# Stone Dust in Concrete: Effect on Compressive Strength

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*Abstract*— Stone dust may be a waste obtained from crusher plants. it's potential to be used as partial replacement of natural river sand in concrete. Use of stone dust in concrete not only improve the standard of concrete but also conserve the natural river sand for future generations. In the present investigation, an experimental program was administered to review the workability and compressive strength of concrete made using stone dust as partial replacement of fine aggregate within the range of 10% - 100%. M25 grade of concrete was designed using Portland pozzolana cement (PPC) for referral concrete. Workability and Compressive strength were determined at different replacement level of fine aggregate viz a viz referral concrete and optimum replacement level was determined based on compressive strength. Results showed that by replacing 60% of fine aggregate with stone dust concrete of maximum compressive strength are often made as compared to all or any other replacement levels.

*Keywords:* Quarry Dust River Sand, Compressive Strength, Cement, Quarry Dust, Concrete

## I. Introduction

Conventionally Concrete is a composite material made of cement, fine aggregate, coarse aggregate and water. At present construction industry is growing exponentially due to several other factors besides increasing developmental activities. This results in huge demand of construction materials. Concrete is most widely used construction material. Major components of concrete are aggregates which are usually available in natural form. Fine Aggregate used in concrete is usually river sand available locally or at nearby location. The naturally available source of fine aggregate is limited intrinsically conservation of an equivalent is un evitable. Going for alternative and supplementary material which may be used as partial or full replacement of conventional material can play an important role in conservation of natural resources. The demand for river sand within the housing industry has consequently increased due to the extensive use of concrete resulting in the reduction of sand sources and increase in price. The large scale depletion of natural sand sources creates also the environmental problem like erosion and failure of river banks, lowering of river beds, saline water intrusion into the land. Thus a investigation is needed to identify suitable substitute that is eco-friendly, inexpensive and better for strength and durability performance. In this connection the use of stone dust as fine aggregate with partial or full replacement may be a promising alternative in concrete making. Quarry dust are often utilized in concrete mixtures as an honest substitute for natural river sand giving higher strength at 50% replacement (Balamurgan et al., 2013). While using crushed stone dust as fine aggregate in concrete it is found that there is increase in compressive, flexural and tensile strength of concrete (Nagpal et al., 2013). It has been observed that 40% replacement of fine aggregate with stone dust is adaptable (Franklin et al., 2014). It was observed that the replacement of natural sand by crusher dust increased the compressive strength of concrete by 5-22% and it was also found that amongst all the mixes, the highest compressive strength was obtained for 40% replacement of sand by crusher dust (Quadriet al., 2013). The required slump could not be achieved by natural sand with given parameter of mix design. But with the use of manufactured sand with proper shape, surface texture, desirable grading to minimize void content, a highly workable mix with the given parameter of mix design, was achieved (MS Shetty, 2013). The compressive strength of concrete from stone powder showed 14.76% higher value than that of the concrete made from normal sand (Mahzuz et al., 2011). It is found that the compressive and flexural strength of concrete made of Quarry Rock Dust are nearly 10% more than the conventional concrete (Suribabu et al., 2015). In the present study it is proposed to investigate the optimum replacement of river sand with stone dust for concrete in term of compressive strength performance at 7 days and 28 days.

## II. Literature Survey

The Physical properties like specific gravity, fineness modulus etc. of stone dust and fine aggregate should be comparable in order to use stone dust as a replacement of fine aggregate. Studies shows that optimum replacement of fine aggregate with stone dust gives maximum compressive strength, durability, flexure strength and other mechanical properties.

Manchiryal R.K., Dewangan A. and Gupta D.P. investigated that the physical and chemical properties of stone dust satisfied IS-2386 which could be used as replacement material of fine aggregate. Authors concentrated on cube compressive strength and beam flexure strength in order to give significance to their work. Ordinary Portland cement of 43 grade, Natural River sand with fineness modulus of 2.51 and granite aggregate as a course aggregate were used in the experiments. Quarry dust was obtained from local resource. In the experiments, river sand was 100% replaced by quarry dust and variation in strength was compared. It was concluded that compressive strength from concrete with quarry dust was comparatively 10% -12% more than the conventional concrete. They also concluded that durability under the influence of sulphate and acid attack of quarry dust concrete was higher than conventional concrete. Permeability of concrete decreased due to better relative density of quarry dust than that of conventional concrete.

Reddy, M.V. (2010) carried out some experiments using waste product like stone dust and ceramic scrap as partial and full replacement of fine aggregate. He prepared six samples of nconcrete in which first sample was prepared by replacing 100% fine aggregate by stone dust. Other samples were prepared by replacing 10%, 20%, 30%, 40%,

 