Experimental study of Partially Replacement of Hospital Waste to Fine Aggregate and adding Micro silica

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***Abstract*-- Disposal of used plastic as a major problem in the current era and the usage of plastic is growing day by day and it creates pollution.so effective ways to recycle and reuse of plastic are being formulated and reusing in concrete. The used plastic waste collected, cleaned and grains into smaller particles. The granules of plastic is less than 4.5mm in size the density is found to be 460kg/m³ and the specific gravity was 1.1.In addition to add micro silica in concrete. The mix were cube casted in 0%,13%(plastic +micro silica),26%,39%,52%,65%.that should be sand replaced with pulverized particles of plastic and micro silica respectively using M25 Grade of Concrete. The strength of the proposed concrete is found after 14days and 28 days by using compressive testing machine.**

I. INTRODUCTION

Silica Fume (SF) is also known as micro silica. It is an amorphous polymorph of silicon Concrete having the silica fume has high strength. This silica fume is react as an active pozzolan dioxide. SF composed of sub microns of silicon di oxide It is produced by arc furnaces as a by product waste of the production of metallic silicon or ferrosilicon alloys. SF incorporation could enhances the concrete basic properties in both the fresh and hardened states. It improves compressive strength, durability, depletion of cement alkalis, resistance to chloride and sulphate penetration

Solid waste is the waste arising from human and animal activities that is normally solid and is discarded as uses less or unwanted. According to World Bank Solid Waste Thematic Group, 1.3 billion tons per year of solid waste is being generated in world. This waste is likely to increase to 2.2 billion tons per year by 2025. **W**orld **H**ealth **O**rganization (WHO) states that more than 1.5 million people die annually due to poor solid waste management. Waste poses severe hazard to public health through blocking of drainage system, formation of standing ponds, and creating breeding grounds for mosquitoes and flies. This triggers malaria and cholera. In addition, because of lack of proper dumping sites, most of the collected waste ends up in open pits, ponds, rivers, dumping grounds, and agricultural lands. A part of this waste gets decomposed in the environment at dumpsites but non-biodegradable waste stays there for years.

significant portion of the total municipal solid waste (MSW). It is estimated that approximately 10 thousand tons per day (TPD) of plastics waste is generated i.e. 9% of 1.20 laces TPD of MSW in the country. The plastics waste constitutes two major category of plastics; (i) Thermoplastics and (ii) Thermoset plastics. Thermoplastics, constitutes 80% and thermoset constitutes approximately 20% of total post-consumer plastics waste generated in India. The Thermoplastics are recyclable plastics which include; Polyethylene Terephthalate (PET), Low Density Poly Ethylene (LDPE), Poly VinyalCholoride(PVC), High Density Poly Ethylene (HDPE), Polypropylene(PP), Polystyrene (PS) etc. However, thermoset plastics containsalkyd, epoxy, ester, melamine formaldehyde, phenolic formaldehyde, silicon,
Urea formaldehyde, polyurethane, metalized and multilayer plastics etc.

LITERATURE REVIEW

Al-Manasseh and Dalai, et al (1997)

In this work researcher is find the effect of plastic aggregate to use the concrete in plastic content. In this purpose they prepared 12 cubes of dimension also take 150×150 mm with water cement ratio varying percentage (0%, 10%, 30% and 40% 50%) of plastic and hospital waste collection.
He is used maximum 13 mm size of plastic aggregate. They find the results are (I) Bulk density of mixture reduced with gain in plastic substance so bulk density is low in conventional concrete

Elango and Ashok Kumar et al

In This they says about that replacement to fine aggregate for plastic waste replaced 10%,20%,30%,40% of replacement with the fine aggregate in concrete cubes(150mm x 150mm x 150mm)

Strength development modes of concrete With Silica Fume as fine aggregate for economic and environmental considerations plays as a vital role in advanced usage of now a days,it gives a durability, compressive strength in harden state and it development through long term hydration and pozolanic reaction.

Physical Properties of Hospital Plastic Waste

Physical State	Solid- Hazardous
Specific Gravity	1.04
Mean grain size (µm)	0.002-0.06
Colour	Whitish Grey
Odour	Odourless

Silica Fume

Silica Fume also known as condensed silica fume or micro silica is very fine, non-crystalline produced in electric arc furnaces as a by-product of the production of elemental silicon allows. The specific gravity ranges from 2.2 to 2.3. Silica

Physical Properties of Silica fume

Physical State	Solid- Non-Hazardous
Specific Gravity	2.23
Mean grain size (µm)	0.15
Colour	White
Odour	Odourless

Chemical Compostion of Silica Fume

Chemical Name	Ingredients percentage
Silicon dioxide (Sio_2)	85
Aluminium Oxide ($Al_2 O_3$)	1.12
Iron Oxide ($Fe_2 O_3$)	1.46
kCalcium Oxide (CaO)	0.2-0.8
Magnesium Oxide (MgO)	0.2-0.8
Sodium Oxide (Na_2 O)	0.5-1.2
Potassium Oxide (K_2 O)	0.5-1.2

Cement

Cement is a binder, a substance used in construction that sets and hardens and can bind other materials together. The most important types of cement are used in the components in the production of mortar in masonry and of concrete, which is a combination of cement and an aggregate to form strong building materials available in the world.

Water

Water is an important ingredient of precipitate in the chemical reactions with cement for produce a gel formation from hydration process. Water is one of the important elements in construction. It is required for preparation of mortar, is utilized in the hydration of cement to form the binding matrix in which the inert aggregates are held in suspension until the matrix is hardened and the remaining water serves as a lubricant between the fine and coarse aggregates and make concrete workable. The pH in surface water is 6.5 to 8.5 and the pH range for ground water is 6 - 8.5.

Coarse aggregate

Crushed angular coarse aggregate of 12-15 mm size were used. Crushed gravel stones obtained by crushing of gavel or hard stone are used as coarse aggregate. The maximum size of aggregates is generally limited to 12.5 mm. the aggregates serves as reinforcement to add strength to the overall composition. Aggregates are formed due to natural

Fine Aggregates

The fine aggregates used in natural sand. The sand is sieved to remove all pebbles. The sieve size used is 4.75mm. The grading should be uniform throughout the work. The moisture content or absorption characteristics must be closely monitored as quality of SCC will be sensitive to such changes.

Control Mix Design

The mix design properties were designed as per IS

Cement: Fine Aggregate(FA): Coarse Aggregate(CA)) From the mix percentage the weight of silica fume and hospital plastic waste required is tabulated and calculated.

Weight of material used

CEMENT (Kg/m^3)	FINE AGGREGATE (Kg/m^3)	COARSE AGGREGATE (Kg/m^3)	WATER (lit/m^3)
384	751.96	1127.95	192

Weights of cement, hospital waste and silica fume required

CEMENT	Replacement % of cement by Hospital waste and silica fume	(HW+ SF) (10 + 3) = 13%	(HW+ SF) 20 + 6) =26%	(HW+ SF) (30 + 9) =39%	(HW+ SF) (40 + 12) =52%	(HW+ SF) (50 + 15) =65%
	Hospital waste (kg/cube)	0.2	0.4	0.6	0.8	1
	silica fume (kg/cube)	0.06	0.12	0.18	0.24	0.30
	Cement (kg/cube)	1.900	1.900	1.900	1.900	1.900
	Sand(kg/cube)	1.74	1.48	1.22	0.96	0.7

EXPERIMENTAL PROCEDURE

Ordinary Portland cement(grade 43), conforming to IS:8112-2013 was used with properties, Fine aggregate with 4.75mm maximum size was used while the coarse aggregate had a 15mm nominal size. Fine aggregate should be sieved by 2.36mm.To casting a cube as per IS code in150mmX150mmX150mm size. To collected materials batched and weighed by mix proportions. Take quality of water as per the quantity and prepared a cubes foe 13%,26%,39%,45%,52%and 65%.the prepared cubes should taken for test after 14 days and 28 days.To test conducted by using compression testing machine and the values should be

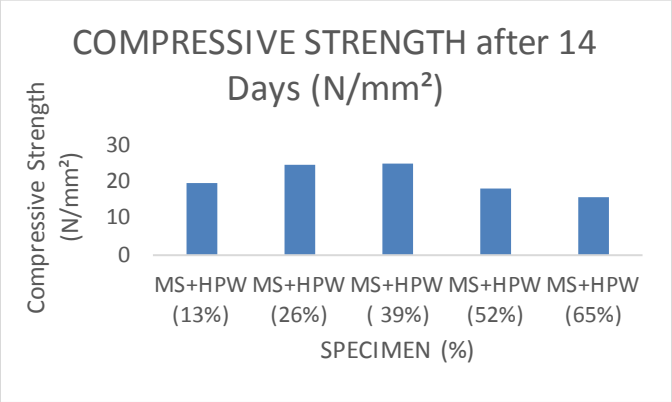
RESULT AND DISCUSSION

Compressive strength

A test result is the average of at-least three standard cured strength specimens made from the same concrete sample and tested at the same age. The dimensions of the cube are 150mm X 150 mm X 150 mm. At first, the cube mould is prepared by connecting it properly with nuts and bolts. Then, it is thoroughly applied with grease in all nuke and corner of the mould. Now the concrete made with partial replacement of sand by silica fume and hospital plastic waste is kept in three layers then the compaction or vibration are ignored. Finally leveling is done in the mould. It is allowed to set for 24 hours and then demoulded. The load was applied without shock and increased continuously at a rate of approximately 140 Kg/cm^2/min until the resistance of the specimen to the increased load broke down and no greater load could be sustained. It is done on curing of cubes after 7, 14 and 28 days. This process is repeated for the percentages 13%, 26%, 39%, 45%, 52% and 65%

Compressive testing of specimen

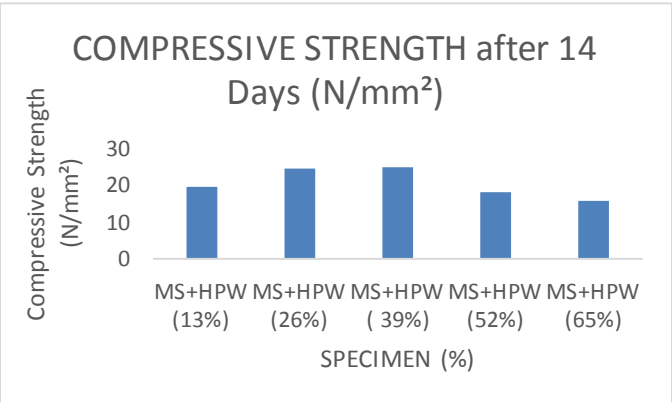
Fig.1. Compressive Strength of specimen after 14 days



Compressive strength of concrete (14 days)

S.NO	SPECIMEN	COMPRESSIVE STRENGTH (N/mm^2)
1	Conventional	22.87
2	(HPW+SF)13%	24.56
3	(HPW+SF)26%	24.42
4	(HPW+SF)39%	24.72
5	(HPW+SF)52%	18.02
6	(HPW+SF)65%	15.69

Fig.1. Compressive Strength of specimen after 28 days



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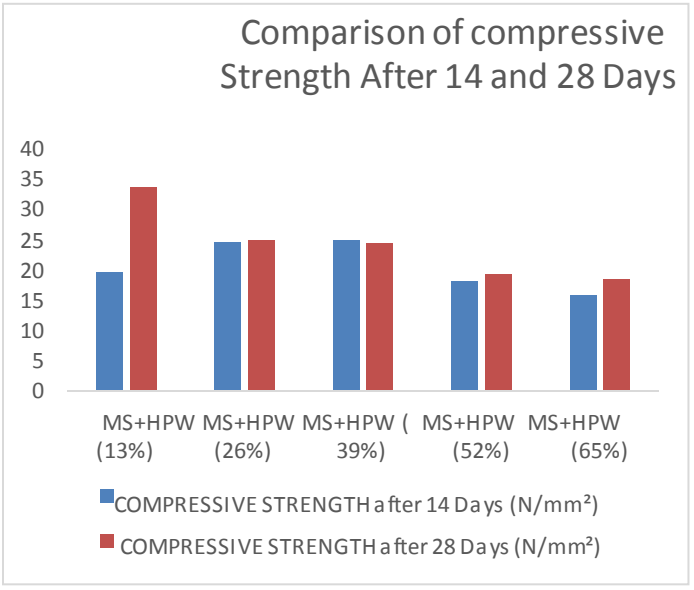
S.NO	SPECIMEN	COMPRESSIVE STRENGTH (N/mm^2)
1	Conventional	29.04
2	(HPW+SF)13%	33.51
3	(HPW+SF)26%	24.83
4	(HPW+SF)39%	24.32
5	(HPW+SF)52%	19.18
6	(HPW+SF)65%	18.02



RESULT AND DISCUSSION

After the compressive strength test of cubes the value should be calculated. The mix proportion of various percentages shows that the compressive strength of the concrete mixed with silica fume and hospital plastic waste shows high strength than the conventional concrete further strength is increased by incorporating various percentages of silica fume and hospital plastic waste.

The cube weight is decreased with increase in percentage of the amount of plastic material incorporated.It is seen that the decrease in weight is linear with increase in replacement.

The result will be increase in adding percentage of Hospital plastic waste and Micro silica. The compressive strength should be increase in gradually and finally decrease in certain stage like decrease in 52% and 65%.

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