibers are used in concrete to control crack due to plastic and drying shrinkage. They provides as impervious layer of concrete which controls permeability. Basically fibers do not increases flexural strength so it is not possible to replace for structural steel. The amount of fibers added to a concrete mix is expressed as a percentage of the total volume of the composite (concrete and fibers), typically ranges from 0.1 to 3%. In this study we used Waste Plastic Fiber derived from waste plastic pot possessing aspect ratio 20 and added as 1 – 3% by weight in concrete composite.

Objectives

- To Study the compressive strength, split tensile strength, and flexural strength of the concrete with and without partial replacement of coarse aggregate and fine aggregate for Rigid Pavement.

Slump Test

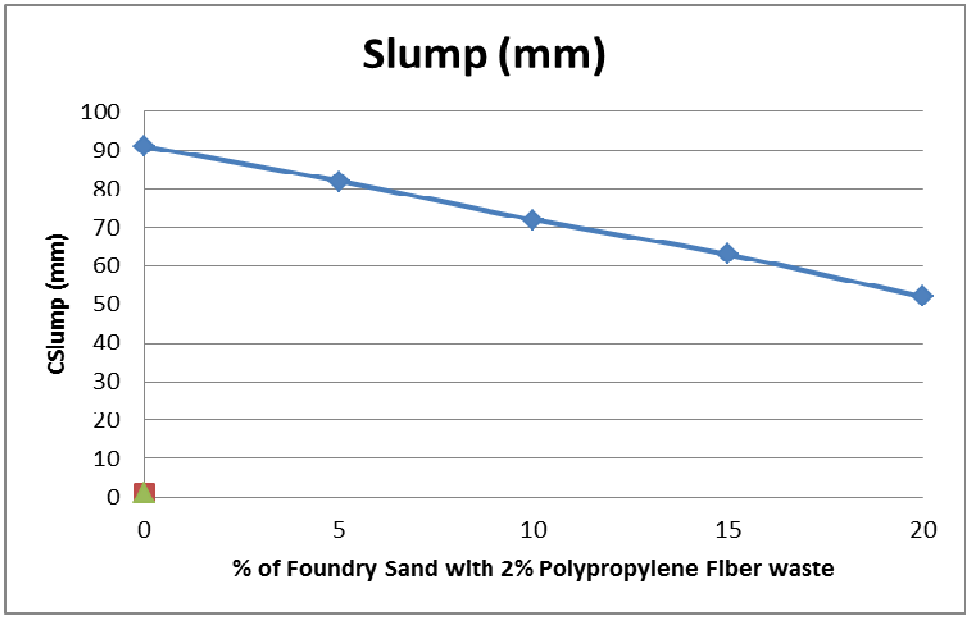

Figure -1 slump value of Mix of M-30 Concrete (with 2% Polypropylene Fiber Waste & varying % of Foundry Sand)

Mechanical Strength

To evaluate the mechanical strength characteristics of concrete reinforced with plastic fibres materials, detailed experimental investigation was carried out and the results are discussed in the forthcoming sections.

Compressive Strength

Totally 108 cube specimens of size 150 mm x150 mm x 150 mm with 3 mixes were casted and tested. Three volume fractions were considered for 2% Polypropylene Fiber waste & Foundry Sand of different volume fractions like 0%, 5 %, 10 %, 15% and 20%..

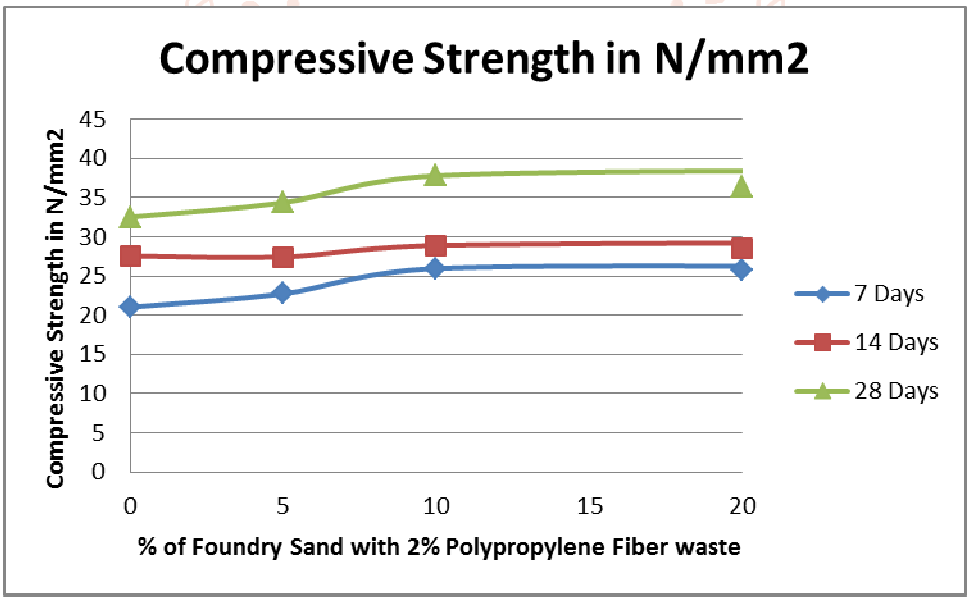

Figure 2 – Compressive Strength of Mix of M-30 Concrete (with 2% Polypropylene Fiber Waste & varying % of Foundry Sand)

Split Tensile Strength

Totally 36 cylinder specimens of size 100 mm diameter and 300 mm height with 3 different % mixes were casted and tested. Three weight fractions were considered for 2% Polypropylene Fiber waste & Foundry Sand of different volume fractions like 0%, 5 %, 10 %, 15% and 20%.

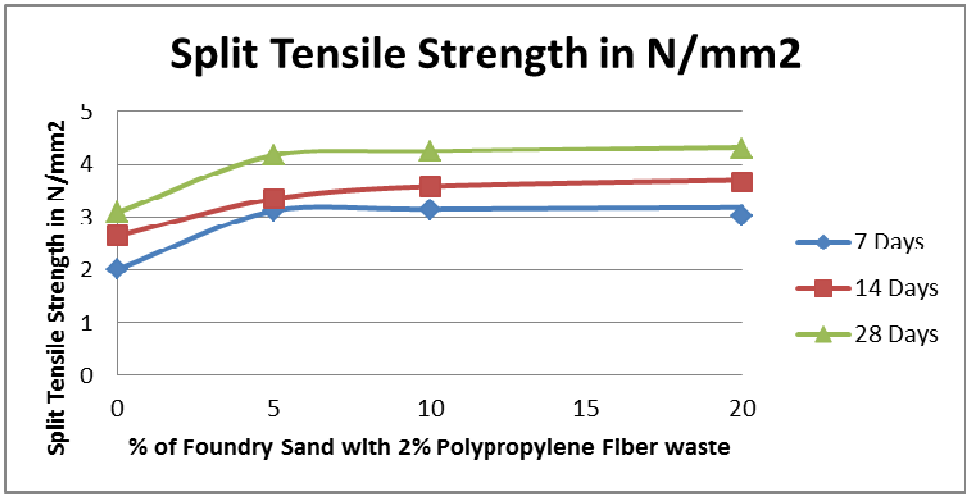

Figure 3 Split tensile Split Tensile Strength of Mix of M-30 Concrete (with 2% Polypropylene % of Foundry Fiber Waste & varying Sand)

Flexural strength of Concrete:

The determination of flexural strength of the prepared samples is carried out as per IS code. The following table shows the flexural strength of 2% Polypropylene Fiber waste & Foundry Sand of different volume fractions like 0%, 5 %, 10 %, 15% and 20%. .

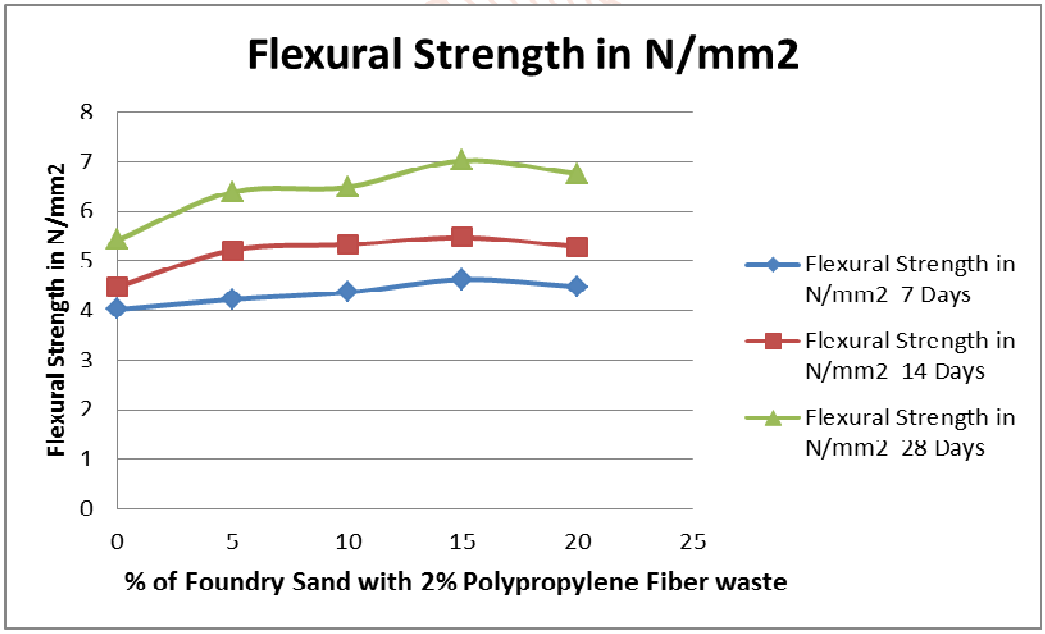

Figure 4 – Flexural Strength of Mix of M-30 Concrete (with 2% Polypropylene Fiber Waste& varying % of Foundry Sand)

Conclusion-

- strength of the concrete by replacing 15% sand by foundry and 2% course aggregate by the Polypropylene Fiber Waste the tensile strength is increase at 7, 14 and 28days respectively in M-30 concrete mix increments from 3.76N/mm2 to 4.24 N/mm2.
- Compressive strength, flexural strength and tensile strength of concrete is increases.
- Polypropylene fiber reduces the water permeability, plastic, shrinkage and settlement and carbonation depth.
- The compressive strength, split tensile strength, flexural strength and modulus of elasticity increase with the addition of fiber content as compared with conventional concrete.

REFERENCES

[1] Chunxiang Qian and Piet Stroeven, 2000, 'Fracture Properties of Concrete Reinforced with steel–polypropylene hybrid fibers, Cement and Concrete Composites, 22, 343-351.

[2] Foti D. "Preliminary analysis of concrete reinforced with waste bottles PET fibers." Construction and Building Materials. pp. 1906-1915, 2011.

[3] Fraternali et al. "Experimental study of thermo-mechanical properties of recycled PET fiber-reinforced concrete", Composites Structures.

pp. 2368-2374, 2011.

[4] Gencel, Ozel, Brostow and Martinez (2011) 'Mechanical Properties of Self-Compacting Concrete Reinforced with Polypropylene Fibres', Materials Research Innovations 2011 VOL 15 NO.

[5] GFRC and PFRC", Cement and Concrete Research, Vol. 35 (2005) pp. 1587-1591.

[6] Hadi, M. N. S., "An Investigation of the Behaviour of Steel and Polypropylene Fibre Reinforced Concrete Slabs," 7th International Conference. Concrete: Construction's Sustainable Option - Harnessing Fibres for Concrete Construction, Dundee, Scotland, 8-10 July 2008.

[7] Hadj Mostef, A., Merdaci, S., Ouahhabi, H. and Ould Larbi, L. "Concrete with added pozzolana reinforced with metal fibers", Proceedings of the International Symposium: On Composite Materials and Structues, University of Oran, Algeria, November 2011.

[8] Hadj Mostefa, A., Ghernouti, Y., Merdaci, S. and Ouahhabi, H. "Renforcement du béton par desfibres métalliques locaux", Proceedings of the National Symposium: On Local Materials in Construction, University kasdi merbah, Ouargla, Algeria, Novembre 2012.

[9] Hassani, Abolfazl, Hossein Gandjidoust, and Amir Abedin Maghanaki, Use of plastic waste (poly-ethylene terephthalate) in asphalt concrete mixture as aggregate replacement, *Waste Management and Research.*

[10] Hassen, O., and Hadj Mostefa, A. "Influence de la granularité du béton hydraulique sur le ressuage", Nature & Technologie fundamental& et Engineering Sciences, A(8), 23-26, 2013.

[11] Hughes, B. P. and Fattuhi, N. I., "Fibrer Reinforced Concrete in Direct Tension," Fiber Reinforced Materials, paper 16, conference at Institution of Civil Engineers, London. 1977, pp 127-133.

[12] Ismail, Z. Zainab, and Enas. A Al-Hashmi, Use of waste plastic in concrete mixture as aggregate replacement, *Waste Management.*

[13] Jianzhuang Xiao, H. Falkner, on residual strength of high- performance concrete with and without polypropylene fi bres at elevated temperatures, Fire Safety Journal, 41, 115–121, 2006.