Research Paper Engineering

Research Scope on Black Sotne Powder Waste for Concrete Works

* N. Venkata Ramana

* Assistant Professor, Civil Engineering Department, JNTUA College of Engineering, ANANTPUR, ANDHRA PRADESH, PIN: 515001

ABSTRACT

This paper presents the possible way of thinking to utilize the stone waste powder for civil construction works. Tadpatri town (located in Anantapur district, Andhra Pradesh (State)) is very much potential to polishing industries. In this town around 1600 stone polishing machines are there, from these much of stone powder generating during processing of finished goods and the same powder dumping in and around the factories. The paper is giving a scope to the researchers to utilize this powder for construction industry as partial replacement of cement and fine aggregate so as to keep the environment green.

Keywords : Stone waste powder, partial replacement to cement, filler material

INTRODUCTION

The uses of recycling materials related to concrete are of increasing interest worldwide due to high environmental impact on the cement and construction industries. During production of cement, CO_2 (about 7%) is released in to the atmosphere, and this leads to cause the environmental pollution. This gives negative influence on ecology and healthy survival of human being. According to industrial ecology concept for sustainable development, by-product of industry may be a raw material for other industry. For example fly ash is one of the industrial waste coming out from the thermal power stations (similarly silica fume from Ferro alloy factories) and this is used by the cement industry as additive to cement. This type of product is selling in the market with name of Portland Pozzolana cement (trade mark may be different, it depends upon production company). The usage of industrial by-products for concrete industry in the form of additive or replacement would be a raw material having economical value. In this connection the author of this paper is focusing a scope to do experimental works pertains to utilize the stone powder to the construction works. A brief recent past research work in this arena is presenting below.

PREVIOUS WORK

Targan et.al. (2003) studied the effect of natural pozzolan (NP), colemanite ore waste (CW), coal fly ash (FA) and coal bottom ash(BA) on the properties of cement and concrete. The study was focused on compressive strength, bending strength, volume expansion and setting time. The results showed that the finial setting time of cement past was generally accelerated when NP replaced part of the cement and also reported that NP replacement levels of 5% resulted in an increase in compressive strength. Valls et.al.(2004) were reported the possibility of usage of sludge from sewage treatment plants. The results confirmed that up to 10% of treatment plant sludge can be added to the concrete for specific applications. Nuno Almeida et.al. (2007) are presents an overview of natural stone slurry use for civil works. The results showed that the substitution of 5% of the sand content by stone slurry induced higher compressive strength. Mustafa Karasahin and Serdal Terzi (2007) studied the use of marble dust in the asphalt mixtures as filler material. The study showed that the marble waste, which are in the dust form could be used as filler material in asphalt mixtures where they are available and the cost of transportation is lower than ordinary filler materials. Hanifi Binici et.al.(2008) were studied the durability of concrete made with granite and marble as recycle aggregate. The results showed the prospects of using these waste by- product in the concrete production. Halil Murat Algin and Paki Turgut (2008) were presented that potential use of cotton waste (CW) and limestone powder waste (LPW) as a building material. The results demonstrated that high level replacement of CW and LPW does not possess sudden failure fracture even beyond the failure loads, indicates high energy absorption capacity, reduction the unit weight and smoother surface compared to the concrete bricks. Kursat Esat Alyamac and Ragip Ince (2009) were used the marble powder in self compacting concrete. The authors developed relation between fresh and harden concrete. Nabil M et.al. (2010) carried out the experimental work on mortar mixes with incorporation of Jordanian burnt stone slurry (BSS).The study forced on fresh and hardens concrete properties. The workability and setting times were decreased with increase of BSS, but the compressive and flexural strengths were increased. Marmol et.al. (2010) were investigated the use of granite sludge waste for the production of coloured cement based mortars. They observed that the granite sludge waste is effective filler or pozzolanic material for mortars and also found that granite sludge can be converted into a reddish pigment by calcinations at low temperature (700-900 ^{0}C) for short time. Bahar Demirel (2010) conducted experimental study on concrete with use of waste marble dust as fine sand. The results found that the use of waste marble dust (WMD) in concrete is enhances the mechanical properties. Valeria Corinaldesi et.al. (2010) studied the rheological studies of mortar and concrete made with marble powder. The study concluded that 10% substitution of sand by the marble powder in presence of as super plasticizing admixture provide maximum compressive strength. Nagabhshana and H.Sharada bai (2011) investigated the properties of mortar and concrete in which crushed rock powder (CRP) is used as a partial and full replacement for natural sand. The strength of mortar containing 40% CRP is much higher than normal mortar containing only sand as fine aggregate. The CRP upto 40% can be effectively used to replace natural sand without reduction in the strength of concrete. Michael Galetakis et.al. (2012) were conducted experimental work on lime stone quarry by product as building material. The optimum mix design procedure was found out by them. Venkata Ramana N et.al.(2013) shown a feasible approach to utilize the damaged stone

waste to construction work. They focused waste marble as coarse aggregate for construction works. The author of this article observed that many of works pertaining to stone waste is limited to Turkey, Greece and Spain countries. Very little work has been focused in India, so the author of this paper expressing a question to the local engineers, can it use (stone powder waste) as building material. The generation of powder from polishing industries and scope to research work has presented below.

GENERATION OF STONE WASTE POWDER

Venkata Ramana.N et.al. (2013) has presented a scenario of polishing industries pertains to Tadapatri town. Total 1300 stone polishing and 300 granite factories working in this area and around 20,000 peoples are getting livelihood from these factories. The black layered stone extending from Tadipatri in Anantapur (Dist) to Kamalapuram (Kadapa (Dist)) and Yerraguntla (Kadapa (Dist)) to Bethamcherla in Kurnool district. As per Geological Survey of India report one sq. yard of land had 1,100 sq.ft of black layered stone. Due to availability of this material, the local peoples are making business with other states of India. The existing material can be known as Kadapa slabs (Geological aspect).The extraction of layered stone can be viewed in Figure 1. The extraction of layered stone is transported to the polishing industries by the mode of tractors and this can be viewed in figure 2. The raw product is converting in to finished products; during this stage water is used as fluid to smoothen the cutting process. Finally the stone powder along with water is coming out and is storing in the small pond. This can be viewed in figure 3, 4 and 5. By elapse of time the pond is filled with sludge and this sludge is taken out form the pond. The sludge is dumping in and around the factories (figure.6) and this waste becomes a problem to the factory owners. Venkata Ramana.N et.al. (2013) were reported the chemical analysis for this powder and the results indicated calcium oxide and silica presence is more in the mix. With this information the author of this article is expecting that, this waste may be act as Pozzolana material for cement. If this waste utilized for the civil works as fine aggregate and partial replacement of cement, the local people can be benefited in the concern of disposal and dust pollution. The author is seeking the engineers and researchers to do experimental works in the following areas so as to ascertain the utility of this waste for construction works.

Fig.1: Extraction of layered stone.

Fig.2:Transpor tation of stone

Fig.3: Converting into use full goods

Fig.4: Cutting of stone

Fig.5: Collection of sludge

Fig.6: Dumping of black waste powder (fresh and harden state)

SCOPE TO RESEARCH WORK

1. Used as fine aggregate with different proportions
2. Used as partial replacement to cement.
3. Behavior of compression, split and flexural on cement mortar and concrete.
4. Temperature studies can be conducted on concrete (with blended of stone powder).
5. Permeability studies on concrete can be conducted.
6. XRD and SEM analysis can be conducted to know the chemical reaction with cement and surface morphology.
7. Design mix procedure can be developed.
8. Possibility to Self compacting concrete (SCC) works.
9. Studies can be conducted with incorporation of different fibres.
10. Applicability for grouting works.

CONCLUSION

By conducting the experimental works on specified areas the efficacy of the material can be ascertain for construction works, if the results are positive, the authorities can be educated the local peoples to utilize this material as building material so as to eradicate the disposal problem and keep environment green.

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