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Effect of Polypropylene Fiber on the Properties of Self-Compacting Concrete with M-Sand RPS I

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ABSTRACT

The use of agro-industrial waste materials in concrete is common solution for waste disposal as well as economy purpose. Various research studies have been conducted on the use of agro-industrial waste as an innovative material to produce good quality of Concrete whether it is plain concrete or self-compacting concrete. The present paper explores the recent innovations in self-compacting concrete containing agro-industrial waste materials. The paper also reviewed latest application of admixtures and their performance onSCC quality.

Keywords: SCC,FA,FRC,PP

CHAPTER 1 INTRODUCTION

1.1 Background

Application of various innovative materials as ingredients in SCC and their effect on the fresh and hardened properties are discussed here. SCC is a special type of highly flow able concrete that does not

require vibration for placing and compaction. Innovative materials are generally used for partial replacement of cement or sand or aggregate or combination of two or more. They may be used as additional filler to enhance the physical and mechanical properties of the SCC. The goal that expected from the paper is to compile the recent innovations in SCC, study their effect on the properties of SCC and establish an international benchmarking for further research. Work in this regard. Self-Consolidating Concrete (SCC) is a special concrete which is highly flow able, no segregating and by its own weight spread into place, completely fill the formwork even in the presence of dense reinforcement and the rebar without the need of any additional compaction. Similar with other cement-based materials, SCC also has a brittle characteristic. This research conducted to evaluate the effects of polypropylene fiber addition on fresh state characteristics of SCC mixes, and investigate the effects of polypropylene fiber on some hardened properties of SCC. In this research, concrete mixes were added with polypropylene fiber of 0%, 0.05%, 0.10%, and 0.15% volume fraction. Fresh characteristics were evaluated based on its passing ability, flow ability, viscosity and segregation resistance using Slump flow and Sieve Segregation, resistance tests. After 28 days of curing, compressive, splitting tensile strength and drop-weight impact resistance were tested. Tests results indicate that polypropylene fibers tend to reduce the flow ability and passing ability but will increase viscosity and segregation resistance of SCC. Furthermore polypropylene fiber reduces deformability of SCC in the fresh state. After 28 days of curing, concrete specimens' tests indicate that polypropylene fiber addition up to 0.10% of volume.

Fractions tend to improve the compressive strength, tensile strength, and impact resistance of hardened SCC. It also can be suggested that polypropylene fibers allowed to be added into SCC mixes up to 0.10% by volume of concrete. SCC must satisfy the following workability performance criteria: 1) Flow ability: The ease of flow of fresh concrete when unconfined by formwork and or reinforcement.

2) Viscosity: The resistance to flow of a material (e.g. SCC) once flow has started; 3) Passing ability: The ability of fresh concrete to flow through tight openings such as spaces between steel reinforcing bars without segregation or blocking; and 4) Stability: the ability of SCC to remain homogenous by resisting segregation, bleeding, and air popping during transport, placement, and after placement. Fiber reinforce concrete is a family of composite materials that combine the high compressive strength properties of cement mortars with significantly increased impact, flexural and tensile strengths imparted by the fiber reinforcement. Without any fiber in the concrete there was development of the cracks due to plastic

shrinkage, drying shrinkage and other reasons of changes in volume of concrete. The development of these micro cracks causes elastic deformation of concrete. The presence of fibers provides crack arresters. When the first crack occurs in the matrix, the strong fibers pickup the load. That support is stronger than the matrix itself, so the next crack must occur elsewhere. More loading adds only new cracks, immediately arrested, rather than causing first cracks to propagate. Failure develops as a gradual, like - plastic yielding. In the present work, polypropylene fiber, 9 mm long and 18 micrometer in diameter are used for the preparation of standard M25 grade concrete.

1.2 Characteristics of polypropylene fiber

PP fibers are composed of crystalline and non-crystalline regions. Each crystal is surrounded by non-crystalline material. Fiber spinning and drawing may influence the orientation of both crystalline and amorphous regions.The degree of crystallinity of polypropylene fiber is between 50-65% in general, depending on the processing conditions. Crystallization occurs between glass transition temperature and the equilibrium melting point of PP. The crystallization rate is faster at low temperatures.In general, polypropylene fiber has excellent chemical resistance to acids and alkalis, high abrasion resistance and resistance to insects and pests. PP fiber is also easy to process and inexpensive compared to other synthetic fibers. It also has low moisture absorption.

1. gives good bulk and cover
2. resistant to abrasion, deterioriation from chemicals, mildew, perspiration, rot, stain, soil and weather conditions
3. resistant to bacteria and micro-organisms
4. colorfast
5. quick drying
6. anti-static behavior
7. thermally bondable
8. strong
9. dry hand
10. comfortable and lightweight

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1.3 Scope of work

Plain concrete has low tensile strength, less ductility, destructive and brittle failure. In order to improve these properties of plain concrete, an attempt has been made to study the effect of addition polypropylene

fiber in ordinary Portland cement concrete. In the this experimental investigation fibers in different percentage 0 to 0.7% has been studied for the effect on strength properties of concrete by carrying compressive strength test and flexural strength test at 28 days for M25 grade of concrete. Test results show that the addition of polypropylene fiber to concrete exhibit better performance than the plain concrete. The results have shown improvement in compressive strength and flexural strength with the addition of polypropylene fiber in ordinary Portland cement concrete The fiber content is vary from0.1%, 0.3%, 0.5% and 0.7% by weight of concrete.

Fiber Reinforced Concrete (FRC) may be defined as composite materials made with Portland cement, aggregate, and incorporating discrete discontinuous fibers. The use of polypropylene fibers has increased tremendously in construction of structures because addition of fibers in concrete improves the toughness, flexural strength, tensile strength and impact strength as well as failure mode of concrete. Polypropylene twine is cheap, easily available, and like all manmade fibers of a consistent quality. Concrete is a mixture of cementious material, aggregate, and water. Aggregate is commonly considered inert filler, which accounts for 60 to 80 percent of the volume and 70 to 85 percent of the weight of concrete. Aggregate is classified as two different types, coarse and fine. Coarse aggregate is usually greater than 4.75 mm, while fine aggregate is less than 4.75 mm. but for fine aggregate, there is alternative material is available, which is artificial crush sand. Demand for manufactured fine aggregates for making concrete is increasing day by day as river sand cannot meet the rising demand of construction sector. Natural river sand takes millions of years to form and is not repleneshible. Because of its limited supply, the cost of Natural River sand has sky rocketed and its consistent supply cannot be guaranteed. Under this circumstances use of manufactured sand becomes inevitable. River sand in many parts of the country is not graded properly and has excessive silt and organic impurities and these can be detrimental to durability of steel in concrete whereas manufactured sand has no silt or organic impurities. Crushed stone produces much more angular and elongated aggregates, which have a higher surface-tovolume ratio, better bond characteristics.

1.4 Motivation for work

1. Desire to give solution to the society for the betterment of Construction quality.
2. To maintain the stability of structure.
3. To make efficient block to sustain load.
4. Lack of awareness in people about poly propylene fiber.

1.5 Conclusion

To investigate effect of polypropylene fiber on fresh SCC addition on four main characteristics of SCC in the fresh state.

- Flow ability, viscosity, passing ability and segregation resistance.
- Effect of polypropylene fiber addition hardened concrete on compressive strength, splitting tensile strength and impact resistance of SCC also wanted to be known. Based on the results of fresh and hardened SCC tests.

To predict the optimum volume fraction of polypropylene fiber in SCC mixes

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