Analysis of Effect of Water Quality on the Strength of Concrete with Manufactured Sand

[1]ASHISH MATHUR, [2]Dr. MALA MATHUR, [3]Dr. R.C CHHIPA

[1]Research Scholar, [3]Professor, Department of Civil Engineering, Suresh Gyan Vihar University, Jagatpura, Jaipur, Rajasthan, India.

[2]Professor, Department of Chemistry, Vivekananda Global University, Jagatpura, Jaipur, Rajasthan, India

ABSTRACT - The study centered on the effect of different qualities of water on concrete compressive strength. The concrete mix of M20 grade with water cement ratio of 0.5 was investigated. Water samples, such as ground water, RO water, and effluent RO water, were collected from Jaipur city and were used to cast 150mm concrete cubes.

Common river sand is expensive due to excessive cost of transportation from natural sources. Also large scale depletion of these sources creates environmental problems. In such a situation the manufactured sand can be an economical alternative to river sand. Use of manufactured sand as a fine aggregate in concrete and mortar draws serious attention of researchers and investigators. From the test results it is observed that the concrete blended with manufactured sand having good durability properties.

As ground water, RO water, and effluent RO water etc. have 7 and 28 day compressive strength. The results shows that concrete made with different qualities of water samples such as of the strength of reference specimens made with different types of water for M20 grade of concrete.

From the analysis of test carried out, it was revealed that, the concrete made with questionable water sample. i.e. ground water sample with a normal water – cement ratio of 0.5, there was about 8.30% more 7- day compressive strength and 5.5% less for 28 days compared to reference specimen

The compressive strength obtained for concrete made with RO water has more strength than the cubes made with normal water.

The concrete made with effluent RO water having slightly less 28 - day compressive strength, compared to 28 days compressive strength with normal water.

The RO water compressive strength is more for 28 days as compared to ground water and effluent RO water samples.

Keywords: Waste Management; Concrete; Compressive Strength; ground water; RO water, and effluent RO water.

I. INTRODUCTION

Now days with the increase in the construction activities, concrete is widely used as construction material and it can be moulded and casted into any form and shape with structure design. So the demand of concrete is increasing day by day and proportionate cement. Cement is a mixture of complex compounds like C_3S (Tricalcium silicate), C_2S (Dicalcium silicate), C_3A (Tricalcium aluminate), C_4AF (Tetracalcium aluminoferrate) etc. The constituents of cement react with water and attain strength of concrete as mould shape. So we can say that the out of all the ingredients of concrete like cement, sand, aggregate, water plays a vital role in the durability and strength of concrete[1].Water is an important ingredient of concrete as it actively participates in the chemical reaction with cement[2]. Water is regarded as an indispensable ingredient as the hydration of cement is possible only in its presence. The quality of mixing water may affect the setting, hardening and strength of concrete. The properties of water have been found to influence the properties of concrete to a

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great extent.[3-10]

Water serves the following purpose

Wet the surface of aggregates to develop adhesion because the cement pastes adheres quickly and satisfactory to the wet surface of the aggregates than to a dry surface.

To prepare a plastic mixture of the various ingredients and to impact workability to concrete to facilitate placing in the desired position.

Water is also needed for the hydration of cementing materials to set and harden during the period of curing.

It has been discussed enough about the quantity of mixing water but so far the quality of water has not been discussed. Since quality of water affects the strength, it is necessary for us to go into the purity and quality of water.

The literature search indicates that, not much research work has carried out on the quality of mixing water in concrete and there are no detailed guide lines for the use of water in concrete. The building code requirements of different countries generally contain broad guidelines on mixing and curing water. Most of the codes consider potable water to be satisfactory for both mixing and curing of Concrete and stipulate permissible limits for solids and aggressive chemicals. .However, In recent years, attention has been focused on the potential for various aspects of wastewater reuse, although previous research has been performed on the use of wastewater that are producing from the water treatment plants and industries for making concrete and reported that no adverse effects on concrete properties in fresh and hardened state[11-19] .

II. MATERIALS USED

CEMENT: Cement is a key to infrastructure industry and is used for various purposes and also made in many compositions for a wide variety of uses. The cement used is Portland pozzalana cement of is used in this study. The specific gravity, initial and final setting time of cement is respectively found as 3.157, 80 minutes and 320 minutes. Fineness Modulus obtained is 8%..

FINE AGGREGATES: Sand is used as the fine aggregate conforming to grading zone II as per IS 383:1970[20]. The specific gravity, fineness modulus, Water absorption, and silt content is respectively found as 2.62, 2.81, 0.32% and 2.604%. As per IS-383 and Morth Table, the Banas Sand of zone - II was recommended for optimization of concrete mix.The Sieves recommended for Gradation of Banas Sand are 4.75mm, 2.36mm, 1.18mm, 600 micron, 300 micron and 150 micron.

COARSE AGGREGATES: Coarse aggregate has a maximum size of about 10mm and 20 mm . The coarse aggregate having a specific gravity 2.71 and fineness modulus of 7.401. Water absorption of coarse aggregate is 0.204 %, Aggregate Crushing value is 15.46% and Aggregate Impact Value is 11.23%.

MANUFACTURED SAND: As per IS-383 & IS-2386[21-31**]** two samples were taken from Kotputli stone sand for gradation with the same size sieve. The main aim was to find percentage of silt and clay in finer particles. The term-manufactured sand is used for aggregate materials dimensionally less than 4.75mm that are processed from crushed rock or gravel and intended for construction use. The term sand refers to relatively small particles and there are little variations of sand with regard to particle size. Manufactured sands are made by crushing aggregate to size appropriate for use as a fine aggregate (< 4.75mm). The crushing process caused the manufactured sand to have an irregular particle shape. These fine particles and irregular shape of the aggregate have adverse effects on the workability and finish of the concrete. These negative effects have given manufactured sands a poor reputation in the construction industry. However this study affirms that in some other practical areas, these fine particles can be utilized to increase the compressive strength of the concrete. Manufactured sand is a material of high quality surplus from coarse aggregate as a byproduct. The term sand refers to relatively small particles; however, there are some variations in the definitions of sand with regard to particle size. Various grading curve were drawn in study of gradation as per Zone-II requirement and need to optimize the concrete mixture. The Aggregate in each test consisted of 39% caorse aggregate (20mm) and 25.7% coarse aggregate(12.5mm) and 35.3% fine aggregate.

WATER: Water is a key ingredient in the manufactured of concrete. Water used in concrete has to meet requirements of IS: 456-2000[32]. One of the most common causes of poor-quality concrete is the use of too much mixing water.

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Consequently "the strength of concrete is governed by the ratio of the weight of water to the weight of cement in a mix, provided that it is plastic and workable, fully compacted, and acceptably cured". Water used for curing and producing of concrete should be practically clean and free from toxic substances such as oil, acid, sugar, salt, alkali, salt, organic matter and other elements which are harmful to the concrete. Tap water is used in this study for the mixing of ingredients and curing of concrete.

TABLE 1 WATER PROPERTIES

Property	Result			Requirement of IS:456-2000
Test	Gound Water	RO Water	Effluent RO Water	
pH Value	7.39	6.75	6.00	Not Less then 6.0
TDS (mg/ltr)	500	270	15000	
Total Hardness	1000	500	3000	
Solid Contents mg/l				
a. Organic	62.5	50.5	111.40	200 Max
b. Inorganic	813	450	1500	3000 Max
c. Sulphate	8.60	0.20	385	400 Max
d. Chloride	332.18	78.50	520	2000(PCC)/500(RCC)
e. Suspended Matter	240	89.50	935	2000 Max

CHEMICAL ADMIXTURES

PC based admixture-Fosroc Auramix 300 are shown in table 2.

TABLE 2 TESTS RESULTS OF CHEMICAL ADMIXTURE

S.No.	Test parameters	Observed results
1	Dry material content(%w/w)	19.27
2	Specific gravity	1.10
3	pH	7.28
4	Chloride(%w/w) (As per BS 5075)	NIL

MATERIAL SUMMARY: Natural Sand (From Banasi) & M.Sand from Kotputli were used in testing during the research program. The coarse aggregate was composed of two sized of Chandwaji Area. The Cementing material was Portland Pozzalana Cement . High range water reducing and water reducing admixture were incorporated into the mix to reach required workability.

MIX PROPORTIONING

Control Mix For comparison the concrete mix was based on a single universal mix called control mix. The control mixes were expected to achieve the target workability for all types of concrete with min. slump of 100-120mm in pump able concrete. It accommodates the wide range of aggregate (well shaped natural sand to poorly shaped crushed stone sand) and reaches the appropriate compressive strength for residential & commercial concrete. The control mix was established through several trial mix. The paste contents for the trial mixes were based on the void contents of the combination of coarse, intermediate and fine aggregates. The IS-2386 Part-3, 1963 is Standard to determine the voids & Bulk density. Each mix needed enough paste to fill the voids between aggregate and provide adequate lubrication of the aggregate particles. Various trial mixes were tested in order to establish a suitable control mix. Water reducing admixture was added to the trial mixtures as needed to increase the workability without increasing water content (Table 3).

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TABLE 3 TRIAL MIX PROPORTION

Trial Mixture No.	W/c ratio
1.M-20(PPC)	0.55

Mix With 100 Percentage Natural Sand for Study

The control mix served as the basis for comparison of the test mix in both parts of experimental program. The first part of Experimental Program the mix with N.sand study was devoted to examining the how fresh and hardened concrete properties behave when sand type in natural. Including the control mixes 20 trials were tested in the study. The mix proportion based on these control mix are given in Table 4.

TABLE 4 MIX PROPORTION (M-20 GRADE OF CONCRETE) With NATURAL SAND

Mix Name	Cement	Fly Ash	Coarse Aggregate		Natural Sand	Water
	(kg)	(kg)	20mm (kg)	10mm (kg)	(kg)	(kg)
M-20 (PPC)	217	93	651	434	779	171.0

Note- All Materials are taken in kg for 1 cum. of concrete

Mix with 100 Percentage M. Sand Replaced By N. Sand for Study

The Ideal mix for a particular M. sand mix may not match the mix proportions of the universal mix design. The latter portion of the research project was devoted to the Design of the concrete mix with 100 Percentage M.Sand. The mixes tested in optimization study were redesigned by holding the same w/c. By the combined aggregate Grading we came to know the proportion of Coarse & Fine Aggregates. With W/c ratio we take cement & Fly ash part & Design the trial mix with different cement content & by that study we approaches to proper design mix. In M.Sand mixes we have to use the PC based admixture due to require workability (Table 5).

TABLE 5 DESIGN MIX WITH M.SAND M-20 GRADE

Mix Name	Cement	Fly Ash	Coarse Aggregate		Natural Sand	M.Sand	Water	Admixture PC Based
	(kg)	(kg)	20mm (kg)	10mm (kg)	(kg)	(kg)	(kg)	(Kg)
M-20 (OPC+PFA)	220	110	708	466	0	633	179.90	2.640

Concrete mixing Procedure

The aggregate is added in mix first for a short period of time before adding the cementing materials. The cementing materials were then added and mixed again until the dry mix appeared uniform. The mixing water was then added while the mixture was rotating. The concrete was mixed for a period of 3 min. left to rest for 3 min. and then mixed again for 2 min. The mix was visually examined and if necessary, high range water reducing admixture was added toward the end of rest period. A slump test was made after the last 2 min. mixing period. If the Ideal Slump has not been met, additional high range water reducing admixture was added to the concrete and the concrete was mixed again for a short period of time. Another slump test was made and the procedure was repeated until the target slump was achieved.

Fresh Concrete Testing Procedure

Workability- The Slump as per trial mix when done as per IS-7320 was 100mm to 120mm in range which was satisfactory for pumping at site. The slump was achieved by adding high range water reducing admixture to the concrete mix and performing a slump test. The slump test is however not useful for extremely stiff or extremely fluid concretes. The test is valid mainly for concrete with medium plastic highly plastic consistency. The water reducing admixture demands can also be an indicator of

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workability. High HRWRA demand indicates a stiff mixture and low HRWRA demand indicates a more fluid mix.

Hardened Concrete Testing Procedure

Compressive Strength- The compressive strength of every mix was measured with 150mm cube. The specimen were tested after curing in chamber for 3,7 days and 28 days as per IS-456 standard code for plain & reinforced cement concrete.

Density, Absorption and Voids

The density, water absorption and voids content are determined as per IS-2386 for all the mixtures in optimization study. As per IS-2386 density pot is taken for determining the compacted and uncompacted density. Similarly water absorption is determined by taking saturated sample in gas for having lid wetting them with water.

TABLE 6 GRADING AND FINES CONTENT (Determined in accordance with IS : 383 & IS : 2386)

Sieve Size	Weight Retained gm		% Retained		Cumulative % Retained		% Passing		Limits (IS-383)	
	20 MM	10 MM	20 MM	10 MM	20 MM	10 MM	20 MM	10 MM	20 MM	10 MM
40 mm	0	0	0.00	0.00	0.00	0.00	100	100	100	100
20 mm	235	0	11.75	0.00	11.75	0.00	88.25	100	85-100	100
12.5 mm	1515	97.50	75.75	9.75	87.50	9.75	12.50	90.25	____	85-100
10 mm	204	854.50	10.20	85.45	97.70	95.20	2.30	4.80	0-20	0-20
4.75 mm	44	45.00	2.20	4.50	99.90	99.70	0.10	0.30	0-5	0-5
Pan	2	3.00	0.10	0.30		100.00				0
Total wt.	**2000.0gm**	**1000.0gm**								
Comments:	Material O.K.,									
Equipment Used	IS Sieves, Weigh Balance,									

TABLE 7 GRADING AND FINES CONTENT (Determined in accordance with IS : 383 & IS : 2386)

TEST DETAILS OF M. SAND

Sieve Size	Weight Retained gm	% Retained	Cumulative % Retained	% Passing	Limits (IS-383) ZONE II
10 mm	0	0.00	0.00	100.00	100
4.75 mm	40	8.00	8.00	92.00	90-100
2.36 mm	20	4.00	12.00	88.00	75-100
1.18 mm	30	6.00	18.00	82.00	55-90
0.6 mm	120	24.00	42.00	58.00	35-59
0.3 mm	165	33.00	75.00	25.00	8-30
0.15 mm	90	18.00	93.00	7.00	0-10
0.075 mm	35	7.00		0.00	
Pan	0	0.00			
Total Wt.	**500gm**		248		
			Fineness Modulus	248/100	**2.48**
Comments:	Material O.K.,	2.2 - 3.2			
Equipment Used	IS Sieves, Weigh Balance,				

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Flakiness Index & Elongation Index were also determined in accordance with IS: 383 & IS: 2386 (Table8).

Table 8

				FLAKINESS GAUGE		LENGTH GAUGE	
	Sieve Size	**Weight Retained gm**	**% Retained**	**Weight Passing**	FLAKINESS INDEX((M2 / M1) * 100)	**Weight Retained**	ELONGATION INDEX((M3 / M1) * 100)
Test Details of 20 mm	14.0 mm	2000.0gm (M1)	100.0	390 (M2)	19.75	415(M3)	20.75
Test Details of 10 mm	6.3 mm	500.0gm (M1)	0.00	90 (M2)	18	95(M3)	19

On the basis of above table it can be predicted that material is ok.

Impact Value and crushing value for coarse aggregate were found 16.83% and 15.48% respectively which was in accordance with IS : 383 & IS : 2386. Particle density (Table 9) & bulk density (Table 10) were also determined.

TABLE 9 PARTICLE DENSITY & ABSORPTION

(Determined in accordance with IS : 383 & IS : 2386)

	20 MM	**10 MM**	**M.Sand**
Particle Density (Oven Dry)	2.61	2.58	2.55
Particle Density (S.S.D.)	2.62	2.61	2.63
Particle Density (Apparent)	2.65	2.65	2.78
Water Absorption (%)	0.50	0.91	3.24
Comments:	Material is O.K.		
Equipment Used :	Gas Jar, Weigh Balance, Oven.		

TABLE 10 BULK DENSITY (Determined in accordance with IS: 383 & IS: 2386)

	20 MM	**10 MM**	**M.Sand**
Mean Weight of Sample (A) :	14.21 kg	9.45 kg	4.64 kg
Volume of Container (B) :	0.0098 m3	0.007 m3	0.0029 m3
UNCOMPACTED BULK DENSITY (A/B) :	1450.00 kg/m3	1350.00 kg/m3	1600.00 kg/m3
	20 MM	**10 MM**	**M.Sand**
Mean Weight of Sample (C) :	15.288 kg	10.15 kg	4.8575 kg
Volume of Container (D) :	0.0098 m3	0.007 m3	0.0029 m3
COMPACTED BULK DENSITY (C/D) :	1560.00 kg/m3	1450.00 kg/m3	1675.00 kg/m3
Comments:	Material is O.K.		
Equipment Used :	Density Pot, Weigh Balance, Tamping Rod.		

Chemical analysis of coarse, fine aggregates and water were also determined.

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TABLE 11 CHEMICAL ANALYSIS OF COARSE AGGREGATES

Characteristic	Observations		Reference
	Material 1	Material 2	
pH	7.00	7.00	
Chlorides (%)	0.01	0.02	IS 456:2000 Clause 8.2.5.2 Table 7
Sulphates (as SO_4) mg/ltrs	40	40	IS 456:2000 Clause 8.2.5.3 Table 4
Deleterious materials (%)	NIL	NIL	IS 383 Table 1
Alkali aggregate reactivity	--	--	IS 2386 (Part VII)
Organic impurities (%)	NIL	NIL	IS 383 Note 2 under table 1
Soundness Test % Loss in weight after 05 cycle by Na_2So_4 method		--	IS 383 Clause 3.6

TABLE 12 CHEMICAL ANALYSIS OF FINE AGGREGATES

Characteristic	Observations M. Sand	Reference
pH	7.60	
Chlorides (%)	0.02	IS 456:2000 CLAUSE 8.2.5.2 Table 7
Sulphates (as SO_4) mg/ltrs	60	IS 456:2000 CLAUSE 8.2.5.3 Table 4
Deleterious materials (%)	NIL	IS 383 Table 1
Alkali aggregate reactivity	--	IS 2386 (Part VII)
Organic impurities (%)	NIL	IS 383 Note 2 under Table 1
Soundness Test % Loss in weight after 05 cycle by Na_2So_4 method	--	IS 383 Clause 3.6

Manufactured Sand Concrete Mix Results

The purpose of study was to determine how sand type, grading affect fresh and hardened concrete properties. The Manufacturer sand grading and grading of M.S. with Natural Sand is taken as per IS-2386 and IS-383 Codal Provision. The replacement of M.S. has been done from 100%, including the control mixes. 20 concrete mixes were tested during the phase of experimental procedure.

III. RESULT OF FRESH CONCRETE WORKABILITY

Slump

The Slump for the mixes tested are tabulated and the slump record with min. value of 110mm and a maximum value of 145mm in laboratory condition when trials were done. The avg. slump was 120mm slightly above the target value of 110mm. The slump was highly dependent on the amount of High Range Water Reducing Admixture (HRWRA) added in the mix. Lower slump was associated with mix containing poorly shaped natural sand along with manufactured sand. The angularity of the sand decreased the slump and higher paste content may be necessary for these mixtures. Without increasing the Paste content the mix required higher dosage of high range water reducing admixture to produce slumps with in the acceptable range of

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100mm to 120mm.

HRWRA Demand

The high range water reducing admixture demand is to achieve a specified slump. In order to identify the correct doses, HRWRA was added incrementally to each mix. Mix with high dosage may have stayed in the mix for a longer period of time. Regardless of sand type or grading or crushed stone sand, the HRWRA demand increased with increasing proportions of crushed stone sand.

In this paper we have reported the Naphtha as well as Poly Carboxylate based admixture, but due to high fines in manufactured sand we have taken up trials with PC based due to slump problem associated in Naphtha based admixture. Similarly the concrete mix plants or batching plants need more HRWRA demand if site is far away to do the job maintaining slump in well defined limits.

TABLE 13 SLUMP STUDY ON NAPHTHA & PC BASE ADMIXTURE (M-20)

Slump in mm	1 % Nephta	0.8 % Mid PC	1 % Mid PC	1.1 % Mid PC	1.2 % Mid PC
Initial	30	90	150	150	180
30 Minute	0	30	100	120	170
60 Minute	0	0	60	110	160
90 Minute	0	0	30	100	150
120 Minute	0	0	0	80	130
150 Minute	0	0	0	70	120

Hardened Concrete Properties:

Compressive Strength

The compressive strength for 7 days and 28 days are tabulated. All mixes achieved the target strength. Although with use of VSI crusher, screening and proper washing arrangement can be more fruitful to attain good M.Sand as well as higher compresive strength. The use of PC based admixture is also helpful to get desired compressive strength of sand blend concrete.In this study the sample from Kotputli source were taken for M. sand. The use of proper sieves, well graded stone with proper crushing followed by dust collector and washing technique can be helpful to get desired strength.

Density, Water Absorption & Voids

As per sample taken for crushed stone aggregate from different source of crusher the data for particle density and water absorption is taken in calculation sheet and also bulk density is calculated shown in proper format. All data of density and water absorption are shown in table as Per IS-383 -1970 and IS-2386. The water absorption is somewhat in range of 3% to 3.5% which is at higher side. So HRWRA was used for making good workability.

In case of natural sand the normal water absorption is 1% to 2%. So different trials for comparison purpose were taken. The bulk density in case of M. Sand is almost equal or in some cases is lower than the Natural sand mix. But again particle size & shape of well graded & further use of processed in VSI crusher with proper screening may give the same result as natural sand. The result obtained in M. Sand have some- how equal with Natural Sand. Well graded particles of M.Sand along with less water absorption may give good packing density and the result will be somewhat higher than natural sand. Due to higher packing density in use of M.Sand the more impermeable layer is obtained, which is less affected by chemical effect & Chloride ingress, provide durable structure. Cost of N-sand and M-sand was also compared and both are in approximately same range .

TABLE 14 COMPRESSIVE STRENGTH TREND COMPARISON FOR M-20

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	Comp. Strength M-20		Comp. Strength M-20		Comp. Strength M-30	
	M. Sand in Mpa (with Ground Water)	N. Sand in Mpa (with Ground Water)	M. Sand in Mpa (with RO Water)	N. Sand in Mpa (with RO Water)	M. Sand in Mpa (with ERO Water)	N. Sand in Mpa (with ERO Water)
7 Days	21	21.25	21.35	21.95	19.65	20.75
28 Days	28.75	29.25	29.75	30.25	26.50	27.75

TABLE 15 PARTICLE DENSITY TREND COMPARISON

	M. Sand	N.Sand
M-20	2349	2364

TABLE 16 WATER ABSORPTION TREND COMPARISON

	M. Sand	N.Sand
	Water Absorption on 28 day's in Percentage	
M-20	3.76	4.25

IV. CONCLUSIONS

Water contributes an active part in imparting strength and durability to concrete. The role of water is not only important at the mixing stage but also during curing. Impurities in water, which may be either in the dissolved or suspended form, may interfere with the hydration of cement, thus affecting the setting, hardening and strength development. It may also cause efflorescence and leaching effects in set cement mortar/concrete. Concrete structures such as buildings, bridges, flyovers, power plants and others are ideally required to be built with utmost care to serve its intended purpose without any recurring expenditure on maintenance. However, it is not so in real life scenario and often distress in concrete is notified within few years of construction. The causes of distress can be attributed to many factors, of which the important being the poor quality of construction, improper detailing of reinforcement and not satisfying the requirements as specified in code of practices.

Use of Effluent RO water may produce more durable economical viable concrete mixture used for specific purpose like in PCC.

Uses of effluent RO water may help in solve the environment problems.

Use of Manufactured Sand may also reduce the natural sand dependability in this region.

Use of Manufactured sand in concrete may reduce the environmental problem, cause by scarcity of Natural sand.

The above studies helps to meet the construction Industry strategic goal of environmental study such that Manufactured sand (MS) can replace natural sand in concrete mix. Using less natural sand leads to a decrease in river dredging and the disruption of river environments. As mentioned the areas used for aggregate mining can be reclaimed and developed for new purposes such as residential, commercial or recreational usage. The results of the hardened properties of the mix have shown that the concrete mix with proportion of manufactured and natural sand achieved a almost Similar compressive strength almost at all tested age of concrete.

Manufactured sands are made by crushing aggregate to sizes appropriate for use as a fine aggregate. During the crushing case the manufactured sand have irregular shapes and more fine particles contributing to improved compressive strength, compared to natural sand control mix. Due to the irregular particle shape of the manufactured sand, in addition to the reduced amount of water cement

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ratio, manufactured sand is more important for high strength concrete mixes. Analysis made on the influence of manufactured sand in the cost of the concrete revealed that no significant cost variation is observed for mixes with fully replacement of the manufactured sand with natural one. Manufactured sand offers important economic advantages in regions where the availability of natural sand is scarce or in cities where transportation cost is high. The use of manufactured sand in the construction industry helps to prevent unnecessary damages to the environment and provide optimum exploitation of the resources. Manufactured sand offers a viable alternative to the natural sand if the problems associated with the workability of the concrete mix can be resolved by using super plasticizer. The addition of super plasticizer to a concrete mix with manufactured sand allows the mix to have a better workability. The Manufactured needs to use clean washed coarse aggregates generally 6 mm to 10 mm size for getting good quality of crushed sand having combination of fines with some percentage of 2 mm to 4 mm coarse particles for producing effective concrete mix. Environment friendly approach is most important aspect and is touched due to understanding of earth life balance along with pollution free society. The requirement of cement has been observed to be very reasonable for all the mixes. The same content of cement was adequate for the same grade of mix with different admixtures. The mechanical properties of M. Sand depend upon the source of raw material. Hence the selection of quarry is very important for obtaining quality fine aggregates. This study shows minimum void content in M. Sand as compare to natural sand which further gives lesser drying shrinkage & less avitations in structure, provide high durability in all types of concrete work.

In this research we check the suitability of a variety of water sources amd use of manufacture sand instead of natural sand for concrete production and tried to produce durable concrete. Use of alternative water sources and manufacture sand may produce more durable economical viable concrete mixture used for specific purpose which is also helpful in solving the environment problems.

REFERENCES

[1] Abdel-Magida Taghried Isam Mohammed, Effect of Magnetized Water on Workability And Compressive Strength of Concrete, Procedia Engineering ,05(04):494-500(2017)

[2] AL-JABRI K. S., AL-SAIDY A. H., TAHA R. and AL- KEMYANI A. J., Effect of using Wastewater on the Properties of High Strength Concrete, Procedia Engineering 14(04) : 370-376(2011)

[3] Asif Rashid Shaikh1, V. M. Inamdar, Study of Utilization of Waste Water in Concrete, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) 13(04):105-108(2016)

[4] B. Chatveera , Lertwattanaruk P., N.Makul, Effect of sludge water from ready-mixed concrete plant on properties and durability of concrete, Cement and Concrete Composites 28(05):441-450(2006).

[5] Basu Prarthita, Study compressive strength characteristics of concrete by partially replacing of OPC cement by Fly Ash with grade M35 along with partial replacement of Natural sand by varying percentage of Crusher Dust and Waste Marble Dust", International Research Journal of Engineering and Technology (IRJET) 03(07):56-72(2016)

[6] Gadzama E.W., Ekele O.J., Anametemfiok V.E. and Abubakar A.U., Effects of Sugar Factory Wastewater As Mixing Water on The Properties of Normal Strength Concrete, International Journal of Science, Environment and Technology, 04(03):813-825(2015)

[7] Ghrair Ayoup M., Othman Al-Mashaqbeh A., Influence of Grey Water on Physical And Mechanical Properties of Mortar and Concrete Mixes, Ain Shams Engineering Journal 05(04):1519-1525(2016)

[8] High-Performance Concrete by P C Aitcin.Hüseyin Yiğiter Halit Yazıcı Serdar Aydın, Effects of Cement Type, Water/Cement Ratio and Cement Content on Sea Water Resistance of Concrete, Building and Environment 42(04):1770-1776(2007)

[9] More Rakesh A. and Dubey S.K., Effect of Different Types of Water on Compressive Strength of Concrete, International Journal on Emerging Technologies, 05(02):40-50(2014)

[10] Obi Lawrence E., Effects of Water Quality on Concrete Compressive Strength, International Journal of Civil, Mechanical and Energy Science (IJCMES) 05(02):07-13(2019)

[11] Reddy Venkateswara. and Vangala, Effects of Strong Alkaline Substances in Mixing Water on Strength and Setting Properties of Concrete, International Journal of

 DOI : 10.35291/2454-9150.2021.0073

Mining, Metallurgy & Mechanical Engineering (IJMMME) , 01(02):2320-4060(2013)

[12] Sandrolini Franco, Waste wash water recycling in ready-mixed concrete plants, Cement and Concrete Research 31(03):485-489(2001)

[13] Sharma Himanshu, Sood Hemant, Deepanshu, Effect of Concentration of Alkaline Water on Strength Of Concrete, International Journal of Civil Engineering, 02(01):4-6(2015)

[14] Sharma Sonika, Chhipa R.C, Interpretation of ground water quality parameter for selected area of Jaipur using regression and correlation analysis, Research Interest 72(02):781-783(2013)

[15] Shrilatha, Rohtih M, Puneeth H C, Khatavkar Naveen K, Effect Of Primary Treated Waste Water in Concrete Mix, International Journal of Current Engineering And Scientific Research 04(08):9-13(2017)

[16] Su Nan, Miao Buquan, Liu Fu-Shung, Effect of wash water and underground water on properties of concrete Cement and Concrete Research,32(05):777-782(2002)

[17] Wegian Falah M, Effect of seawater for mixing and curing on structural concrete, The IES Journal Part A: Civil & Structural Engineering, 03(04):235-243(2010)

[18] Yalley P P and A Sam, Effect of Sand Fines and Water/Cement Ratio on Concrete Properties, Civil Eng Research Journal 04(03):1-7(2018)

[19] IS 383 (1970): Specification for Coarse and Fine Aggregates From Natural Sources For Concrete

[20] IS: 2386(Part V) -1968 methods of test for aggregates

[21] IS: 2386 (Part III) – 1963. Water absorption of coarse aggregates.

[22] IS: 2386 (Part IV) – 1963 aggregate impact value of coarse aggregates.

[23] IS: 2386 (Part IV) – 1963 the abrasion value of coarse aggregates.

[24] IS: 2386 (Part IV) – 1963 the aggregate crushing value of coarse aggregates.

[25] IS: 2386 (Part III) – 1963 specific gravity of course aggregate.

[26] IS: 2386 (Part I) – 1963 flakiness index and elongation index of coarse aggregate.

[27] IS: 2386 (Part I) – 1963 particle size distribution of fine aggregate.

[28] IS: 2386 (Part III) - 1963 bulking of fine aggregate we are using.

[29] IS: 2386 (Part III) – 1963 specific gravity of fine aggregate.

[30] IS: 2386 (Part II) – 1963 silt content of fine aggregate.

[31] IS 456: 2000 Plain and Reinforced concrete code of practice

 DOI : 10.35291/2454-9150.2021.0073