

Compressive Strength of Concrete using Plastic Waste

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ABSTRACT: In developing countries the major problems concern by the using of plastics products. These plastics are non biodegradable materials such as toxic and inorganic materials. If those plastics are stored or dumping in any open sites it will cause the major environmental problems. Using this plastic waste or recycling. This waste into the useful products means the quality of wastage will reduce. In construction wise plastics are used as fine aggregate and coarse aggregate in concrete. Here the polypropylene plastics are replaced as a fine aggregate and coarse aggregate at a percentage of 5, 7, 9 at the grade M20 concrete. Finally this study shows the results of compressive strength of concrete cubes using a plastic waste in M20 grade of concrete.

KEYWORDS: Plastics, Polypropylene, Compressive strength, M20 grade concrete

I. INTRODUCTION

Plastic waste is a material consisting of a synthetic of semi- synthetic organics. Plastic product in the environment that adversely affects the human, wildlife, etc. The lands gets littered by plastic bag garbage presenting an ugly and unhygienic seen. This littering reduces the rate of rain water percentage and low water levels in every city.

In last two decades in US PET bottles and jars are produced up to 16%. Compare to other product materials and also HDPE the natural bottles also manufacture up to 4.9%. In India 0.24 into the million tones of plastic dumped into the ocean every year. The amount of plastic waste per year is 0.6 million tones. At December 2014 estimated the quantity of plastic floating in the ocean at nearly 270000 tones. So that the plastics should be recycled in proper manner. If plastic used in construction wise 0.5% of plastic shell be reduced. This is also one of the ways of safe disposal of plastic waste.

II. PROPERTIES OF PLASTICS

Table 1: Properties of Waste Plastics

Type of plastics	Polypropylene
Density of waste plastics	0.93 to 0.97 g/cm ³
Size of polypropylene	10mm

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III. EXPERIMENTAL RESULTS

1. SCRAPED PLASTICS



Fig 1: Scraped Plastics

Percentage of plastics (Granular shape) to minimize F.A

For 5% = 110gms

For 7% = 154gms

For 9% =198gms

Table 2: Compressive Strength of Concrete Cubes (Adding 5% of plastic)

Sample	Age curing(Days)	of Area of cube(mm ²)	of Failure load kN	Comp. strength N/mm ²	Avg. strength N/mm ²
1	7	22500	560	24.88	
2	7	22500	560	24.88	25.17
3	7	22500	580	25.77	
1	28	22500	660	29.33	
2	28	22500	690	30.66	30.51
3	28	22500	710	31.55	

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Table 3: Compressive Strength of Concrete Cubes (Adding 7% of plastic)

Sample	Age of curing (Days)	Area of cubes (mm ²)	Failure loads kN	Comp. Strength N/mm ²	Avg. Strength N/mm ²
1	7	22500	615	27.33	
2	7	22500	610	27.11	27.45
3	7	22500	628	27.91	
1	28	22500	680	30.22	
2	28	22500	725	32.22	32.15
3	28	22500	765	34.00	

Table 4: Compressive Strength of Concrete Cubes (Adding 9% of plastic)

Sample	Age of curing (Days)	Area of cubes (mm ²)	Failure loads kN	Comp. Strength N/mm ²	Avg. Strength N/mm ²
1	7	22500	650	28.88	
2	7	22500	730	32.44	31.99
3	7	22500	780	34.66	
1	28	22500	800	35.55	
2	28	22500	845	37.55	37.10
3	28	22500	860	38.22	

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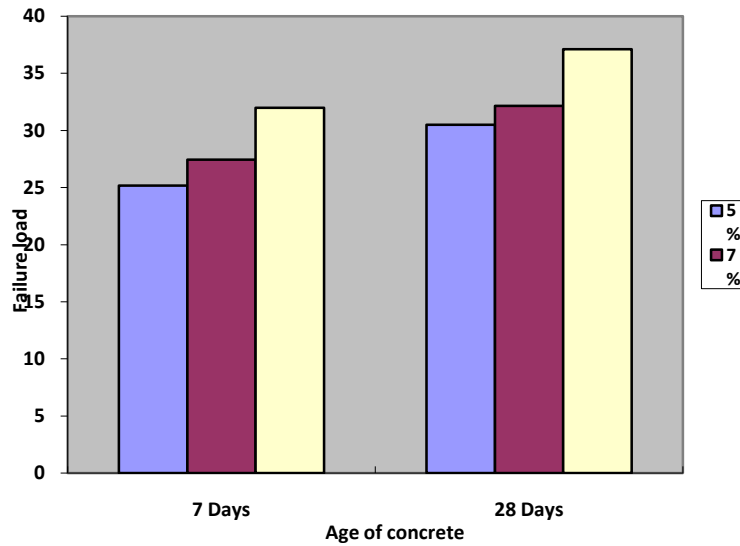


Fig 2: Failure Load of Concretes with Scraped Plastics

2. CRUSHED PLASTICS (High Density)



Fig 3: Crushed Plastics (High Density)

Percentage of plastics (Crushed shape) to minimize C.A

For 5% = 220gms

For 7% = 308gms

For 9% = 396gms

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Table 5: Compressive Strength of Concrete Cubes (Adding 5% of plastic)

Sample	Age of curing (days)	Area of cube (mm ²)	Failure load (kN)	Comp. Strength (N/mm ²)	Avg. strength (N/mm ²)
1	7	22500	640	28.44	28.07
2	7	22500	630	28.00	
3	7	22500	625	27.77	
1	28	22500	710	31.55	32.21
2	28	22500	725	32.22	
3	28	22500	740	32.88	

Table 6: compressive Strength of Concrete Cubes (Adding 7% of plastic)

Sample	Age of curing (days)	Area of cube (mm ²)	Failure load (kN)	Comp. Strength (N/mm ²)	Avg. strength (N/mm ²)
1	7	22500	640	28.44	29.00
2	7	22500	660	29.33	
3	7	22500	655	29.24	
1	28	22500	720	32.00	33.33
2	28	22500	760	33.77	
3	28	22500	770	34.22	

Table 7: Compressive Strength of Concrete Cubes (Adding 9% of plastic)

Sample	Age of curing (days)	Area of cube (mm ²)	Failure load (kN)	Comp. Strength (N/mm ²)	Avg. strength (N/mm ²)
1	7	22500	675	30.00	30.33
2	7	22500	670	29.77	
3	7	22500	700	31.11	
1	28	22500	780	34.66	35.25
2	28	22500	790	35.11	
3	28	22500	810	36.00	

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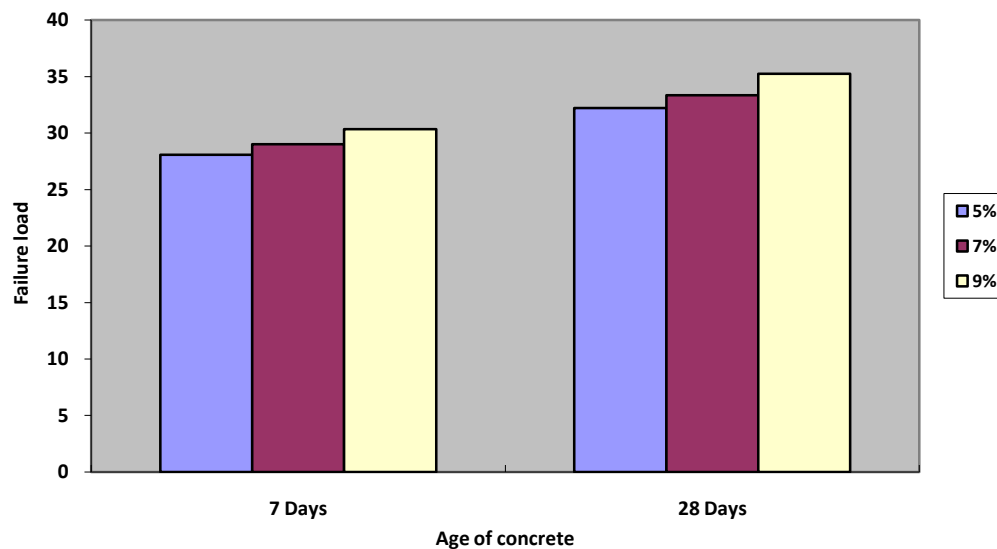


Fig 4: Failure Load of Concretes with Crushed Plastics

IV. RESULTS AND CONCLUSIONS

- The strength of M₂₀ grade of concrete using scraped plastics at 9% was 37.10 N/mm² at 28 days curing period
- Using crushed plastics (High Density) the compressive strength of concrete cubes at 9% was 35.25 N/mm²
- Compare to crushed plastics the strength of scraped plastic concrete was high
- Plastics are added additionally to the concrete as coarse aggregate at the percentage of 5, 7 and 9.
- The compressive strength of the plastic concrete was high compare to the conventional concrete
- Using waste plastics into the concrete means the strength of the concrete is high up to 50% to 70%.

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