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An Expremental Study on Fibre Reinforced Concreteusing Waste Polypropylene Fiber

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***Abstract*—Normal or traditional concrete makes use of extra of the uncooked cloth like sand, gravels, Normal or traditional concrete makes use of extra of the uncooked cloth like sand, gravels, fly ash etc. its utilization has been expanded to an widespread quantity wherein there are probably possibilities of assembly with the call for of such production substances. It may cause growth the fee of the substances drastically. To conquer such situations, exchange constructing substances have been rising now-a-days. This examine has been made as an try in enhancing the technological disease through the usage of waste polypropylene fiber i. e. (0%, 0.25%, 0.5%, 0.75% and 1.00%). The density of Fiber ferroconcrete (FRC) became examined straight away after making ready the concrete blend while the compressive electricity and consequently the cut up lastingness of the Fiber ferroconcrete (FRC) have been examined after 7 and 28 days of curing. Results imply that the density of sparkling Fiber Reinforced Concrete (FRC) barely or negligibly decreases from 2397 kg/cm3 to 2393 kg/cm3 with the addition of polypropylene fiber.**

***Index Terms*—Normal, traditional, constructing, situations, density, ferroconcrete.**

I. INTRODUCTION

Ceramics had been the primary engineering substances regarded to mankind and that they none the less represent the maximum used substances in phrases of weight [1, 2]. Hydraulic cements and cement-primarily based totally composites together with concretes are the primary ceramic-primarily based totally substances. Concrete gives many benefits within side the software because of its progressed mechanical characteristics, low permeability and better resistance towards chemical and mechanical attacks. Although concrete conduct is ruled extensively with the aid of using its compressive energy, the tensile energy is essential with admire to the advent and sturdiness of concrete. The tensile energy of concrete is especially plenty lower. Therefore, fibers are commonly added to beautify its flexural tensile energy, crack arresting machine and publish cracking ductile behavior of simple matrix. Concrete change via way of means of the usage of polymeric substances has been studied for the Beyond 4 decades [3]. In general, the reinforcement of brittle constructing substances with fibers has been acknowledged from historic length together with placing straw into the dust for housing partitions or reinforcing mortar the usage of animal hair etc. Many substances like jute, bamboo, coconut, rice husk, cane bagasse, and sawdust in addition to artificial substances together with polyvinyl alcohol, polypropylene (PP), polyethylene, polyamides etc. have additionally been used for enhancing the concrete [4,5,6,7,8]. Research and improvement into new fiber bolstered concrete goes on nowadays as well. Polypropylene fibers have been first recommended as an admixture to concrete in 1965 for the development of blast resistant homes for the United States Corps of Engineers. The fiber has finally been progressed similarly and at giftit's far used both as brief discontinuous fibrillated cloth for manufacturing of fiber strengthened concrete or a non-stop mat for manufacturing of skinny sheet components. Since then using those fibers has elevated exceptionally in production of systems due to the fact addition of fibers in concrete improves the toughness, flexural electricity, tensile electricity and effect electricity in addition to failure mode of concrete. Polypropylene wire is cheap, abundantly available, and prefers all artificial fibers of a steady quality. Properties of Polypropylene Fibers the raw fabric of polypropylene is derived from monomeric C3H6 which is only hydrocarbon. Its mode of polymerization, its excessive molecular weight and the mannerist's miles processed into fibers integrate to offer polypropylene fibers very beneficial residences as defined below [9]: • There is a satirically normal atomic association within side the polymer molecule and excessive crystalline. Due to normal shape, it's miles called isotactic polypropylene. • Chemical inertness makes the fibers immune to maximum chemicals. Any chemical to be able to now no longer assault the concrete parts will don't have any impact at the fiber either. On touch with extra competitive chemicals, the concrete will continually become worse first. • The hydrophobic floor now no longer being moist via way of means of cement paste facilitates to save you chopped fibers from balling impact for the duration of blending like different fibers. • The water call for is nil for polypropylene fibers. • The orientation leaves the movie vulnerable within side the lateral route which helps fibrillations. The cement matrix can consequently penetrate with inside the mesh shape among the person fibrils and create a mechanical bond among matrix and fiber.

II. OBJECTIVES OF RESEARCH WORK:

To study the physical and mechanical performance of industrial waste polymer fiber used in the concrete mixtures.

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1. To prepare the various proportions of polymer modified concrete using industrial waste fiber.
2. To determine the optimum use of industrial waste fiber in the cement concrete mix, which produces the best concrete of having better properties like density test, compressive strength and split tensile strength.
3. To inspect the opportunity of using industrial waste fibre in cement concrete mixture.
4. To determine the compressive strength, split tensile strength of the polymer modified concrete which is made of industrial waste fibre.

III. LITRATURE RIVEW

Zhong (2020)

The progressive increase in the amount of glass waste produced each year in the world made it necessary to start the search for new recycling methods. This work summarizes the experimental results of the study on mortar samples containing dispersed reinforcement in the form of glass fibers, fully made from melted glass waste (bottles). Mortar mixes were prepared according to a new, laboratory-calculated recipe containing glass fibers, granite as aggregate, polycarboxylate-based deflocculant and Portland cement (52.5 MPa). This experimental work involved three different contents (600, 1200, and 1800 g/m3) of recycled glass fibers. After 28 days, the mechanical properties such as compressive, flexural, and split tensile strength were characterized. Furthermore, the modulus of elasticity and Poisson coefficient were determined. The initial and final setting times, porosity, and pH of the blends were measured. Images of optical microscopy (OM) were taken. The addition of glass fibers improves the properties of mortar. The highest values of mechanical properties were obtained for concrete with the addition of 1800 g/m3 of glass fibers (31.5% increase in compressive strength, 29.9% increase in flexural strength, and 97.6% increase in split tensile strength compared to base sample)

Stance of the concrete is also improved

Recycled tyre steel fiber (RTSF) is considered as a potential and sustainable alternative to manufactured steel fiber (MSF), while RTSF resulted in lower energy absorption capacity and more serious corrosion problem in concrete compared to MSF. This paper presents an experimental study on engineering properties of concrete reinforced with hybrid RTSF (0.5%–0.9% Vf) and polypropylene fiber (PPF, 0.1%–0.5% Vf). Results show that combining RTSF with PPF could compensate the serious workability loss caused by RTSF and the workability was improved by 38.9%–66.7%. However, the compressive, splitting tensile and flexural strengths were weakened significantly when PPF was over 0.3% Vf in hybrid fibre reinforcement (total content of 1.0% Vf). The strain field shown in digital image correlation images suggests that hybrid RTSF and PPF can create a synergistic effect in restraining the crack growth and the post-cracking behaviour of concrete especially toughness that was enhanced with the presence of PPF. RTSF was more effective in restraining shrinkage of concrete than PPF. With the increase of PPF content in hybrid fibre reinforcement, the chloride migration coefficient of concrete was reduced by 4.9%–6.8% as compared with the mixture reinforced with only RTSF.

Małek (2020)

Herein, the paper reports an experimental investigation lasting one year on the chloride resistance of polypropylene fiber (PF) reinforced concrete with fly ash (FA). Four influential factors at four levels were studied, viz. water to binder ratio (w/b) (0.53, 0.34, 0.29, and 0.25), PF dosage (0%, 0.06%, 0.08%, and 0.1% in volume basis of the total volume of concrete), FA content (0%, 15%, 25%, and 35% in mass substitution ratio of cement) and concentration of NaCl solution (0%, 3%, 5%, and 7%). Dry–wet cyclic immersion and long-term soaking were taken into consideration in addition to the aforementioned factors. A L16(4^4) orthogonal table was used to sequence influencing factors and to determine the optimal combination. Results showed that 7% NaCl solution caused the highest chloride content in 0–5 mm depth, whilst the w/b ratio of 0.25 curbed the chloride penetration within 10 mm even for concrete subjected to dry–wet cyclic immersion for 360 d. Subsequently, a respond surface model (RSM) basing on polynomials was constructed to visually evaluate the effect of PF dosage and FA content. Results clarified that a cubic model was more precise and PF dosage and FA content turned out to have the positive facilitation to chloride resistance. The positive effect of PF however is not consistent and commensurate for concrete with varied fly ash content. Finally, a fuzzy logic based nonlinear model accommodating all seven influencing factors was verified to be proper and adaptive in predicting chloride content.

Chenet. Al (2021)

According to (1) (Amit Rai, Dr. Y.P Joshi,)(2019) in normal cement concrete, microcracks grow prior to structure is loaded because of the drying shrinkage and other causes of volume change. When a structure is loaded,the micro cracks open up and propagate because of the development of such micro-cracks, results in inelastic deformation in the concrete structure. Fibre reinforced concrete (FRC) is cementing concrete reinforced mix with additional or less by chance dispersed small fibres. In the FRC, a numbers of tiny fibres are distributed and dispersed randomly in the cement concrete structure at the time of mixing, and thus improve concrete properties in all directions. The fibers help to transfer the load to the internal micro cracks.FRC is cement based composite material that has been developed in therecent years.It hasbeensuccessfullyusedinconstructionwithitsexceptionalflexuralandtensilestrength, resistance to the spitting, impact resistance and outstanding permeability and frost resistance. It is an efficient way to increase the toughness, resistance to the plastics hrinkage cracking and shock resistance of the mortar. These fibers have many more benefits. Steel fibers can improve the structural strength to decrease in the heavy steel reinforcement requirement.

IV. METHODOLOGY

The aim of the experiment is to investigate the various mixes of concrete for the testing of compressive strength &

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split tensile strength with the variable percentage of polypropylene fibre. in cubes & Cylinder. The Mix adopted is M20 (1: 2.036: 3.102), designed as per IS 10262:2010.
To test the concrete for compression (150mm x 150mm x150mm), split tensile strength (300 mm length with 150 mm diameter) were cast respectively. Specimen is obtained for 7 and 28 days.
Performingthephysicalandmechanicallaboratorytestsonthet estsamplesprepared with polypropylene fiber and compared them with the available standard test results. Analyze the determined test results and draw the conclusions

V. RESULT & DISCUSSIONS

MATERIALS AND TESTS

This research describes preliminary design and planning such as experimentation of the coarse and fine aggregates, selection of fibres with fibre **Aggregate Impact Value Test Results Table-3**
volume dose aggregate, target strength of concrete specimens, and mix proportion in gand number of mix batches and concrete specimens required to meet up the scope of this research work.

Result Shows the effect of Accelerator on Concrete Mix Table-1

Concrete	Cement Kg/m³	Water Kg/m³	Reduction In Water Content (%)	W/C Ratio	Slump (mm)	Compressive Strength kg/cm²		
						3 Days	7 Days	28 Days
Reference concrete	350	210	Nil	0.6	55	88.5	163.4	253
Concrete with Accelerator	350	178.5	15.0	0.51	60	135	216	304

Water Absorption of Test Samples Table02

S.No.	W1	W2	%Water Absorption
1	2000	2030	1.5
2	2000	2026	1.3
3	2000	2026	1.3
4	2000	2028	1.4
5	2000	2026	1.3
6	2000	2028	1.4

Average water absorption of these sample found=1.367%.

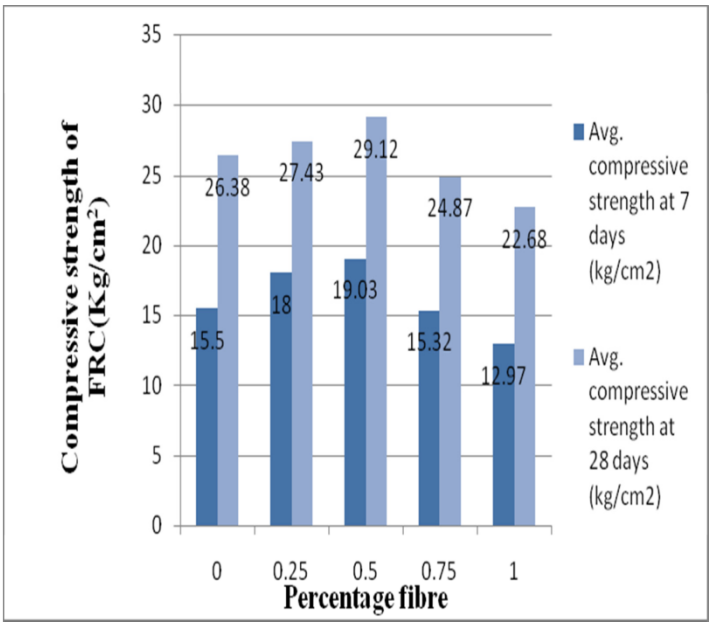
The Average AIV of the sample was found=13.60.

S.No.	W1 (gm)	W2 (gm)	AIV
1.	400	54	13.5
2.	400	56	14.0
3.	400	54	13.5
4.	400	52	13.0
5.	400	56	14.0

Split Tensile Strength of Fibre Reinforced Concrete (Mix-I) Table-4

S.NO	Fibre Content	Split Tensile Strength After7Days(kg/cm²)	Split Tensile Strength After 28Days(kg/cm²)
1	0%	1.80	3.30
2	0%	1.70	3.20

Average split tensile strength of the sespecimen after 7 days curing =1.72kg/cm².
Average split tensile strength of the sespecimen after 28 days curing =3.25kg/cm².



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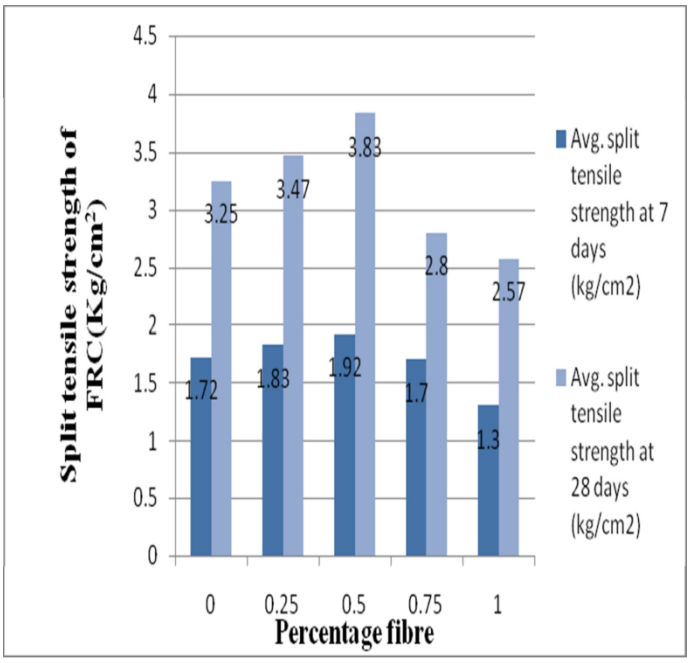

VI .CONCLUSION

After the detail analysi s of the test results we can say that the addition of waste polypropylene fiber significantly affect the 7 and 28 days compressive strength and split tensile strength of the Fibre Reinforced Concrete (FRC). From the critical difference, it can be clearly seen that the addition of waste polypropylene fiber in certain amounti.e.0.50% of the weight of cement increases the compressive strength upto 10% as well as split tensile strength increases around 17% than conventional concrete. Experimental results also shows similar trend. Hence, the results of statistical analysis are equivalent to the experimental results. From the experimental investigation this

i. The addition of waste polypropylene fibre does not affect very much the density of concrete mix.
ii. The gradual increases in the compressive strength of Fibre Reinforced Concrete (FRC) at7 days and 28 days curing with 0.25% and 0.50% addition of fibre but after that it start reducing the compressive strength with increase of fibre addition.
iii. The gradual increase seen in the split tensile strength of Fiber Reinforced Concrete (FRC)at 7 days and 28 days curing with 0.25% and 0.50% addition of fibrebutafterthatitstartsreducingthesplittensilestrengthwithincreaseoffibreaddition.
iv. The addition of waste polypropylene fiber increases the strength of concrete for all curing ages up to a certain point. After that there is an abrupt reduction in the strength of the Fiber ReinforcedConcrete(FRC).Because at higher dosage, concrete loses it stability to make a proper bond.

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