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Studies on Self Compacting Fuel Dispenser Hose Pipe Rubber in Concrete

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Abstract: ***The experimental study undertaken to investigate the influence of partial replacement of Coarse aggregate with Fuel dispenser hose pipe rubber in concrete. Tests were conducted to determine the optimum level of replacement of Fuel dispenser hose pipe rubber in concrete. The main focus of this study is to find out the strength properties of concrete in which Coarse aggregate is partially replaced by Fuel dispenser hose pipe rubber in concrete 10%, 20%, 30%, 40% and 50%.***

The fuel dispenser hose pipe rubber is mostly available in all the petroleum bunk. Open burning of hoses for steel extraction causes several pollution problems. An attempt was made to replace coarse aggregate with the fuel dispender hose pipe . When it was cut to a required size of 20 mm and less in self compacting concrete. This fuel dispenser hose pipe with different percentage of 10%, 20%,30%, 40%,50% was tested for partial replacement of coarse aggregate for M25 grade concrete. The compressive strength of fuel dispenser hose pipe with 10% replacement was found to have 28 N/mm^2 at the end of 28 days Which is more than the conventional concrete. The split tensile strength of fuel dispensor hose pipe with 10% replacement was 5N/mm^2 at the end of 28 days which is more than conventional concrete. The flexural strength of fuel dispensor hose pipe with 10% replacement was 5N/mm^2 at the end of 28 days which is more than conventional concrete. Hence 10% of fuel dispenser can be replaced for coarse aggregate in cement concrete.

Key Words – Fuel dispenser Hose pipe, steel extraction, Self-compacting Concrete, Petroleum bunk

I. INTRODUCTION

The global consumption of natural aggregate is very high, due to the extensive use of concrete. In general, the demand of natural aggregate is quite high in developing countries like India is facing shortage in good quality natural aggregate. Approximately, the number of petroleum bunk in puducherry is 45. The maximum usage of fuel dispenser hose pipe rubber in petroleum bunk is 6 months after which it is replaced by new one. The average number of fuel dispenser hose pipe rubber in one petroleum bunk which is getting wasted is 10. The weight of each single pipe is about 2kg. Hence, the amount of fuel dispenser hose pipe rubber which is available annually 900 in numbers which is about 1800 kg (i.e., 1.8 t per year)

Chen Bing et al (2014) in this study, the use of tire- rubber particles as a replacement for coarse aggregate in concrete is investigated. Rubber has replaced coarse aggregate at content levels of 25, 50, 75, and 100% in concrete by volume. Two different series, I-series the w/c ratio is .40, II-series the w/c ratio is .60Rubber particle replacement levels of 25, 50, 75, and 100% in coarse aggregate reduced their strengths by 26.5, 47.1, 58.5, and 74.3%, respectively. For the series II mixtures, rubber particle replacement levels of 25, 50, 75, and 100% in coarse aggregate reduced their strengths by 15.6, 41.5, 54.5, and 70.0%, respectively.

A.Turatsinze et al (2008) has examined on the modulus of elasticity and strain capacity of self- compacting concrete incorporating rubber aggregates. Rubber aggregate from scrap tyres was used as a partial replacement for Coarse Aggregate (CA) at 5, 10, and 15 % by volume proportions. Drastic reduction in compression strength with increasing rubber aggregate content.

II. MATERIALS

A. Cement

Ordinary Portland cement (OPC 53 grade) is used as the main binder. (OPC) – 53 grades confirming to IS: 12269 – 1987 was used. The physical properties of cement obtained and used are given in Table 3.1

Table 1Physical Properties of Cement

SI .NO	Properties	Test results
1	Standard consistency	29%
2	Initial setting time	55 min
3	Final setting time	185 min
4	Specific gravity	3.15

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B. Fly ash

The fly ash used in this study was obtained from Neyveli Thermal power plant. It falls in the category of class C grade. In this project class C fly ash is used for the preparation of SCC. The physical properties of fly ash are determined as per IS: 1727-1967, is given in Table .3.2

Table 2 Properties of Fly Ash

SI .NO	Properties	Test results
1	Type	C
2	color	Brownish black
3	Specific gravity	2.28
4	consistency	38%

C. Fine Aggregate

Good Quality River sand, free from silt other impurities were used in this study. Sand passing through 4.75 mm has to be used in this experimental work. The following properties of fine aggregates are determined as per: 2386-1963, is given in Table .3.3

Table 3 Properties of Fine Aggregate

SI .No	Properties	Test results
1	Fineness modulus	2.18
2	Size of aggregate	4.75 mm passing
3	Specific gravity	2.59
4	Water absorption	1.55%
5	Loose Bulk density	1560 kg/m^3
6	Zone	II

D. Coarse Aggregate

The coarse aggregate passing through 20 mm and retaining 4.75 mm has to be used for experimental work. The following properties of coarse aggregate are determined as per IS: 2386-1963, is giving Table.3.4.

Table 4 Properties of Coarse Aggregate

SI.NO	Properties	Test results
1	Fineness modulus	9.16
2	Size of aggregate	20 mm
3	Specific gravity	2.7
4	Water absorption	0.4%
5	Bulk density	1570 kg/m^3
6	Impact value	19%

E. Fuel Dispenser Hose pipe Rubber

The Fuel dispenser hose pipe rubber aggregate passing through 20 mm and retaining 4.75 mm has to be used for experimental work. The following properties of rubber aggregate are determined as given in Table .3.5

Table 5 Properties of Fuel Dispenser Hose Pipe Rubber

SI.NO	Properties	Test results
1	Size of aggregate	20 mm
2	Water absorption	1.6%
3	Bulk density	970 kg/m^3

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Figure 1 Fuel Dispenser Hose Pipe Rubber

F. Chemical Admixture

To improve the workability of the fresh concrete, super plasticizers are used. This is a crucial component in SCC .VARAPLAST 123 from Akarsh Chemicals (INDIA) Ltd was used. It is a non-toxic brown liquid based on naphthalene polymer. The properties of the super plasticizers (SP) as given in the literature of the manufacturer are in the Table 3.6

Table 6 Properties of Admixture as Given By Its Manufacturer

SI.NO	Physical State	Brown Liquid
1	Dry Matter Content	35%
2	Specific Gravity	1.21
3	Chloride Content	Nil
4	pH	7 To 8
5	Air Entertainment	Less Than 1%

III. METHODOLOGY

To estimate and collect the discarded fuel dispenser hose pipe stocks in Pondicherry.To cut the fuel dispenser hose pipe rubber by steel cutting machine to the required size of 20mm and less. To find the Density and specific gravity of fuel dispenser hose rubber material. Design of self-compacting Concrete mixes by replacing coarse aggregate with hose pipe rubber material at various percentages. Strength studies on self-compacting fuel dispenser hose pipe rubber material concrete 20% to 100%.

To cast concrete cubes specimen of size 100× 100 ×100 and to test the harden cube on 28 days under compression. To cast concrete cylinder specimen of size 100× 200 and to test the harden cylinder on 28 days under split tensile. To cast concrete prism specimen of size 100× 100 ×500 and to test the harden prism on 28 days under flexural. Strength studies like compressive strength, flexural strength and split tensile strength are to be conducted.

IV. RESULT AND DISCUSSIONS

A. Compressive Strength

Table 7 Compressive strength at 28 days

Mix Identity	Mean Weight(kg)	Mean load at failure(KN)	Compressive strength (MPa)	Reduction in strength (%)
MC-00	2.410	394.40	39.44	
MCR-10	2.290	328.80	32.88	16.63
MCR-20	2.090	278.10	27.81	29.48
MCR-30	1.87	222.40	22.24	43.61
MCR-40	1.62	178.40	17.84	54.76
MCR-50	1.55	151.40	15.04	61.86

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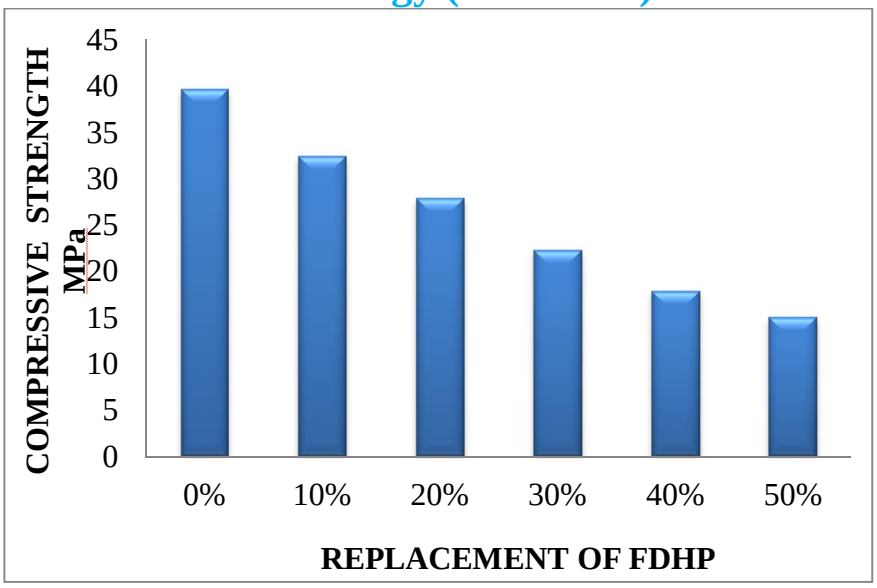

Fig 2 Compressive Strength of Self-Compacting FDHP Concrete at 28 Days

B. Split Tensile Strength

Table 8 Split Tensile Strength at 28 Days

Mix Identity	Mean Weight(kg)	Mean load at failure(KN)	Split Tensile Strength (MPa)	Reduction in strength (%)
MC-00	3.78	236.79	3.35	
MCR-10	3.59	234.67	3.32	0.89
MCR-20	3.28	231.14	3.27	2.3
MCR-30	2.93	219.83	3.11	7.16
MCR-40	2.54	204.93	2.9	13.43
MCR-50	2.43	192.26	2.72	18.80

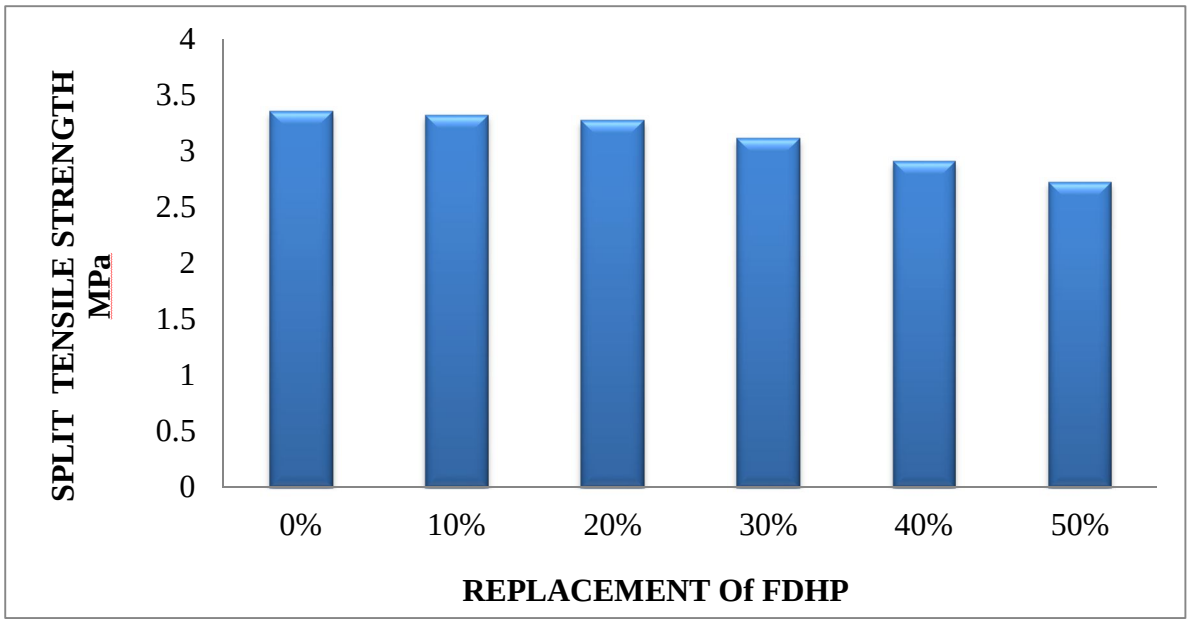

Fig 3 Split Tensile Strength of Self-Compacting FDHP Concrete at 28 Days

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C. Flexural Strength

Table 9 Flexural Strength at 28 Days

Mix Identity	Mean Weight(kg)	Mean load at failure(KN)	Flexural Strength (MPa)	Reduction in strength (%)
MC-00	12.05	11.2	5.6	
MCR-10	11.45	10.78	5.39	3.75
MCR-20	10.45	8.86	4.43	20.89
MCR-30	10.93	8.04	4.02	28.21
MCR-40	8.1	7.2	3.6	35.71
MCR-50	7.75	6.46	3.23	42.32

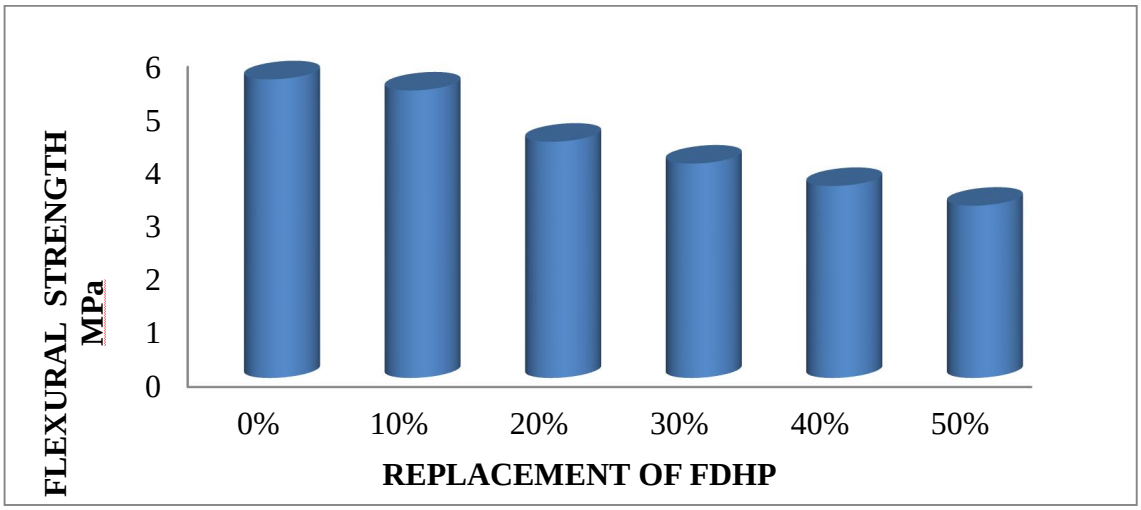

Fig 4 Flexural Strength of Self-Compacting FDHP Concrete at 28 Days

V. CONCLUSION

A. Compressive strength of self-compacting fuel dispenser hose pipe rubber concrete various from 39.54 MPa to 15.04 MPa at 28 days, for the replacement of 10% to 50%.Compressive strength of self-compacting fuel dispenser hose pipe rubber concrete for 10% replacement is 32.38 MPa which is close to the conventional SCC.

B. Split tensile strength of self-compacting fuel dispenser hose pipe rubber concrete various from 3.35 MPa to 2.72 MPa at 28 days, for the replacement of 10% to 50%.Split tensile strength of self-compacting fuel dispenser hose pipe rubber concrete for 30% is 3.11 MPa which is close to the conventional SCC.

C. Flexural strength of self-compacting fuel dispenser hose pipe rubber concrete various from 5.6 MPa to3.23MPa at 28 days , for the replacement of 10% to 50%.Flexural strength of self-compacting fuel dispenser hose pipe rubber concrete for 10% is 5.39 MPa which is close to the conventional SCC.

D. Hence, 10% of fuel dispenser hose pipe rubber in concrete is found to be optimum dosage for this project work.

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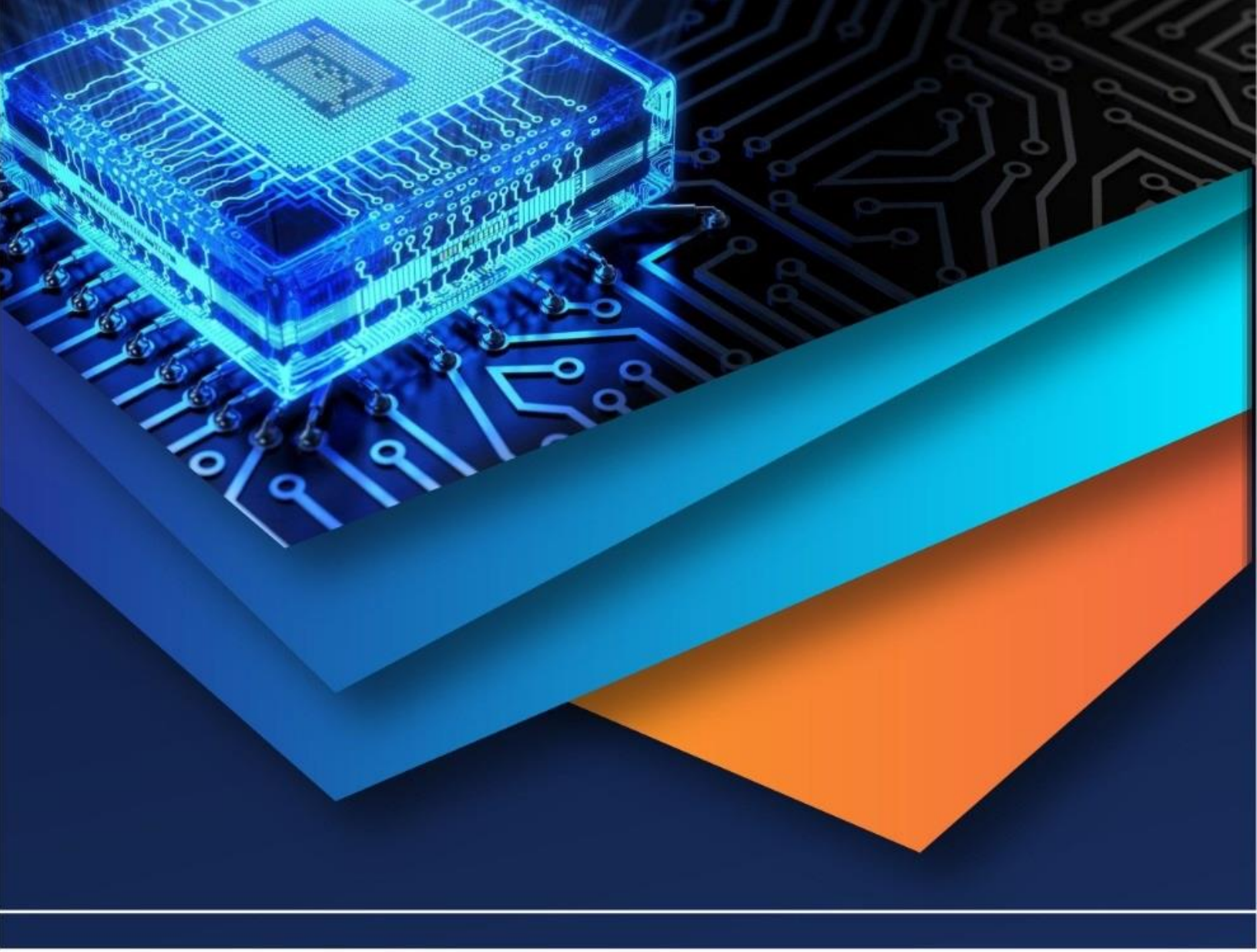

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