EXPERIMENTAL INVESTIGATION OF HIGH STRENGTH CONCRETE BY ADDITION OF INDUSTRIAL SCRAP

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Abstract- *The industrial scrap concrete is relatively homogeneous. The industrial scrap is prepared by using a scrap obtained from the lathe industries .The industrial scrap is added in the ratio of 3%, 6%, 9%. Water-cement ratio is fixed as 0.40. The concrete of mix M30 is being adopted, .The investigation includes cube, cylinder, beam specimens. The several studies including compressive strength, tensile strength and flexure strength are done for this investigation and results are being discussed.*

Keywords: Industrial scrap concrete, high strength, composite concrete, high performance, tensile strength

1. INTRODUCTION

This paper describes an experimental study of an enhancement of concrete properties by using industrial scrap waste addition to Portland cement. The industrial scrap concrete consists of cement, water, fine aggregate and lathe wastes. It is relatively homogeneous. It has been found that industrial solid waste management is a major world wide concern. Because of its heavy price effects, which cause economic and other environmental risks, most of the industries are not interested in disposal of these waste. The steel scrap is the waste product obtained from the lathe industries, which is disposed in land those fills cause a serious of land pollution. Therefore using this waste material can used as an additive to the cement to prevent the spoilage of the environment.

2. Materials Used

The materials used in the industrial scrap concrete are as follows

1.Cement
2. Industrial scrap
3. Fine aggregate
4. Coarse aggregate

2.1 Cement

The Ordinary Portland cement (OPC) is used throught this project. This cement has a consistency of 35% with 30 minutes as the initial setting time and 610 minutes as the final setting time. The sieving method is used for testing the fineness (as per IS 4031 Part 1:1996) has fineness value of 2.80 and the specific gravity of 3.12.

2.2 Industrial scrap

The industrial scrap obtained for the study is obtained from the local industries. It provides an additional strength to the concrete. The scrap is added to the concrete in different mix ratios and the results are tabulated

3. Mix Proportion

The various mix proportions are calculated On the trial and error method are tabulated below.

Table 1: Mix Ratio

mix	Cement (kg/m³)	Sand (kg/m³)	Coarse (kg/m³)	Water (lit)	Scrap (%)
Trial 1	479	684	1116.4	191	3
Trial2	450	650	1106..3	183	6
Trial3	430	644	1089.2	175	9

4. Test on Hardened Concrete

4.1 COMPRESSIVE STRENGTH TEST

Compression test develops are thermo re-complex system of stresses. Due to compression load, the cube or cylinder undergoes lateral expansion owing to the Poisson‟s ratio effect. The cube specimen is of the size 150 x150 x 150 mm. The compressive strength was calculated by using the relationship

Table 2: Compressive Strength

Mix	Steel Scrap	7 days Strength (N/mm²)	28 days Strength (N/mm²)
Normal	-	22.14	26.50
M1	3%	26.85	35.12
M2	6%	27.83	40.14
M3	9%	22.01	33.52

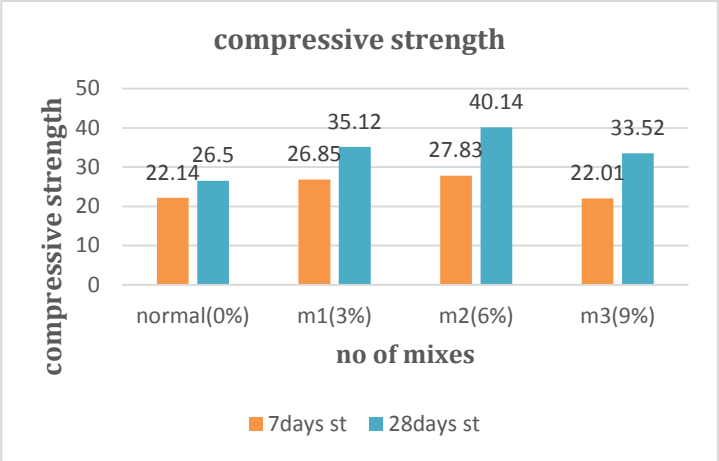

Chart. 1 : Graph of Compressive strength

Fig. 1: Tesing of Compressive strength

4.2 SPLIT TENSILE STRENGTH TEST

Tensile strengths are based on the indirect splitting test of cylinders. The cylindrical testing specimen is laid between the loading of a compression testing machine and the load is applied until failure of the cylinder, along the vertical diameter.

Table 3: Split Tensile Strength

Mix	Steel scrap	7days strength (N/mm²)	28 days Strength (N/mm²)
Normal	-	2.35	2.57
M1	3%	2.59	2.96

M2	6%	2.63	3.15
M3	9%	2.34	2.89

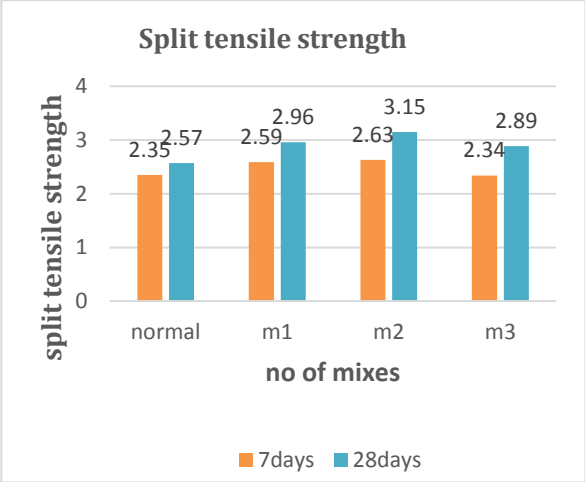

Chart 2: Graph of split tensile strength

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Fig. 2: testing of split tensile strength

4.3 FLEXURAL STRENGTH TEST

The test is carried out to check the flexural strength of a concrete. Prisms of cross section 150mm x 150mm x 700mm are casted. The flexural strength of both Conventional and cement replaced concrete is calculated and the results are tabulated

Mix	Scrap(%)	7days strength (N/mm²)	28days strength (N/mm²)
Normal	-	3.35	4.04
M1	3%	3.05	3.85
M2	6%	3.32	4.06
M3	9%	3.39	4.15

Table 4: Flexural Strength test

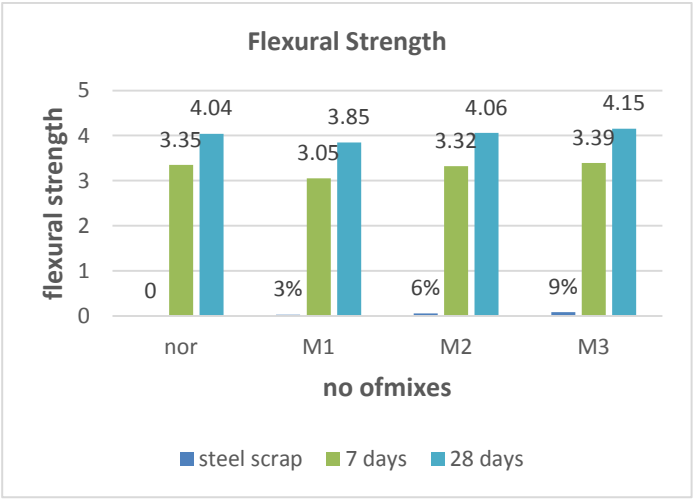

Chart. 3: Graph of flexural strength

Fig. 3 Testing of flexural strength

5. CONCLUSION

- M30 grade of concrete mixes were prepared and tested for both fresh and hardened concrete.
- Results were found out based on the characteristic strength of concrete mixes which is compared to the normal concrete mix.
- As the percentage of Steel scrap waste increases in the concrete the compressive strength, split tensile strength and flexural strength attends the desired strength at 28 days for 6 % replacement and decreases for 9%addition
- The compressive strength of the concrete in which the steel scrap is added with 6% of steel waste is increased by 13.64% compared to normal concrete mix.
- The split tensile strength of a scrap concrete is increased by 3.79% than the conventional concrete
- Flexural strength of the concrete also gets increased by 5.69% by the addition of 6% of steel scrap waste in the concrete.
- Therefore, addition of steel scrap waste increases the strength of the concrete than normal concrete.

6. REFERENCES

- International journal on Durability of building materials on "Experimental investigation of concrete by the addition of steel scrap" by Kokila, B.Madusudhanan, KKarpaga Kannan
- International Journal for Research in Applied Science & Engineering Technology" Experimental Study On Usage of Steel Mill Scrap to Enhance Mechanical Properties of Concrete" by V.John Sundar Raj , K.Vasu , M.Dinesh ISSN:2321-9653,volume 5 Issue V,May 2017
- P Sai Mannvit, B Bavan Prasad,M Harsha Varadhan "Experimental Examination of Fibre Reinforced Concrete Incorporated with Lathe Steel Scrap", international Journal Of Innovative Technology and Exploring Engineering(IJITEE) ISSN:2278-3075, Volume 9,Issue 2,December 2019.
- Code of practice"Bureau of Indian Standards",2000,New Delhi
- Abibola Asheed Ogungbire,Michael Olawadre Adyeinka, S.O.A Olawae"Investigation of Compressive,Split tensile and Flexural Characteistics of Steel Scrap Composite Concrete", International Journal Of Civil Engineering and Technology(IJCIET),Volume9,Issue9, September 2018.
- IS 10262-2009, Guidelines for Concrete mix design proportioning, Bureau of Indian Standards, New Delhi.