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EXPERIMENTAL STUDY ON RUBBERIZED CONCRETE

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ABSTRACT

Modifications of construction materials have an important bearing on the building sector. Several attempts have been therefore made in the building material industry to put to use waste material products, e.g., worn-out tyres, into useful and cost-effective items. Success in this regard will contribute to the reduction of waste material dumping problems by utilizing the waste materials as raw material for other products. The present proposal involves a comprehensive laboratory study for the newer application of this waste material in the preparation of fibrous concrete. The primary objective of investigation is to study the strength behavior i.e. compressive and flexural strength of rubberized concrete with different volume of crumb rubber. The proposed work is aimed to study the effect of volume variation of crumb rubber on the compressive strength &flexural strength.

Keywords— Crumb rubber, rubberized concrete, compressive strength, flexural strength, Slump test.

INTRODUCTION

About one crore 10 lakhs all types of new vehicles are added each year to the Indian roads. The increase of about three crores discarded tyres each year pose a potential threat to the environment. Hazardous materials can be classified as chemical, toxic or non-decaying material accumulating with time. The accumulation of rubber and plastic can be considered non-decaying materials that disturb the surrounding environment. However, a positive method for disposing of this non-decaying material, such as reuse in concrete mixes, would have a beneficial effect. One of the major environmental challenges facing municipalities around the world is the disposal of worn out automobile tyres. Most discarded tyres are buried in the landfills. Only fewer are used as fuel or as raw materials for the manufacture of rubber goods. Burying scrap tyres in landfills is both wasteful and costly. Disposal of whole tyres has been banned in the most landfills because they are bulky and tend to flow to the surface with time, so tyres are often shredded.

If tyres are reused as a construction material instead of being burnt, the unique properties of tyres can once again be exploited in a beneficial manner. In this context, the use of tyre chips in lightweight concrete is considered a potentially significant avenue. Thus, the use of scrap tyres in concrete manufacturing is a necessity than a desire. The use of scrap tyres in concrete is a concept applied extensively over the world. The use of scrap tyres rubber in normal strength concrete is a new dimension in concrete mix design and if applied on a large scale would revolutionize the construction industry, by economizing the construction cost and increasing the worn out tyre disposal. It is with this intension, an experimental study is proposed to be conducted by using crumb rubber as sand in cement concrete.

AIM & OBJECTIVE

Aim: -To Determine the compressive strength & flexural strength of the concrete when
rubber is used as partial replacement to the course aggregate.

Objective:-

- To reduce the emission of CO2.
- To reduce the cost of concrete.
- To help environment from harmful gases.

LITERATURE REVIEW

Kamil (1974) analyzed the properties of crumb rubber concrete, The unit weight of the CRC mix decreased approximately 6 pcf for every 50 lbs of crumb rubber added.

The compressive strength decreased as the rubber content increased. A Part of strength reduction contributed towards entrapped airt. Investigation efforts revealed that the strength reduction could be substantially reduced by adding a de-airing agent into the mixing truck just prior to the placement of the concrete. Various methods have been executed in order to improve the strength and the stiffness of waste tyre modified concrete. However preparing waste tyre powders and thin tyre fiber is time, effort and money consuming.

Eldin (1993) performed tests on rubberized concrete, using tyre chips and crumb rubber as aggregate substitute of sizes 38mm, 25mm and 19mm exhibited reduction in compressive strength by 85% and tensile splitting strength by 50% but concluded its ability to absorb a large amount of plastic energy under tensile and compressive loads.

Topcu (1995) investigated the effect of particle size and content of tyre rubber on the mechanical properties of concrete. The experiment has been declared stating, although the strength was reduced, the plastic capacity was enhanced significantly.

Zaher (1997) concluded that RPCC mixtures can be made using ground tyre in partial
replacement by volume of CA and FA. Based on the workability, an upper level on 50% of the total aggregate volume may be used. Strength data developed in their investigation (compressive and flexural) indicates a systematic reduction in the strength with the increase of rubber content. From a practical viewpoint, rubber content should not exceed 20% of the aggregate volume due to severe reduction in strength. Once the aggregate matrix contains non-traditional components such as polymer additives, fibres, iron slag, and other waste materials, special provisions would be required to design and produce these modified mixes. At
present, there are no such guidelines on how to include scrap tyre particles in PCC mixtures.

Guoqiang (2004) conducted investigations over chips and fibers. The tyre surfaces are treated with saturated NaOH solution and anchoring a hole at the center of the chips were also investigated and they concluded that fibres perform better than chips: NaOH surface treatment does not work for larger sized tyre chips. Further efforts will be geared towards enlarging the hole size. The length of those fibres restricted to less than 50mm in order to avoid entangle. Steel belt wires provide positive effect on increasing the strength of concrete. From the above it has been stated that the waste tyre rubber modified concrete is characterized having high toughness, low strength and stiffness.

Serge (2004) used saturated NaOH solution to treat waste tyre rubber powders. They found that NaOH surface treatment increased rubber/cement paste interfacial bonding strength and resulted in improved strength gain and toughness in waste tyre powder modified cement mortar.

Garrick (2006) determined the analysis of waste tyre modified concrete using 15% by volume of coarse aggregate when replaced by waste tyres as a two phase material as tyre fiber and chips dispersed in concrete mix. The result is that there is an increase in toughness, plastic deformation, impact resistance and cracking resistance. But the strength and stiffness of the rubberized sample were reduced. The control concrete disintegrated when peak load was reached while the rubberized concrete had considerable deformation without disintegration due to bridging caused by tyres. The stress concentration in the rubber modified concrete is smaller than that in the rubber chip modified concrete can bear a higher load than the rubber chip modified concrete
before the concrete matrix breaks.

Hernadez olivares (2007) used crumbed waste tyre (average length 12.5mm) and shortly
poly propylene (pp) fibers (length from 12-10mm) to modify the concrete.

CONCLUSION

- From above literature review it clearly revealed that the performance of 5%, 10%, replacements has boosted better in the performance cadet of compressive strength. In split tensile strength, 5%, 10% replacements exhibit good performance.
- In flexural strength aspect, all proportional replacement concluded exceptionally better performance. In accordance with the graphical representation it is very clear that 5% replacement of coarse aggregates along with waste tyre aggregates determined gradual and strong improvement in all the above mentioned strength aspects of concrete.
- From this experimental study of the partial replacement of crumb rubber tyre with coarse aggregate the results concluded that the strength parameters such as compressive strength, split tensile strength and flexural strength goes on reducing, if the replacement percentage increases.
- By comparing all the strength parameters of various mix proportion such as 5%, 10%,20% and 30%. The results shows that the mix proportion with 5% and 10% exhibit 90% of normal strength.

METHODOLOGY

These steps are followed during the research

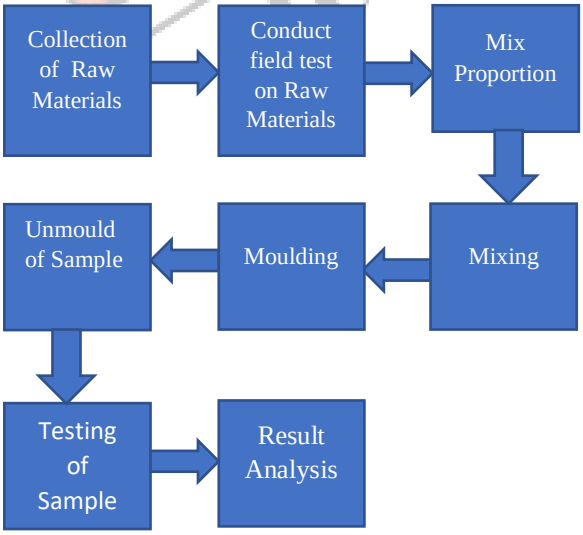

Figure 1- Block diagram of working process

REFERENCES

- Al-Akhras NM, Smadi MM (2002) Properties of tyre rubber ash mortar. Dhir RK et al. (Eds.), Proceedings of the International Conference on Sustainable Concrete Construction. University of Dundee, Scotland, UK pp. 805–814.
- Albano C, Camacho N, Reyes J, Feliu JL, Hernandez M (2005) Influence of scrap rubber addition to Portland Concrete Composites: Destructive and non-destructive testing. Composite Structures 71: 439–446.
- Ali NA, Amos AD, Roberts M (1993) Use of ground rubber tyres in Portland cement concrete.
- Al-Tabbaa A, Aravinthan A (1998) Natural clay-shredded tyremixtures as landfill barrier materials.Waste Management 18 (1): 9–16.
- Benazzouk A, Queneudec M (2002) Durability of cement rubber- composites under freeze thaw cycles. Dhir RK et al. (Eds.), Proceedings of the International Conference on Sustainable Concrete Construction. University of Dundee, Scotland, UK, pp. 356–362.
- Biel TD, Lee H (1996) Magnesium oxychloride cement concrete with recycled tyre rubber. Transportation Research Record No. 1561, Transportation Research Board, Washington, DC,pp. 6–12.
- Dhir RK (Ed.), Proceedings of the International Conference on Concrete 2000, University of Dundee, Scotland, UK pp. 379–390
- Downs LA, Humphrey DN, Katz LE, Blumenthal(1997)Water quality effects of using tyre chips below the groundwater table. Report Prepared by the Department of Civil and Environmental Engineering, University of Maine, Maine for the Maine Department of Transportation, Orono.
- Edil TB, Bosscher PJ (1992) Development of engineering criteria for shredded or whole tyres in highway applications. Report No.WI 14- 92, Department of Civil and Environmental Engineering, University of Wisconsin, Madison, WI.
- Eldin NN, Senouci AB (1993) Rubber-tyre particles as concrete aggregates. ASCE Journal of Materials in Civil Engineering 5 (4): 478–496.