INDUSTRIAL WASTE AND THEIR PROPERTIES

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ABSTRACT

The research work carried out included an experimental investigation on strength properties of concrete made with 10% replacement of sand by Granite quarry dust of less than 75 micron particle size. The tests were carried out to find the compressive strength, splitting tensile strength and specimens. Results showed that up to 10 % replacement of sand by Granite quarry dust there was no reduction in compressive strength, split tensile strength.

Keywords: Industrial waste, tensile strength and Granite.

INTRODUCTION

Following are the industrial waste's which are suggested to blend with self compacting concrete. Granite powder, Lathe scrap powder and Tanning waste. Granite and marble process industry generates a large amount of wastes mainly in the form of powder during sawing and polishing processes, which pollute and damage theenvironment. Therefore, this work aims to characterize and evaluate the possibilities of using the granite and marble sawing wastes, generated by the process industries from Nazarethpet, Ambattur as alternative raw materials in the production of Self compacting concrete by partial replacement of sand [1].

Fig .1 Granite powder

Table 1. Chemical oxide composition in granite powder

Constituent	Value(%)
SiO2	72.04%
Al2O3	14.42%
Na2O	3.69%
CaO	1.82%
FeO	1.68%
Fe2O3	1.22%

Granite quarry sludge is the waste from rock processing in quarries and crusher units. The fines are at present disposed by filling in barren land causing serious environmental issues. If this material is possible to be used for partial cement replacement it is of benefit both economically and environmentally. The effect on strength properties of concrete in replacing some portion of sand by Granite quarry powder obtained from a local crusher unit is analyzed[2-3].

LATHE SCRAP POWDER

Every day about massive amount of lathe waste are generated by each lathe industries in the Ambattur industrial region and dumped in the barren soil there by contaminating the soil and ground water, which creates an environmental issue. Hence byadopting proper management by recycling the lathe scrap with concrete is considered to be one of the best solutions.

Fig .2 Lathe scrap powder partial replacement with sand

The energy absorption capacity was increased almost linearly with the fibre content. Concretes containing lathe scrap have been shown to have substantially improved resistance to impact and greater ductility of failure in compression, flexure and torsion and can be effectively used in pavement. When fly ash used as a good substitute for cement in reasonable proportions by volume and whatever deficiencies that may result can be easily overcome by use of steel fibres. In this study, an attempt has been made to analyze the mechanical characteristics of the waste lathe scrap material which is available from the locally available lathe industries is used as a steel fibre for determining the characteristics compressive , split tensile of M20 cement concrete for various proportions of steel scraps are experimentally found out [4].

Leather industry generates significant amounts of solid waste and industrial sludge. They originate from various technological steps of leather production, 1 mg of raw yields altogether about 700 kg of waste. Moreover, tannery waste contains chromium compounds, commonly used as tanning agents. This poses a further threat to the environment. Tannery industrial sludge since it is causing major problem to environment, this sludge when mixed into concrete as a partial replacement. Which is rich in fiber content washed away from tannery industries. These fiber content present in the sludge helps to increase the compressive strength of the concrete [5-6].

RESULTS

The main aim of this experimentation is to find out the effect of addition of industrial waste, which is a waste product from the various industries, such as Granite quarry powder, Tanning waste(sludge), Lathe powder. In this experimentation combinations of admixtures which is taken as Super plasticizer + VMA. The flow characteristics and strength characteristics of self compacting concrete produced from different waste material are found.

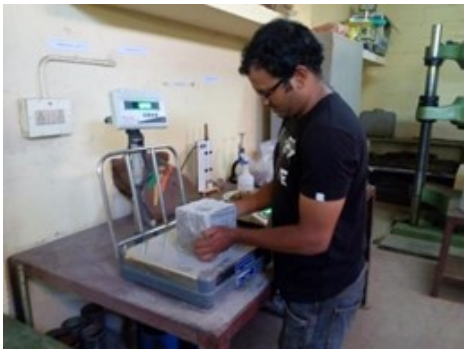
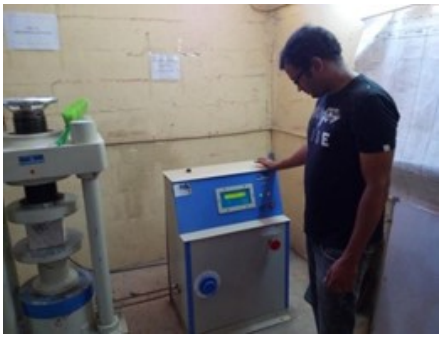
A viscosity modifying admixture called GLENIUM STREAM2 was used to induce the flow without segregation. GLENIUM STREAM 2 is dosed at the rate of 50ml of cementitious material. Other dosages may be recommended in special cases according to specific job site conditions. GLENIUM STREAM 2 consists of a mixture of water soluble polymers which is absorbed on to the surface of cement granules there by changing the viscosity of water and influencing the rheological properties of the mix. It also resist the segregation due aggregation of the polymer chains when the concrete is not moving. GLENIUM STREAM 2 is a chloride free admixture. It should be added to the concrete after all the other components of the mix. This is particularly important in order to obtain maximum efficiency. It is a colourless free flowing liquid. A high performance concrete superplasticizer based on modified polycarboxylic ether was used in the experimentation. The trade name of the superplasticizer is GLENIUMTM SKY 784. It greatly improves the cement dispersion. Optimum dosage of GLENIUMTM SKY 784 should be determined in trial mixes (Fig 1-3). As a guide a dosage range of 300ml cementitious material is normally recommended.

Fig .1 Admixture measured	**Fig .2** During the mix	**Fig .3** Cube casting
		

The cement, sand and coarse aggregates were weighed according to the mix proportion 1:1.5:3. To this dry mix required quantity of 10% Industrial waste is blended to it. To this dry mix required quanity of water added and thoroughly mixed. To this the superplasticizer was added at the rate of 50 ml of cementitious material. The entire mix was thoroughly mixed once again. At this stage, almost the concrete was in a flowable state. Now, the flow characteristic experiments for self compacting concrete like slump flow test, V-funnel test, L-box test and U-box test were conducted.

After conducting the flow characteristic experiments the concrete mix was poured in the moulds required for the strength assessment. After pouring the concrete into the moulds, no compaction was given either through vibrated or through hand compaction. Even the concrete did not require any finishing operation. The specimens were demoulded and were transferred to the curing tank wherein they were allowed to cure for 28 days.

For compressive strength assessment, cubes of size 150mmX150mmX150mm were prepared. For tensile strength assessment, cylinders of diameter 150mm and length 300mm were prepared. After 28 days of curing the specimens were tested for their respectively strengths (fig 4-5).

Fig .4 Checking weight of the cube	Fig .5 Compression test
	

This waste is used for dumping for filling the low lying areas causing the environment in deterioration in long run, so this mix should be used for the construction activity it will reduce the problem of environmental pollution at the same time it reduces the cost of the construction and add it makes the concrete high performing from the durability point of view. So from these three points the project is under taken. Based on the experimentation conducted, the following observations were made and hence someconclusions.

REFERNECES

1. Felekoglu, B. (2007). “Utilization of high volumes of lime stone quarry wastes inconcrete industry (self-compacting concrete case),” Resource, Conservation and Recycling, 51(4), 770-791.

2. Gartner E (2004). "Industrially Interesting Approaches to 'Low-CO2' Cements." Cement and Concrete Research, 34(9), 1489-1498.

3. Gourley, J. T., & Johnson, G. B. (2005). "Developments in Geopolymer PrecastConcrete." Paper presented at the International Workshop on Geopolymers and Geopolymer Concrete, Perth, Australia.

4. Gourley, J. T., & Johnson, G. B. (2005). "Developments in Geopolymer PrecastConcrete." Paper presented at the International Workshop on Geopolymers and Geopolymer Concrete, Perth, Australia.

5. Hardjito, D. and Rangan, B. V. (2005). Development and Properties of Low-Calcium Fly Ash-based Geopolymer Concrete, Research Report GC1, Faculty of Engineering, Curtin University of Technology, Perth.

6. Izumi, I. 1995."Placing 10,000 m3 Super Workable Concrete for Guide Track Structure of Retractable Roof of Fukuoka Dome," Advances in Concrete Technology, SP-154, V. M. Malhotra, ed., American Concrete Institute, Farmington Hills, Mich., 1995, pp. 171-185.