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EFFECTIVE USE OF INDUSTRIAL RECYCLED WASTE IN CONCRETE

P. Sai divya [1], M. Haritha chowdary [2], V.Omeshwar rao[3], P.Siva Bharath Reddy[4]

[1]*Department of Civil Engineering, JNTUACEP, Email-ID: perugudivya6@gmail.com*

[2] *Department of Civil Engineering, JNTUACEP, Email-ID : mandalaharitha99@gmail.com*

[3] *Department of Civil Engineering, JNTUACEP, Email-ID:omeshwarrao158@gmail.com*

[4] *Department of Civil Engineering, JNTUACEP, Email-ID: psivabharathreddy@gmail.com*

ABSTRACT

The main aim of this research is to identify how industrial recycled waste can help towards the promotion of sustainable built environment under varying percentages of different materials. The replacement of fine aggregate by 30%, 40% &50%. Partial replacement of cement by flyash as 20%. The experiment is done to know the compressive strength of concrete made with partial replacement of fine aggregate and partial replacement of cement.

Key words:-fly ash, quarry dust, compressive strength.

I.INTRODUTION

Use of industrial recycled waste is applied to reduce consumption of natural resources, energy and pollution of the environment. Sand as fine aggregate and cement has been the most popular components of concrete but over use of these materials led to the following problems to industries.

1. Depletion of natural aggregate
2. High consumption of Portland cement which leads to high emission of carbon dioxide.

If we consider the environment the cement industries generate 5-7% of global CO2 so it is better to find the replacement material for cement. Fly ash is used extensively as a partial replacement of cement because fly ash in concrete gives many benefits. Nevertheless of reduction in strength due to relatively slow hydration of fly ash, it causes an increase in workability of concrete. So, cement is partially replaced with fly ash without affecting the mechanical properties of concrete. Since there is a huge problem related to aggregates due to their non-availability, one of the industrial wastes quarry dust is used as partial replacement of fine aggregate. The utilization of Quarry waste, which is a waste material, will reduce the cost of concrete production. Using such replacement in the concrete construction sector is advantageous, as the production cost of concrete will be reduced. Waste materials that are used as partial replacement of aggregates for concrete are available from the blasting of quarries such as quarry dust which can be used as full replacement of river sand if required and highly economic.

II.LITERATURE REVIEW

- Prof.CHETNA M VYAS, Prof. DARSHANA R BHATT “concept of green concrete using construction demolish waste as recycled aggregate”. He concluded that 0-40% replacement of recycled aggregate gives enough compressive strength and no drastic change in workability.
- Prof. ABHIJEETH BHAIKERKAR “a review on green concrete”. He concluded that partial replacement of concrete materials and byproducts results in economical and eco-friendly concrete with better compressive strength and decreased permeability.
- Mr.Vardhan Nagarkar publishes a paper on green concrete in 2016 in which they conclude that green concrete is a very low energy and resources consuming material.

. III.MATERIALS AND METHODS

The materials used in this study are Fly ash, cement, quarry dust, coarse aggregate, fine aggregate.

- Fly ash:

The ash deposited at the thermal power plants is named as fly ash. Replacement for Cement with varying percentages .Before application in concrete the ash was ground and sieved through a number 425µ.

Figure-1 Flyash

- Quarry dust:

Quarry dust is obtained from the quarries and it is one of the best examples for the partial replacement of fine aggregate. It reduces the sand scarcity. In concrete production it could be used as a partial or full replacement of natural sand.

Figure -2 quarry dust

IV. METHODOLOGY

The percentage amount of cement replaced with fly ash is 20% and sand replaced with quarry dust as 30%, 40% and 50% respectively.

- Mix proportion of concrete for M20 concrete.

Concrete contains cement, water, fine aggregate, coarse aggregate (Recycled and Natural). With the control concrete, i.e. 100% of the natural fine aggregate is replaced with the artificial fine aggregates , 20% of the cement is replaced with supplementary cementitious material i.e. fly ash and 30% , 40%, 50% of fine aggregate is replaced with quarry dust . Three cube samples were cast in the mould of size 150x150x150 mm for each 1:1.5:3 concrete mix. After about 24 h the specimens were de-moulded and water curing was continued till the respective specimens were tested after 7,14 and 28 days for compressive strength.

Table 1

Cement	Super plastisizer (Water reducing)	water	Fine aggregate	Coarse aggregate
403kg/m^3	7 kg/m^3	201.6kg/m^3	672kg/m^3	1209kg/m^3

Water cement ratio is 0.5

1: 1.5: 3

b) The size of the cube is 150×150×150 mm^3

c) In total weight of cement 20% is replaced by flyash and fine aggregate is replaced with quarry dust by 30%, 40% and 50% and tested for different days.

casting cubes

slump cone

V.RESULTS AND DISCUSSIONS

The compressive strength of concrete for 7 , 14 and 28 days maintaining the percentage replacement of cement with flyash by 20% and varying the percentages of sand with with quarry dust as 30%,40% and 50% respectively is given in
Table 2.Also the compressive strength of concrete without any replacement is given in Table 3 for 7, 14 and 28 days respectively.

It is noticed that by maintaining the percentage replacement of flyash as 20% and varying the sand replacement by quarry dust as 30%,40% and 50% , the maximum compressive strength obtained at 50% replacement of sand by quarry dust at 28 days as compared with conventional concrete. Therefore, it can be said that the maximum replacement of sand by quarry dust gives more than required compressive strength as compared to conventional concrete also being economical.

Table 2.

S.No	% replacement of cement with fly ash	% replacement of sand with quarry dust	Curing period in days	Compressive Strength N/mm^2
1	20%	30%	7	17.03
		40%		15.79
		50%		14.17
2	20%	30%	14	23.58
		40%		21.87
		50%		19.62
3	20%	30%	28	26.2
		40%		24.3
		50%		21.8

Table 3.

S.No	%replacement of cement and sand with fly ash and quarry dust	Curing period in days	Compressive strength in N/mm^2
1	0%	7	13.7
2	0%	14	22.5
3	0%	28	26.3

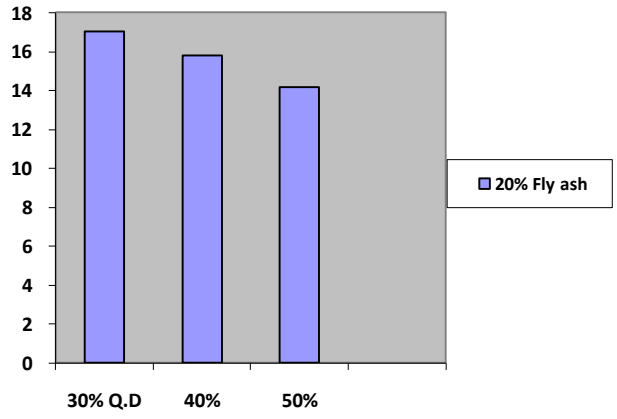

Figure 5: 7days compressive strength for 20% fly ash replaced Concrete

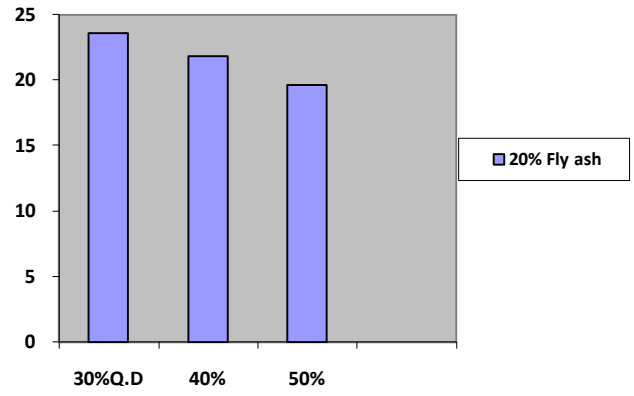

Figure 6:- 14days compressive strength for 20% fly ash replaced Concrete

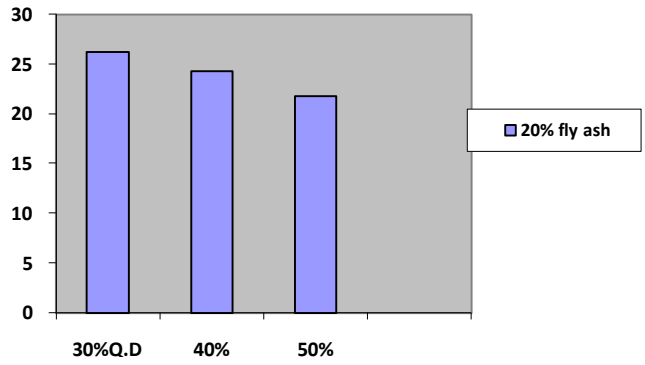

Figure 7:-. 28 days compressive strength for 20% fly ash replaced Concrete

VI.CONCLUSION

1. From the above results we came to know that for20% replacement of cement by fly ash with all the percentages of Quarry dust replacement it gives almost nearer strength of 70-80% of the conventional concrete.
2. Though the compressive strength has decreased by increasing the percentage of replacement of fine aggregate, it includes little declination and highly economical.
3. It is shown that maintaining the percentage of fly ash declines the reduction of compressive strength.
4. There is a less reduction in compressive strength till 50% replacement of sand by quarry dust. Therefore, it is good to replace sand till 50%.

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