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UTILISATION OF WATER REDUCING ADMIXTURES IN PARTIALLY REPLACING SAND BY QUARRY DUST IN CONCRETE

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Abstract:
Concrete plays a pivotal role in construction field . River sand used as fine aggregate ,is one of the main constituent of concrete . The continuous infrastructure development and urbanization etc has led to decrease of natural sand due to increased construction activities . Sand scarcity has increased its cost . Consequently the cost of construction has increased greatly . Therefore , there is need of such material preferably waste which can replace the natural sand so that river erosion , river shrinking and filtration property of riverbed is not affected adversely and high compressive strength of concrete is achieved at lower cost. In such a situation , Quarry dust can be a good substitute to Natural River sand . In this Study, sand is replaced partially by Quarry Dust by the percentage of 0% 15% 25% 35% 40% and 50% and performance of M20 and M25 grade of concrete is analyzed by compressive strength testing at 7^{th}, 14^{th} and 28^{th} days. Water cement ratio of 0.5 and water reducing admixture's amount is kept 21 ml in whole study. Finally we came to know that optimum compressive strength is obtained at 35% replacement of sand by quarry dust

Index terms : Compressive strength , slump and Quarry dust

1.Introduction:

Concrete consists of fine aggregate (sand) , coarse aggregate , cement and water . All these constituents are available easily in few areas but in other areas it should be replaced by an economical and environmental friendly substitute . In the case of fine aggregates , the continuous extraction of sand from river bed has resulted in increased cost of concrete and river erosion , shrinking and other serious environmental concern . Thus the waste material , Quarry dust having similar properties like sand can be used in place of sand partially .

Hence the problem of quarry dust disposal , is also solved and the quality of concrete in terms of compressive strength is increased considerably and this technique is efficient and effective as well .

2. Objectives:

The main objectives of the project are as follows:

- Waste material like quarry dust is utilized to reduce the cost of construction.
- Qualities of quarry dust gets incorporated in concrete thereby increasing strength and reducing river erosion , shrinking and other environmental concern.
- Comparative analysis of sand and Quarry Dust by slump test and compressive strength

3. Materials Used:

1. Cement: OPC 43 grade is used .
2. Fine aggregate: sand sample conforing to zone 3 is used .
3. Coarse aggregate: Coarse aggregate of 20 mm size is used.
4. Water: Normal water of tap is used.
5. Quarry Dust: Quarry dust a waste obtained after the process of crushing of stones .
6. Water reducing admixture: These are used for increasing workability and strength .

4. Methodology:

1. Fine aggregate , coarse aggregate , cement along with water is collected.

2. Basic tests on cement , coarse aggregate and fine aggregate are performed.

3.Design mix as M 20 and M 25 .

4. All the ingredients discussed above are mixed and concrete mix is prepared .

5. Slump test is performed to have idea about the workability of concrete .

6 . Filling of moulds with concrete along with proper compaction

7 . demoulding of cube from mould and cube is kept under water for curing.

8. compressive strength of cubeis found out at 7^{th}, 14^{th} and 28^{th} days by applying gradual load at rate of 140 kg /cm sq.

5 Results and Discussions:

S.N.	Name of experiment	Obtained Reading
1.	Fineness of cements	10 %
2.	Standard consistency test	34 %
3.	Initial setting time	103 min
4.	Final setting time	193 min
5.	Compressive strength at 28 days	45.34 M Pa

Table 1: tests on cement

S.N.	Name of experiment	Obtained Reading
1.	Bulking of sand	4.15 %
2.	Fineness modulus of sand	3.15
3.	Fineness modulus of quarry dust	3.09
4.	Specific gravity of sand	2.2
5.	Specific gravity of quarry dust	2.39
6.	Water absorption of sand	1.6 %
7.	Water absorption of quarry dust	0.5 %

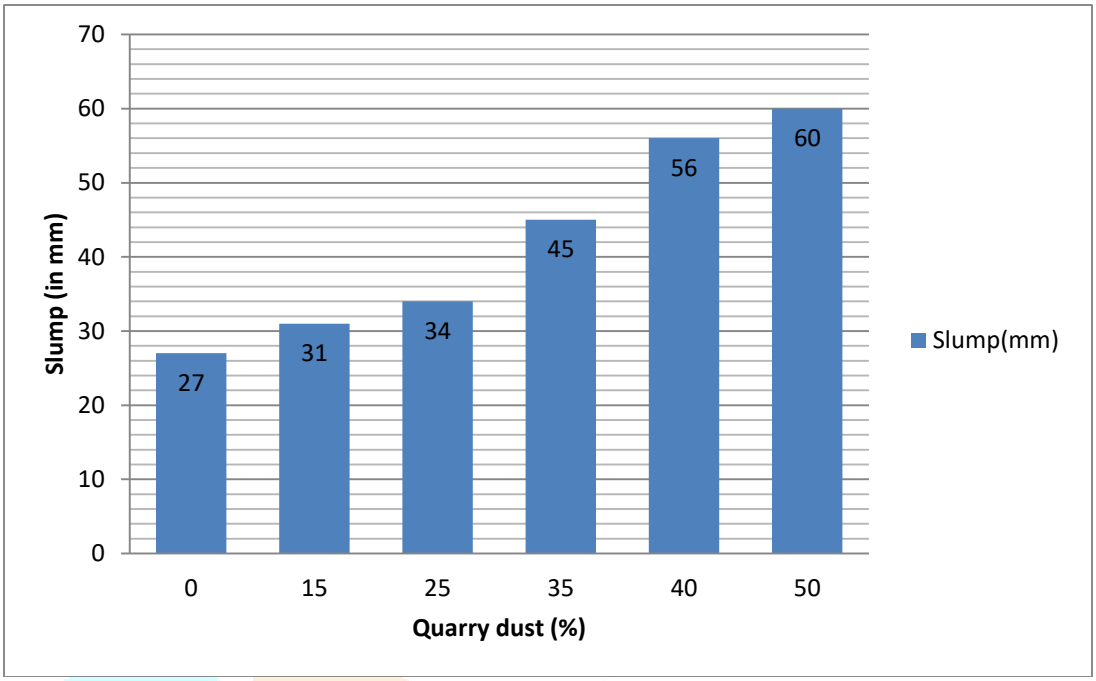
Table 2: tests on fine aggregate

S.N.	Name of experiment	Obtained Reading
1.	Water absorption test	0.54 %
2.	Impact value test	12.95 %
3.	Abrasion value test	31.43 %
4.	Crushing value test	23.69 %
5.	Specific gravity test	2.8

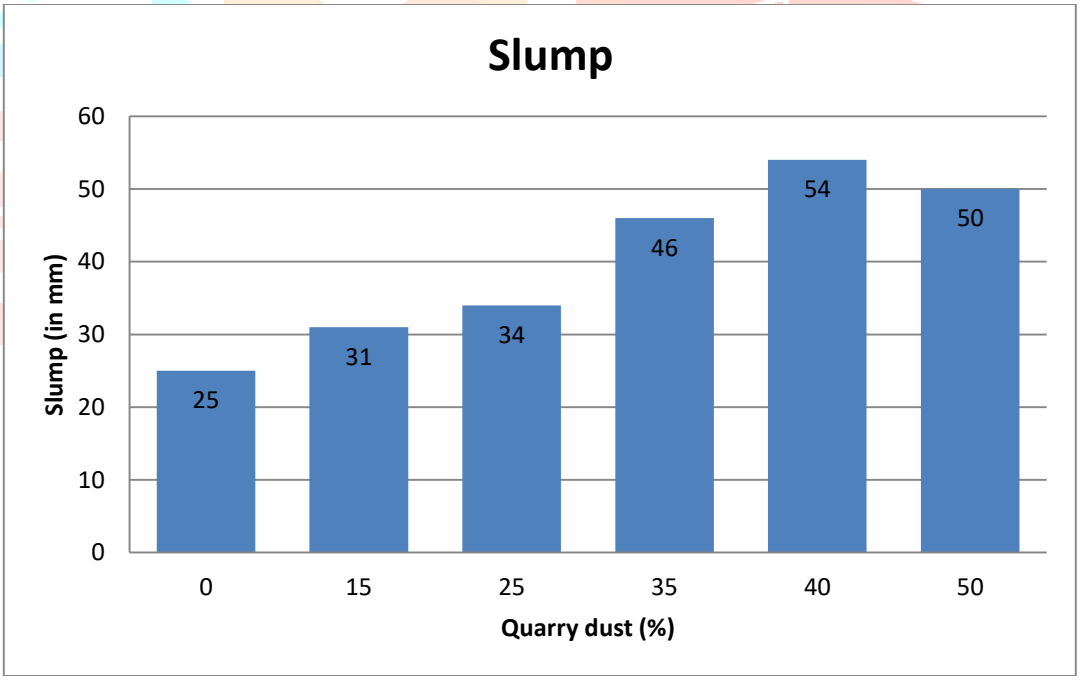
Table 3: tests on coarse aggregate

Results on fresh concrete:

Graphical representation clearly shows that on increasing percentage replacement of sand , slump value increases , keeping water cement ratio constant. Increased quantity of Fineness means more need of water for mixing purpose for better packing which reduces workability consequently .



Graph 1. Slump variation for M20

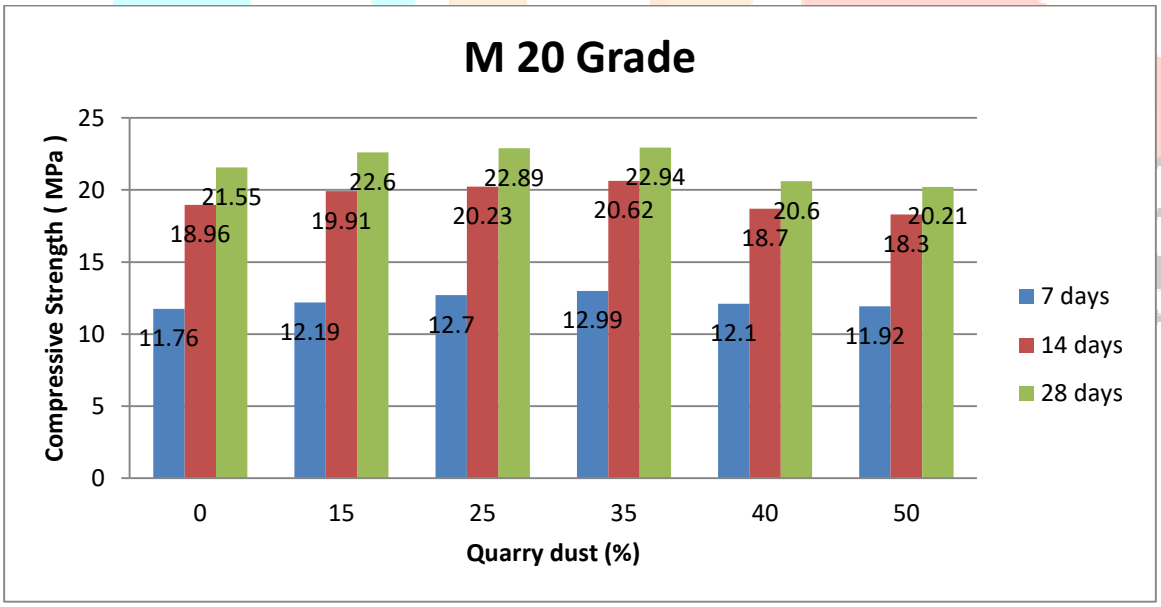


Graph 2. Slump variation for M25

Results on hardened concrete:

S. No.	Quarry dust (%)	Compressive Strength (MPa)		
		7days	14days	28days
1	0%	11.76	18.96	21.55
2	15%	12.19	19.91	22.60
3	25%	12.70	20.23	22.89
4	35%	12.99	20.62	22.94
5	40%	12.10	18.7	20.6
6	50%	11.92	18.3	20.21

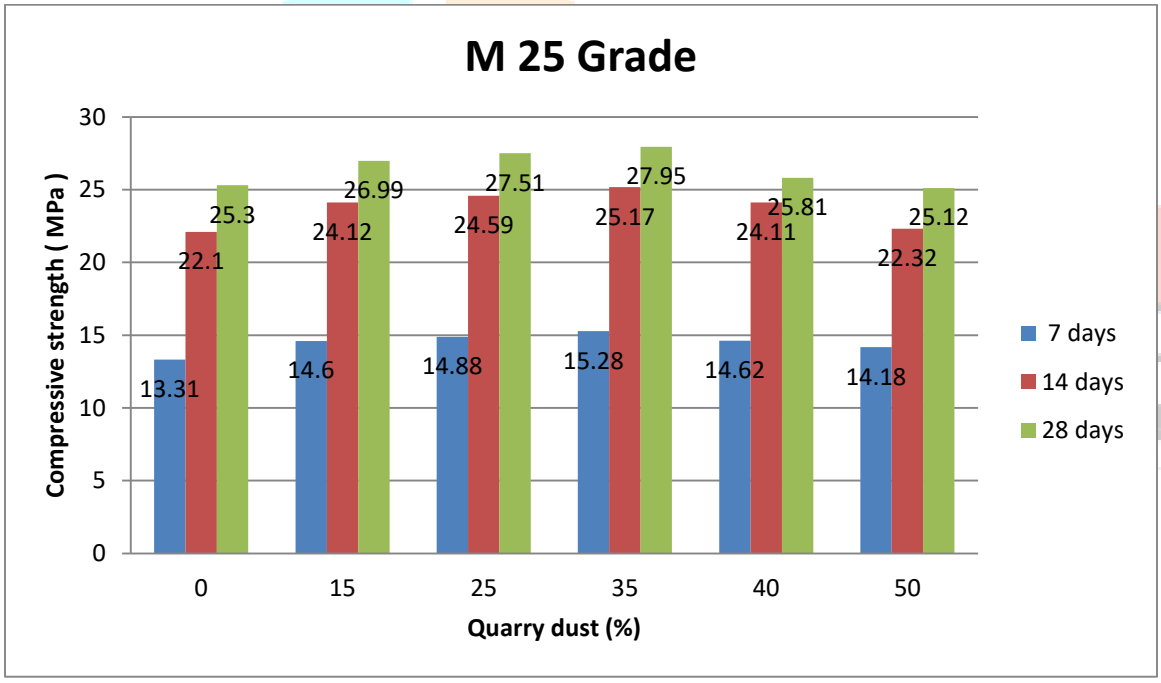
Table 4. Compressive strength of M20 concrete



Graph 3. Compressive strength of M20 concrete

S. No.	Quarry dust (%)	Compressive Strength (MPa)		
		7days	14days	28days
1	0%	13.31	22.1	25.30
2	15%	14.60	24.12	26.99
3	25%	14.88	24.59	27.51
4	35%	15.28	25.17	27.95
5	40%	14.62	24.11	25.81
6	50%	14.18	22.32	25.12

Table 5. Compressive strength of M25 concrete



Graph 4. Compressive strength of M25 concrete

From above tables, it is clear that optimum compressive strength is achieved by replacing 35% of sand by quarry dust. On further increment in the replacement percentage , strength in compression decreases. For range between 0 to 25%particles are not sufficient to cover the void present in between the aggregate and cement resulting in lower value of compressive strength.

6. Conclusion

1. Optimum compressive strength is achieved by replacing 35 % of sand by Quarry dust for both M20 grade and M25 grade of concrete.
2. It solves the problem of Quarry dust and cost associated with it.
3. It promotes a way to sustainable construction by preventing over exploitation of river sand.
4. Cost of construction is reduced significantly i.e. replacement is economical.

References:

1. Conc Celik T, Marar K (1996). Effects of crushed stone dust on some properties of concrete, Cement Concrete Res.,26(7):1121-1130.

2. K.Subramanian and A.Kannan "An Experimental study On Usage of Quarry Dust as Partial replacement for sand in Concrete and Mortar", Australian Journal of Basic and Applied Sciences, 7(8): 955 – 967,2013.

3. Ahmed, E. Ahmed. and Kourd., A.E., (1989), Properties of concrete incorporating natural and crushed stone very fine sand. ACI Material Journal, 86 (4),417-424.

4. Dr.P.B.Sakthivel, C.Ramya and M.Raja "An Innovative Method of Replacing River sand by Quarry Dust waste in Concrete for Sustainability", International Journal of Scientific & Engineering Research Volume 4, Issue 5, May2013.

5. Joseph O. Ukpata, Maurice E.Ephraim and Godwin A.Akeke "Compressive Strength Of Concrete Using Lateritic Sand And Quarry Dust As Fine Aggregate", ARPN Journal of Engineering and Applied Sciences, Volume 7, No.1,Jan2012.

6. G.Balamurugan, Dr.P.Perumal "Use of Quarry Dust to Replace Sand in Concrete – An Experimental Study", International Journal of Scientific and Research Publications, Volume 3, Issue 12, December 2013 ISSN 2250-3153.

7. Akshay C. Sankh, Praveen M. Biradar, Prof. S. J Naghathan, Manjunath B. Ishwargol "Recent Trends in Replacement of Natural Sand With Different Alternatives", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278- 1684, p-ISSN: 2320-334X PP 59-66.