Determination of strength characteristics of concrete by partial replacement of aggregates with e waste and hdpe granules

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Abstract

E-waste is the challenge every nation is currently grappling with. Since e-waste is not portable and the rise in electronic product use is expanding this issue. This problem is increasing. Deposits are the most efficient form of recycling, and this process requires a broad land area that is problematic to reach . But concept of selective replacement of aggregates using e-waste as an element of concrete. We cannot replace it completely as aggregate provides some key properties to concrete like strength, durability and workability. Using e-waste as building material seems right when we look at the amount of aggregate required for making concrete and if we are able to reduce that amount it will be very beneficiary as it reduces the load from the natural resources. In this work we did the usage of E-waste for field add-ons in the concrete mix M20 separately and then we measured the level of stress, flexure intensity and tensile resistance at the percentage of E-waste with coarse aggregates from 0%, 3%, 7.5%, 12% and 15% respectively the results shows increase in compressive strength and thendecrees in flexure strength which gives light weight of concrete.We use HDPE separately, including Fine aggregates in the M20 concrete mix, as opposed to the compression intensity, flexure resistance & Split tensile force measurements for HDPE percentage and fine aggregates. From 5%, 7.5%, 10%, 12.5% and 15% respectively the results shows increase in compressive strength and then decrease in flexure strength which gives light weight of concrete as well.But as per our topic it is clear that we have to use both e-waste and hdpe simultaneously. We make a mix of concrete M20 in which we use the same percentage of Ewaste in coarse aggregates and HDPE as a fine aggregates and same tests and results shows that use of both simultaneously increases the strength of M20 concrete up to 60%.Waste usage is an effective disposal since the utilization of waste content lowers the expense of concrete in residential construction. Limited substitution of RCA by E waste relative to standard concrete to achieve mechanical characteristics and chemical properties (corrosion and alkaline attack) (compressed and bending resistance). Electronic waste is an increasing threat causing severe contamination and human issues. Removal of this is a challenging problem. E-waste is perceived to be the most feasible method for the processing of significant amounts of e-waste products in the concrete field. Owing to rising prices of ordinary rough aggregates, civil engineers were compelled to consider appropriate alternatives. For coarse aggregates, e-waste is used as one such substitute. Because of the scarcity of the rough compound for concrete preparation, a partial substitution of e-waste was attempted with the rough compound.The findings of the study have shown that in E-waste concrete major gains were made in compressive strength comparison with normal concrete. The recovery of E-pollution eliminates pollution and saves energy.The fresh concrete was tested for slump test, while the hardened concrete

for compressive strength. The inclusion of concrete of new plastic granules contributed to the creation of low weight concrete. The findings were noticed. In this research, Virgin plastic granules have been used as a partial substitute of natural coarse concrete aggregates (NCA). The amounts planned for new plastic granules ranged from 0% to 15%. The compressive strength of each sample was determined and compared with conventional concrete mix. The use of Plastic in concrete mix for a given w/c ratio, reduces the tensile and Compressive strength and also lower the density.

Keywords- E-waste, coarse aggregates, compressive strength,flexure strength & Split tensile,building material

I. INTRODUCTION

Electronics waste could be understand as a destructionproduced by rejected or damage electronic devices. It is a new concern which can create severe environmental issues because electronic waste can hardly be easily disposed of without doing harm to the ecosystem. The traditional method of e-waste disposal is to dump waste in landfills, but this method has many serious problems because it requires a lot of rare lands in our country and also contains many different hazardous materials such as lead, cadmium, beryllium, etc. These substances can pollute the soil when mixed with the soil, and contaminate the soil when mixed with groundwater, which is also very harmful to anyone, and if one consumes this water, this may trigger severe health issues and can also reverse them in certain situations cause cancer. In India, we produced around 15 million tons of e-waste, and by 2018, this number will reach 30 million tons, 3% of the e-waste generated has been properly decomposed, and the rest is decomposed by waste. Young sellers who do not worry about the harmful effects of e-waste

1.1 Aggregates

It is a granular rocky material made up of a sequence of < 0.10 mm to > 50.00 mm in thickness. Granular content such as sand, rubble, moved dirt, hydraulic concrete pellets or slag are aggregates that are used to manufacture concrete or slurry in hydraulic cemented media. Crude and fine aggregate forms are included. Increasing category type depends on its scale and is classified into many forms of classifications. When the aggregates are mixed with cement or bonding materials, it is called bonding material, and when cement or bonding materials are not used, it is called non-aggregate. Aggregates are typically produced by natural rocks splitting. Thecompound’s composition depends on the molten, sedimentary or metamorphic source material. In order to assess the appropriateness for specific purposes, complete evaluations are analyzed. Metallurgy, particle size, texture, and rock features of rock samples can also be used to evaluate applicability.

Figure 1 Aggregate

For Coarse Aggregates in Roads following properties are desirable:
Strength
Hardness
Toughness
Durability
Shape of aggregates

Adhesion with bitumen

1.2 Fine Aggregate

Another form of conglomerate is one that passes through a 9.5mm (3/8 ") sieve, passes almost entirely through a 4.75mm sieve (No. 4), and remains mainly on a 75 ونm screen (No. 200) sum. In order to improve workability and achieve economy by reducing the amount of cement, good aggregate must have a circular form. The exact assembly is calculated by filling the vacuums in the ground community and using it as a process able device. Aggregate properties have an effect on the final concrete. For example, changes in size, grade, texture, shape, and assembly strength mean changes in the properties of the resulting concrete. See also: Impact of aggregate properties on concrete.

1.3 Classification of aggregates

Generally, the coarse aggregate size is greater than 4.75 mm, and the good aggregate size is smaller than 4.75 mm. In most structural applications, the maximum volume is a maximum of 40 mm for coarse aggregate, while for large amounts of concrete such as dams, the maximum size is 150 mm. On the other hand, the maximum particle size of the fine aggregate was 0.075 mm.Figure 2 shows a typical particle size analysis for coarse and thin aggregates.

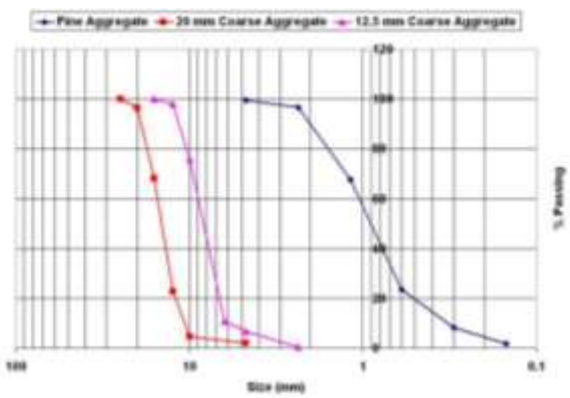

Figure 2. Sieve analysis of Particle for size distribution of aggregates

1.3 E-Waste

It is the waste produced by the electronic disposal. It is an ongoing problem which causes serious environmental issues, as e-waste cannot be disposed efficiently without harming the environment. The conventional form of e-waste management is dumping waste into land fill but this method has so many serious problems as it needs a lot of landmass which is in scarcity in our country and it also contains so many different harmful materials like lead, cadmium, beryllium etc. these materials when mixes with soil they contaminate the soil and when mixes with ground water they contaminated it also makes it very harmful to consume by any anyone and if someone consume this water it with cause serious health issues and in some cases it even cause cancer. In India we generate about 15 million metric tons of e-waste and this number is going to 30 million metric tons by the year 2018 and still 3% of the e-waste generated in is decomposed properly and the rest of it is decomposed by the small peddlers who will not concern the harmful effects of the e-waste.

1.4 High-Density Polyethylene (HDPE)

High-density polyethylene (HDPE) is a thermoplastic polymer produced from ethylene monomer. When used in HDPE pipes, it is sometimes called "alkane" or "polyethylene". HDPE has high strength to density and can be used to produce plastic bottles, wear-resistant tubes, geomembrane and plastic wood. HDPE is usually recyclable and the resin identification number is "2".

Figure 3 HDPE sample size

HDPE's high density-to-density ratio is known. The density range is between 930 and 970 kg / m3. Although HDPE is significantly higher than HDPE, HDPE has no branching that enhances the power between particles and the tensile strength relative to LDPE. It is more complex, cleaner and immune to higher temperatures (120 degrees Celsius / 248 degrees F short-term). Unlike polypropylene, HDPE is not able to withstand the normally required autoclave conditions. By choosing the correct catalyst (for example, the Ziegler-Natta catalyst) and reaction conditions, it can be ensured that no bifurcation exists.

1.4.1 HDPE and Different Solvents.

Depending on the training procedure used to build a specific sample, the physical properties of HDPE can differ. In certain cases, a globally validated evaluation system is the deciding factor for evaluating such characteristics of a complex procedure. For instance, a static tensile test (NCTL) is used in the rotational modulation to evaluate the resistance of an environmentally stressing sample crack.

1.4.2 The Process of Making HDPE

HDPE is manufactured under controlled conditions through the use of a large amount of heat on petroleum. This process is also called "cracking" and helps produce ethylene gas. During the production process, the gas molecules will stick to form the polymers and then form the polyethylene. After this process, the polyethylene will have adhesive appearance, but after a series of mold processing, it will become granular. After the molding process is complete, you will get a strong polymer material that can be used for many purposes and applications in your home or factory.

1.4.3 HDPE Uses and Applications

Since HDPE is a universal material, it has many uses. Most notably, it is used to fill bottles. Because of its durable structure and recycling, it is one of the most popular materials for liquid containers. It is also used to contain hazardous materials and agricultural chemicals. HDPE can be made in durable furniture. HDPE also has important uses and applications in commercial building design. Because of its chemical properties, HDPE materials are resistant to heat, moisture, scratches and scratches. This makes it an ideal material for garden furniture, commercial lockers and commercial bathroom partitions.

Regular polyethylene has a high density with moderate crystallinity and a high rate with melting. Linear polyethylene is stronger and more tensile than ramified polyethylene. It is used in tubes, house wares, games, pipes and separation of wire and cables. Properties the following explains the properties of HDPE since LDPE yarn or fibers are seldom requested:

Table 1 properties of hdpe

characteristic	unit	value
Specific gravity	g/cm^2	0.960
Range of temp	^{0}C	-30 to +95
Melting temp	^{0}C	130
Tensile strength	cN/tex	50
Elongation at break	%	25
Shrink at 100 c	%	5
seltextinguishing		optional

Benefits HDPE's good UV resistance does not cause any problem in hot weather.
HDPE has outstanding strength and does not impact damp or dry situations. HDPE has outstanding strength. It is suitable for fast drying compared to natural yarn and fibers.
HDPE is both sexy and simple to care for.
For horse, plant etc. HDPE is easier to use. No breaks, no strings torn, no jagged boundaries.
Colorful quick drying low Static thermal bonding, solid, dry hand (transportation moisture from the skin) very pleasant and lightweight thanks to Polyolefin Origin capable to provide good mass and paint, abrasion-resistant to chemical deteriorations, mildew, sugaring, rotting, stain, soil and weather conditions.

III.RESEARCH BACKGROUND

[1] Akram et al. (2015) published a paper “E-waste management by utilization of E-plastics in concrete mixture as coarse aggregate replacement” they focused mainly Coarse aggregate replacement, Durability, E-waste, management, Strength. This research reflects on the usage of plastic e-waste in concrete and explores the possibility of the partial substitute of coarse aggregates using shredded e-plastic particles.

[2] Ahirwar et al. (2016) The primary object of this research is to examine the improvement in mechanical properties of concrete by applying electronic waste to concrete. The usage of electrical waste aggregates contributes to low weight concrete construction. In this study report, the coarse compound is partly substituted for E-waste from 0 to 30%; 10 percent, 20 and 30 percent of fly ash are also applied to this mixture with the partial substitution of cement. The usage of this technological waste in concrete is thus recommended to reduce the need for standard coarse and fine aggregates and thereby to conserve the natural capital.

[3] Singh and Malviya (2009) publish a paper called "Experimental Analysis of Part of Partial Replacement of Aggregate by electronic waste for flexible flooring." In India, the majority of the highways are bituminous surface pavements. Symptoms of distressed including splitting, rutting and so on are gradually attributed to the intense traffic, filling cars and major shifts in everyday and seasonal pavement temperature in earlier stages. Work has shown that modifications can be used to boost the rheological properties of bitumen and bituminous blends and render them more appropriate for road building.

[4] Balaji et al. (2019) published an article "Experimental study on waste plastics disposal. In this investigation, the specifications of concrete composed of plastic HDPE granules and crushed river sand waste glass were examined separately. Including concrete plastic displayed a reduction in strength and concrete comprising glass demonstrates a rise in strength as the proportion of the components decreases. Then the optimum crushed glass combination was determined dependent on concrete intensity. Then, the new mixing amounts (S80G15P5, S75G15P10, S80G15P15 and S65G15P20) include both plastic and glass. The only finely substituted plastic derived results were higher than the only fine aggregate.

[5] In this article, India faces a big challenge to dispose of waste in sites all over the world, Zarbade et al. (2015). This research paper provides an overview of post-effects of the usage of reclaimed complete waste, e-waste, and cocoon shells as additional content in cement blends for use by host companies to maintain the highest mechanical consistency in the corresponding cement. Concrete blends comprising different surplus material and critical qualities were set, such as friction intensity and water preservation or water absorption, and a control mixture remained resolved and contrasted.

[6] Proposed in this paper by Xavier, Parappattu (2016), the disposal of used plastics is a major challenge facing the world of our time. Plastics are seen more and more every day. It is very harmful to the atmosphere owing to the poor biodegradability of plastics. Partial replacement in the M30 grade of concrete comprising steel and polypropylene fasters by recycled plastic granules, 8% and 12%, is done in the study. The steel fibers were applied by concrete volume at 0.5 %, 1% and 1.5%. The research found different percentages of steel and polypropylene, 70:30, 75:25 and 80:20. After 7 days and 28 days of water therapy, the compressive, broken tensile and bend intensity are calculated.

[7] Shinu&Needhidasan(2019) proposed in this paper, Electronic waste or E-waste is considered as the most dangerous among the wastes generated in the modern digital world. Due to the unending growth of these electronic wastes the drinking waters are getting polluted and our ecosystem is getting worstly affected all around the world. The present environmental problems can be minimized to a certain extent by utilizing these electronic waste materials in the construction industry

[10] Manjunath (2016) proposed for this e-waste paper demonstrates a specific solution to environmental and economic issues in the usage of e-plastic waste goods. By utilizing E plastic waste, the overall costs are high and infrastructure and roads have strong energy. It reduces waste management costs and saves electricity.

[8] This paper proposes Prashant& Kumar (2019) concrete, common building material, due to its plastic mouldability and its solidity being strong and highly compressible content. About 70% of the concrete volume consists of aggregates, which not only provide the concrete mix with weight, but also carry on substantial loads. Aggregate characteristics play a significant part in determining the attributes of the substance manufactured from it. It mentions an experimental test to research the effectiveness of e-waste to remove the coarse aggregates partly. The electrical or electronic disposals discarded are e-waste. M30 blend was formulated with 10, 15 and 20 percent of the substitute rates checked. Slump tests and compressive force tests shall be performed and recorded in this paper for each replacement stage. One efficient approach to reduce E-waste is by the usage of electrical waste in concrete, which will then rest on locations and cause environmental problems.

[9] As indicated in this article, wastes are used in concrete outputs such as fly ash and silicium, etc. from other factories, Rathore&Rawat (2019).The paperexamines the impact of E-waste as a partial substitute for gross aggregates in a concrete mixture.In fact it is not practical or desirable for the building industry to substitute any e-waste scale with more than 15%. Thus, this study indicates that the substance of E-waste may be used as a partial remedy for the variations of cough of up to 15%. The issue of waste management should be addressed and ultimately leads to environmental emissions from e-waste products.

[10] The aim of this research is to analyze the durability testing of binary blended self-compacting (SCC) cement with electronic material waste replacement effect, namely high impact polystyrene grain (HIPS) granules in partial sand, as suggested in this paper by Chunchu&Putta (2019). In this analysis the cement is replaced by pozzolanic fly ash material with a binder content of 497 kg / m3 and an agreed water / binder ratio of 0.36 for all SCC blends. For the 28 and 90 day curing cycles of SCC-produced HIPS specimens (0% – 40 percent of sand-replacement replacement) toughness characteristics such as porosity, water absorption and surprise are predicted.

[11] Sabău& Vargas (2019), suggested in this article, has greatly increased the amount of waste produced by human operation by the exponential rise in population growth levels in the world and the present consumer lifestyle. Especially because of its difficult degradation process, e-plastic waste causes significant environmental damage. This paper aims to identify the feasibility of partial replacement of gross mineral aggregates with e-plastic material from concrete. Tests on concrete mixes of 40, 50% and 60% of plastic e- waste were carried out for fresh and hardened properties in a control mix without e-plastic waste designed to achieve a pumping strength of 21 MPa.

[12] The mechanical and chloride properties of fine, coarse-aggregate concrete substituted partially by high density polyethylene (HDPE) waste is examined by Shanmugapriya& Helen (2017). Totally six separate M25-grade concrete mixtures, with a partial fine aggregate replacement, is built by 5.0 %, 15.0 %, and coarse aggregates by 10%, 15%, 20% and HDP waste.

[13] Kibria et al (2017), this research reports on experimental investigations of polystyrene polymer. The use of polystyrene polymer is increasing day by day with economic growth. However, this polystyrene polymer is not decomposed and causes a serious environmental problem by increasing as a solid waste.

[14]Kumar et al. (2017), In this research work, waste flex is added to the concrete blend by producing very small parts about a certain proportion of cement in the mixture. This eliminates the issue of waste management and thus eliminates the expense of concrete more by utilizing waste materials. They took three% of the flex in the concrete blend, i.e. 0 .75%, 1% and 1.5% by cement weight. The concrete blend for the study is M-25. This research provides a comparative analysis of the compressive intensity of concrete cubes comprising standard concrete flex with a single construction combination between 7 and 28 days' treatment of the cubes. The analysis showed that the compression strength of the regular concrete measured after curing the Cubes was improved by 1 percent by the weight of the concrete and by the same amount at two percent by the other compression factor.

[15] Gibreil& Feng (2017), which investigates on HDPE (high-density polyethylene) as well crumb rubber powder (CRP). Unchanged and adjusted asphalt was used to calculate surface characteristics, density, softening points and ductility for a range of products of HDPE and CRP. Marshall Flow and steadiness were also conducted, including the Marshall Quotient, humidity response, and routing checking. The findings revealed that the physical properties of asphalt and Marshall Properties of HMA mixtures are enhanced with HDPE and CRP as additive. The resistance to humidity harm after introducing HDPE and CRP dramatically improved along with the resistance to permanent deformation.

IV.MATERIALS AND METHODS

4.1 Materials

4.1.1 Cement

Ordinary Portland limestone cement was used for casting the cubes and beams for all the concrete mixes. The cement was of uniform grey color, and bought from a local vendor. In this research we use Ordinary Portland Cement (OPC) of 43 grade of brand Ambuja Cements form single batch through the investigation was used.

Table 2 Oxides composition of Portland limestone cement (Sam et al., 2013)

Concentration of oxides (% weight)			
OXIDS	**CEM A**	**CEM B**	**CEM C**
CaO	**61.74 ± 0.4**	**62.19 ± 0.4**	**57.37 ± 0.3**
SiO2	**18.77 ± 0.6**	**21.90 ± 0.6**	**21.69 ± 0.2**
Al203	**5.41 ± 0.2**	**2.50 ± 0.9**	**6.40 ± 0.2**

Fe2O3	**3.01 ± 0.1**	**2.92 ± 0.3**	**3.10 ± 0.1**
S03	**3.89 ± 0.6**	**4.03 ± 0.1**	**4.0 5± 0.1**
MgO	**3.13 ± 0.4**	**2.23 ± 0.1**	**3.34 ± 0.1**

4.1.1.1Tests on Cement

Normal Consistency

This test determines the quantity of water required to produce a cement paste of standard consistency for the use in other test. The Vicat'sapparatus (IS: 5513-1976) is used for this purpose. The consistency of standard cement paste is defined as that consistency which will permit the Vicat's plunger 50mm long and having the bottom of the Vicat'smould.

Apparatus.

Vicat's apparatus with mould, Plunger, Balance, Measuring cylinder, Non-porous plate.

4.1.1.2Procedure

• Prepare a pastas of weighed cement consistency with a weighted quantity of drinking water (during not less than 3 minutes and no longer than 5 minutes)

• Remember time to calculate from the moment the water is applied to dry cement before the mold is full.

• Gently apply a paste to the Vicat's mold and bring it down to the tip of the container.

Place the test block and the mould together with a non-porous resting plate under the plunger

Lower the plunger gently to touch the surface of test block and quickly release, allowing it to sink into the paste.

Prepare trial pastes with various % of water and carry out tests as above until the amount of water necessary for penetration of the Vicat's plunger to 5mm to 7mm from the bottom is determined.

Results and Discussion

The concrete mixes with a characteristic compressive force of 20 Map were prepared in conjunction with IS 10262. Concert mixtures have been designed to substitute the thin sum (5%, 7.5%, 10%, 12.5% & 15%) and the field (0%, 3%, 7.5%, 12%&15%) with a hard disk (HDPE, 3%). e-waste. In Table 3, a traditional concrete mixing technique was developed and the water cement ratio was constant to 0:42, a detailed mix proportion of the mix is given by M20 Mix.

Table 3 Details of mix proportion.

Mix Designation	**Quantity in kg/m3**				
	Cement Fine Aggregate		**Coarse Aggregate**	**% of HDPE**	**% of E-waste**
1	**315**	**847.6**	**1285.5**	**5**	**0**
2	**315**	**805.2**	**1285.5**	**7.5**	**3**
3	**315**	**762.8**	**1285.5**	**10**	**7.5**
4	**315**	**722.3**	**1285.5**	**12.5**	**12**
5	**315**	**847.6**	**1156.86**	**15**	**15**

4.1.2Fresh Slump Test

The slum test was carried on fresh concrete which contains mixture of both E-waste and HDPE. The results are as following.

Table 4 Slum result of fresh concrete using E-waste and HDPE.

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Sr. No	Slump cone Designation	% of E-waste	% of HDPE	Slump Value Slum Value
1	S1	0	5	70
2	S2	3	7.5	65
3	S3	7.5	10	45
4	S4	12	12.5	40
5	S5	15	15	30

With the growing waste-plastic ratio, slumps are likely to decrease sharply due to added waste-plastic fibers which block flow and decrease the workability of concrete.

V.TESTS

5.*1 Compressive strength using HDPE as fine aggregates*

The compressive intensity results in a transition in the concrete mix with a disparity in the HDPE weight. The test results revealed that for 7 days compressive intensity in mixes of 5 percent, 7.5 per cent, 12.5 per cent, and 15 percent HDPE sand substitution respectively were observed of 71.2 per cent, 69.6 and 67.5 per cent of its 28 days intensity. With the rise in sand replacement rate, the values were reduced. Whereas, in the case of coarse aggregate substitution 78, 3% of mixes, 72, 8% for mixes, 73, 0% for 0 percent, 3%, 7, 5%, 12 and 15% for e-waste substitution have been observed. Related observations were produced on 14 days, which revealed tests of compressive intensity levels between 80.1 percent and 85.7 percent in the 28 days. The compressive power of 28 days of mixtures of 112.5% sand replacement and 15% coarse aggregate substitution indicates similar results to the traditional product cement mixture. Since the lack of crushing power is increased for the HDPE, the unit weight of the cement blends can be decreased as the amount of HDPE is limited. The reduced force between the paste and the plastic surface and the hydrophobic nature of the plastic can also be ascribed to the low hydration of the cement, where the movement of water can be restricted.

Table 5 Compressive strength of concrete using HPDE.

S. No	Cube Designation	Compressive Strength (N/mm2)			% Age of HDPE
		7 Days	14 Days	28 Days	
1	CC	23	27.8	35.00	5
2	F1	21	25.00	31.00	7.5
3	F2	24.2	26.8	35.01	10
4	F3	18.9	24.00	28.25	12.5
5	C1	22.9	25.00	30.25	15

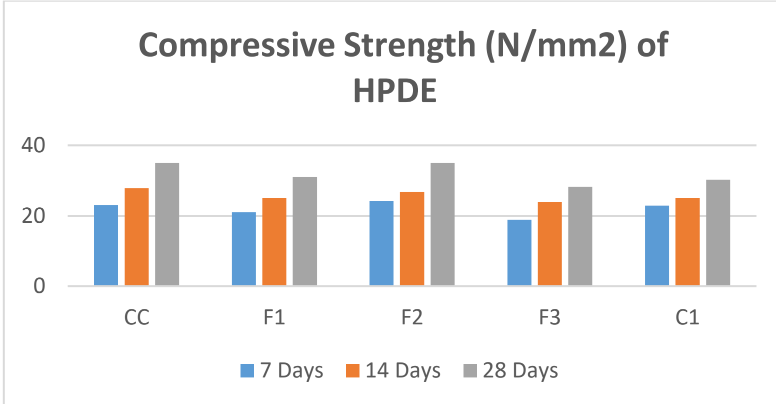

Figure 3 Compressive strength results HPDE of the concrete mixes.

5.2 Compressive strength using e-waste as coarse aggregates

The compressive power of standard concrete as well as concrete with electronic-waste at 7 days, 14 days and 28days are given in table6 below. It can be clearly seen that the strength of the concrete will increase up to 17.8% when 7.5% aggregate is replaced by e-waste after 28 days. But when we further increase the percentage of e-waste the strength of concrete starts decreasing.

Table 6 Result of Compressive Strength

S. No	Cube Designation	Compressive Strength (N/mm2)			% Age of E-waste
		7 Days	14 Days	28 Days	
1	A1	17.77	23.09	28.80	0
2	A2	19.11	26.06	33.33	3
3	A3	20.44	28.09	35.11	7.5
4	A4	18.66	23.09	28.08	12
5	A5	16.35	20.89	24.24	15

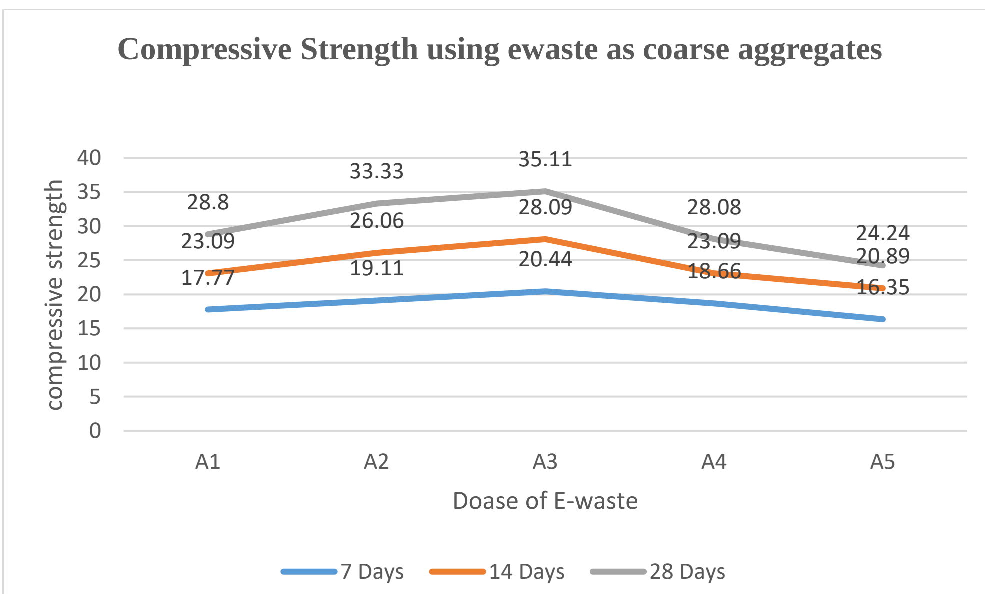

Figure 4 Graph showing Compressive Strength using e-waste as coarse aggregates

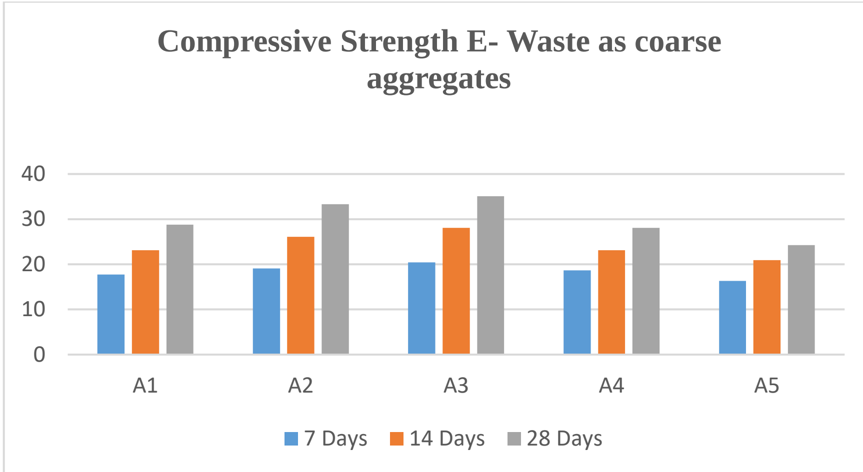

Figure 5 Compressive Strength using e-waste as coarse aggregates

As find from above graph and table5 the compressive strength adding an E-waste as coarse aggregate found at highest compressive strength of 35.11 N/m2 at the e-waste mixing of 7.5. This is the optimized value when the Compressive Strength find high.

5.3 Compressive Strength (N/MM2) of concrete using E-waste as coarse aggregate and HDPE as fine aggregate

Table 7 Compressive Strength (N/MM2) of concrete using E-waste as coarse aggregate and HDPE as fine aggregate

S. No	**Cube Designation**	**% Of e-WASTE**	**% OF hdpe**	**Compressive_Strength (N/mm2)**		
				7 Days	**14 Days**	**28 Days**
1	**M1**	**0**	**5**	**18.9**	**19.98**	**21.08**
2	**M2**	**3**	**7.5**	**19.9**	**22.5**	**23.9**
3	**M3**	**7.5**	**10**	**21.5**	**23.0**	**26.3**
4	**M4**	**12**	**12.5**	**22.3**	**24.0**	**26.7**
5	**M5**	**15**	**15**	**17.0**	**19.99**	**23.8**

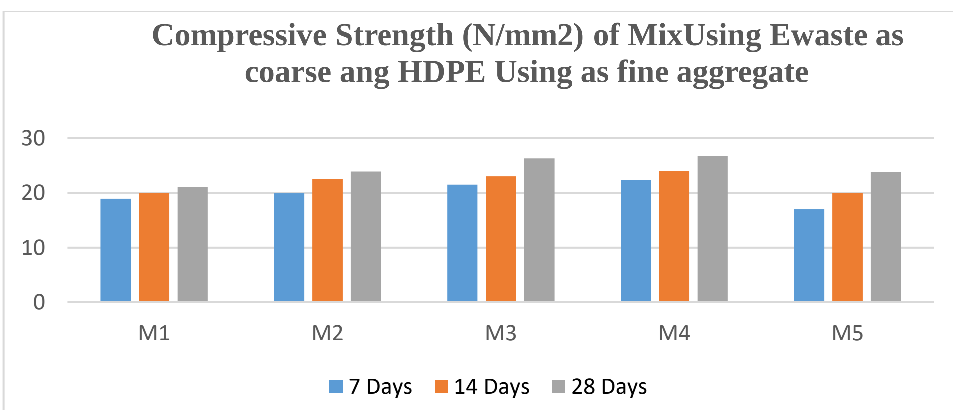

Figure 6 Compressive Strength (N/mm2) of Mix Using Ewaste as coarse and HDPE Using as fine aggregate

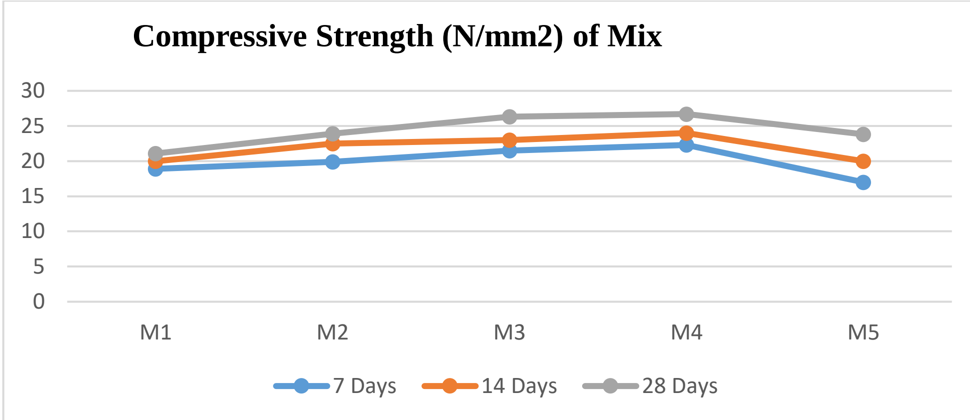

Figure 7 Graph Compressive Strength (N/mm2) of Mix Using Ewaste as course and HDPE Using as fine aggregate

As find from above graph and table the compressive strength adding an E-waste and HPDE found at highest compressive strength of 26.7 N/m2 at the e-waste mixing of 12 of E-Waste and 12.5 of HDPE. This is the optimized value when the Compressive Strength find high.

5.4 Split tensile strength using HDPE

The change of tensile strength at 28 days of curing is shown below in the concrete mixes' division of strength. Tests show 7-14-day findings higher than normal cement mixtures, growing with the ductile property of HDPE wastes.

Due to the free water accessible on plastically surfaces, the decrease in the divided tensile strength of the cement mix with an improvement in HDPE waste volume is primarily due to a weaker relation between the flatter plastic surfaces and cement paste.

Table 8 Split tensile strength of concrete using HDPE and fine aggregate

S. No	Cube Designation	% OF hdpe	Split Tensile (N/mm2)		
			7 Days	14 Days	28 Days
1	CC	5	1.28	2.75	3.33
2	F1	7.5	1.28	1.80	2.40
3	F2	10	2.02	2.65	3.28
4	F3	12.5	1.88	2.38	2.90
5	C1	15	1.35	2.01	2.50

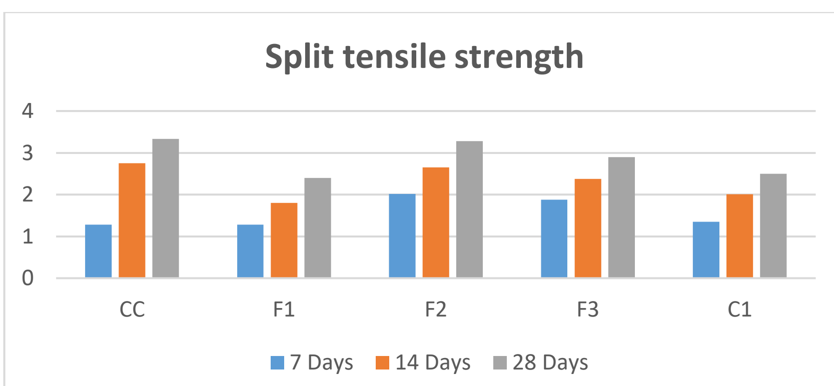

Figure 8 Split tensile strength of HDPE

5.5 Split tensile strength using E-Waste

Table8 above showed the results of the split tensile strength. The study was done with a 7, 14 and 28 day age compressive concrete power. The cubes have been checked with a 2000KN compression check unit. From the figure8 above, 10% of the substitution of gross aggregate by E- waste in concrete shows the highest split tensile power.

Table 9 Split tensile strength using e-Waste AS course Aggregate

S. No	Cube Designation	% OD e-WASTE	Split Tensile (N/mm2)		
			7 Days	14 Days	28 Days
1	EW0	0	2.10	2.72	3.65
2	EW5	3	2.62	3.28	3.69
3	EW10	7.5	3.10	3.52	3.99
4	EW15	12	2.78	3.28	3.61
5	EW20	15	2.65	2.82	3.05

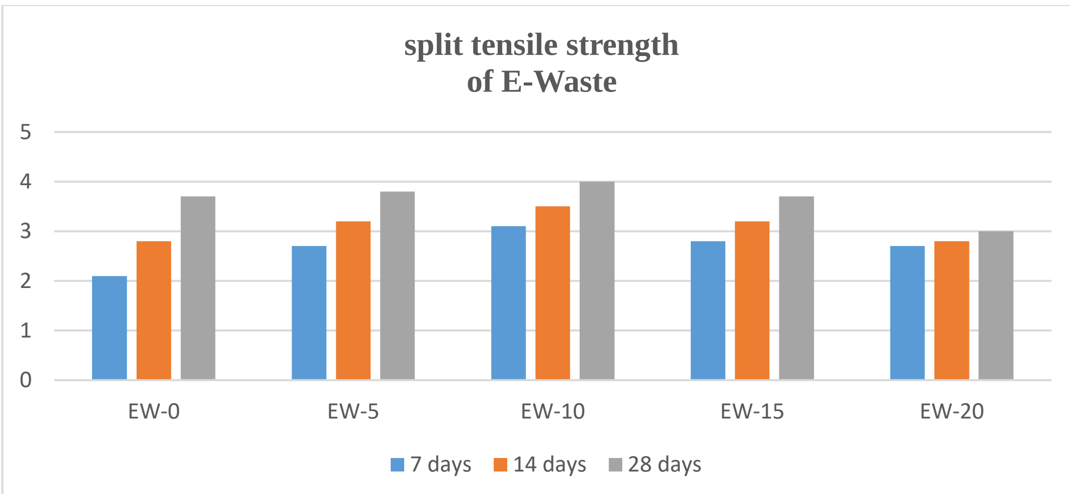

Figure 9 Effect of E-waste on split tensile strength using E-waste as coarse aggregate

5.6 Split Tensile strength of concrete using E-waste as course aggregate and HDPE as fine aggregate

Table 10 Split Tensile strength of concrete using E-waste as course aggregate and HDPE as fine aggregate

S. No	Cube Designation	% OD e-WASTE	% OF hdpe	Split Tensile (N/mm2)		
				7 Days	14 Days	28 Days
1	M1	0	5	2.2	2.3	2.4
2	M2	3	7.5	2.4	2.6	2.7
3	M3	7.5	10	2.8	2.7	2.8
4	M4	12	12.5	3.1	3.2	3.4
5	M5	15	15	3.5	3.6	3.7

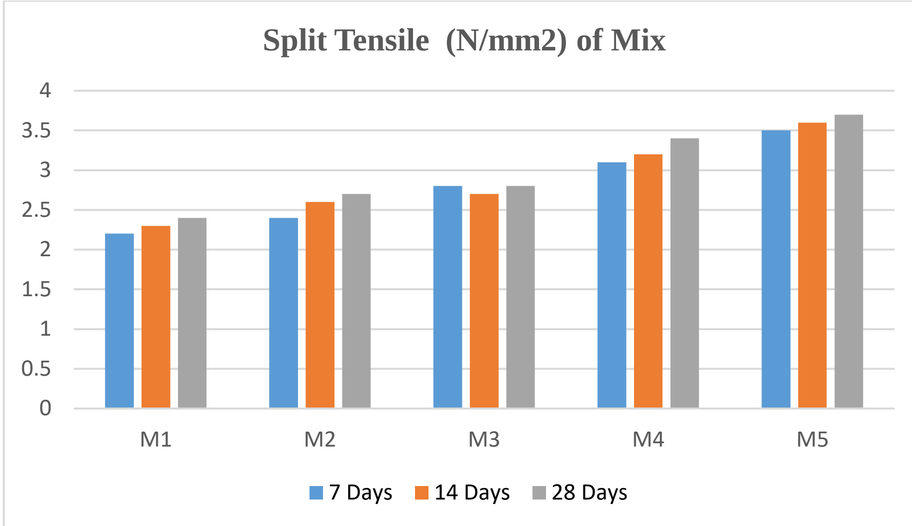

Figure 10 showing Split Tensile strength of concrete using E-waste as course aggregate and HDPE as fine aggregate

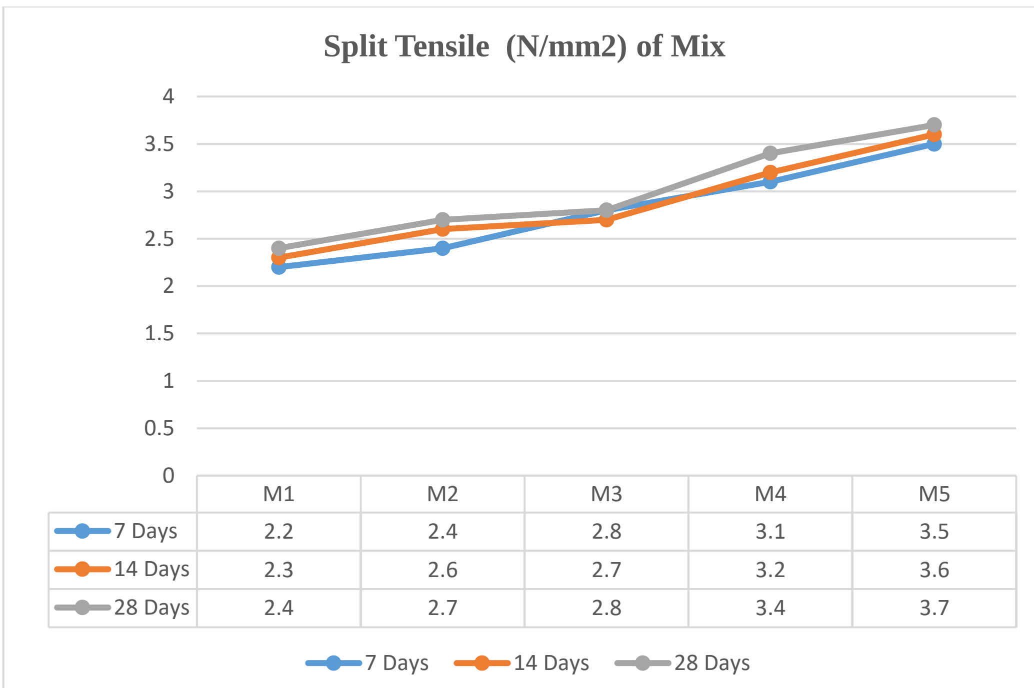

Figure 11 Split Tensile strength of concrete using E-waste as coerce aggregate and HDPE as fine aggregate

As find from above graph and table 10 the Split Tensile strength adding an E-waste and HPDE found at highest compressive strength of 3.7N/m2 at the e-waste mixing of 15 of E-Waste and 15 of HDPE. This is the optimized value when the Compressive Strength find high.

5.7 Flexural Strength Using HDPE

The variation of concrete bending strength at the age of 7, 14 and 28 days. From the test results, it was found that mixtures of partial aggregate replacement by HDPE waste had a higher bending power than standard concrete mixtures, regardless of volume and age of replacement. For mixtures of 10% sand replacement (6.14 MPa) and 15% coarse aggregate substitution (6.34 MPa) relative to the traditional concrete mix (3.86 MPa), the average flexural intensity has been found to be 28 days.

Table 11 Flexural Strength of concrete using HDPE and fine aggregate

S. No	Cube Designation	% OF hdpe	Flexural Tensile (N/mm2)		
			7 Days	14 Days	28 Days
1	CC	5	2.15	3.10	3.88
2	F1	7.5	2.18	2.26	4.92
3	F2	10	3.20	3.20	5.98
4	F3	12.5	2.28	2.27	4.82
5	C1	15	3.27	3.15	4.25

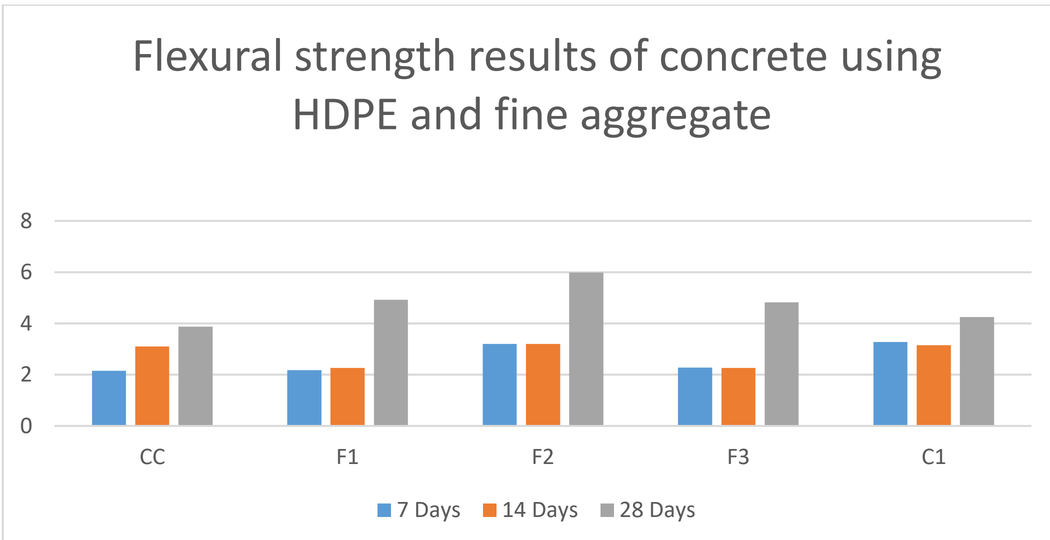

Figure 12 Flexural strength results of concrete using HDPE and fine aggregate

5.8 Flexural Strength Using E-waste

Flexural strength results of normal concrete and replaced concrete were presented. The test results show the maximum flexural strength when 15 percent replace the coarse aggregate with E-waste in concrete.

Table 12 Flexural Strength Using E-waste as a course aggregate

S. No	Cube Designation	% OF E-Waste	Flexural Tensile (N/mm2)		
			7 Days	14 Days	28 Days
1	ES-0	0	2.92	3.28	3.88
2	ES-5	3	4.95	4.92	4.95
3	ES-10	7.5	5.25	5.22	6.02
4	ES-15	12	5.72	5.98	6.25
5	ES-20	15	4.02	4.75	5.25

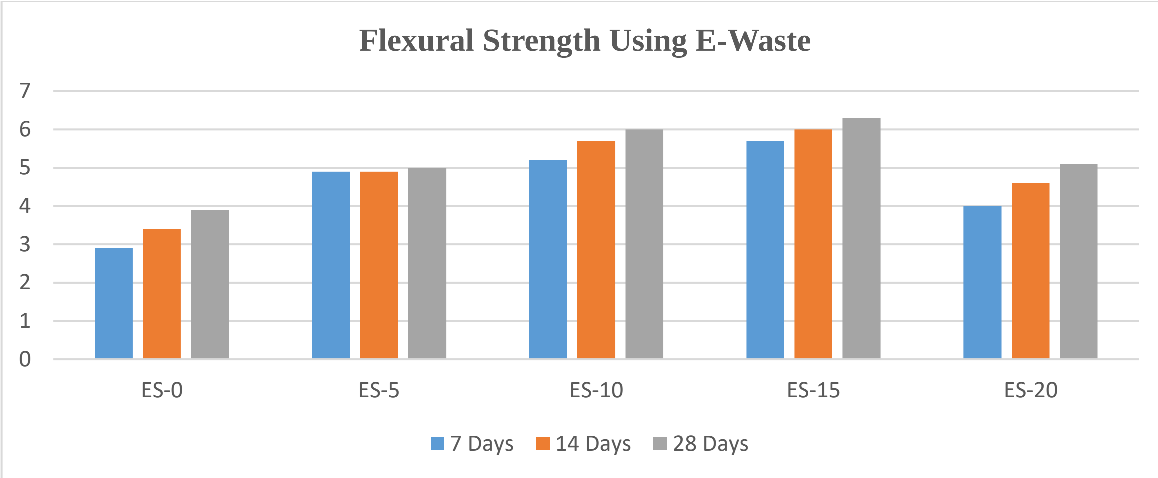

Figure 13 Flexural Strength Using E-Waste

5.9 Flexural Strength of concrete using E-waste as coarse aggregate and HDPE as fine aggregate

Table 13 Flexural Strength of concrete using E-waste as coarse aggregate and HDPE as fine aggregate

S. No	**Cube Designation**	**% OD e-WASTE**	**% OF HDPE**	**Flexural Tensile (N/mm2)**		
				7 Days	**14 Days**	**28 Days**
1	**M1**	**0**	**5**	**5.1**	**5.3**	**5.6**
2	**M2**	**3**	**7.5**	**5.2**	**5.4**	**5.8**
3	**M3**	**7.5**	**10**	**5.5**	**5.8**	**6**
4	**M4**	**12**	**12.5**	**5.7**	**6.3**	**6.5**
5	**M5**	**15**	**15**	**6**	**6.5**	**6.8**

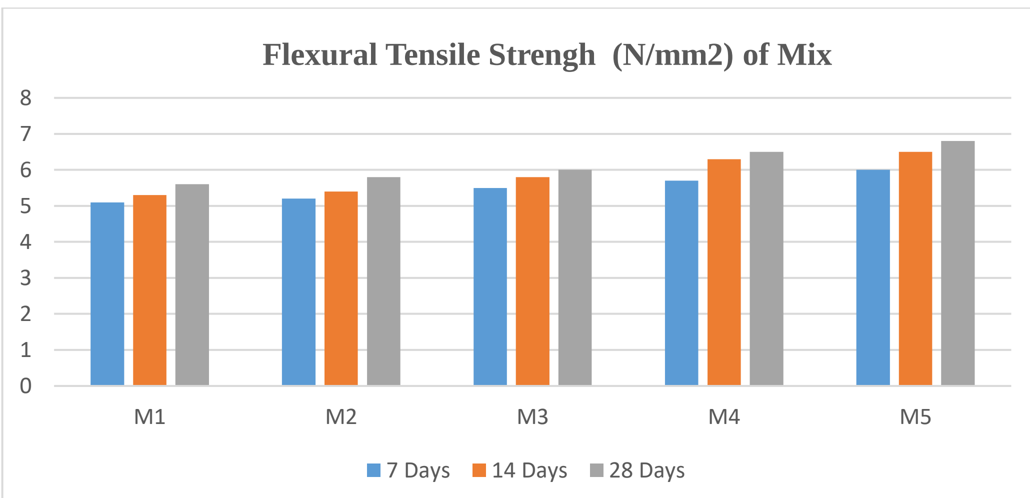

Figure 14 showing Flexural Strength of concrete using E-waste as coerce aggregate and HDPE as fine aggregate

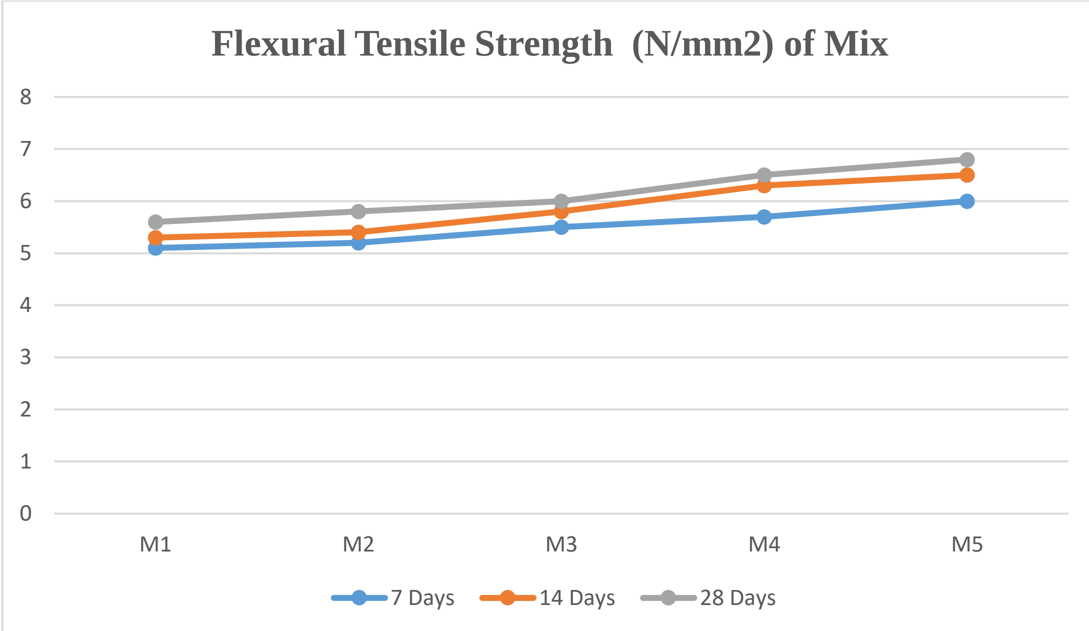

Figure 15 Graph showing Flexural Strength of concrete using E-waste as coarse aggregate and HDPE as fine aggregate

As find from above graph and table 13 the Flexural Strength adding an E-waste and HPDE found at highest compressive strength of 6.8 N/m2 at the e-waste mixing of 15 of E-Waste and 15 of HDPE. This is the optimized value when the Compressive Strength find high.

VI.CONCLUSION & FUTURE SCOPE

6.1 Use of E-waste as a course aggregate

E-waste inclusion reveals a compressive intensity improvement of up to 15 % replacement.

Increased strength of split TEST was almost insignificant whereas up to 15 percent replacements were achieved with flexural tensile strength. The results of e-waste on bending power are more severe than the split tensile energy.

The sulfate attack and chloride attack, which do not affect concrete strength and the optimal mixture, are more durable than the control mix from the durability study. It is ideal for maritime application.

- The e-waste can be disposed of effectively.
- Makes the concrete light weight and therefore reduces the weight of the structure.
- Allows it robust so that seismic loads can comfortably carry.
- The burden on natural capital is raising.
- It makes concrete more workable.
- Saves the land used for e-waste disposal.
- It reduces the risk of damaging e-waste materials.

6.2 Use of HDPEas a fine aggregate

Compressive and break tensile strength in concrete mixtures of different natural aggregate substitution rates of HDPE waste is identical in behavior. Whereas the bending strength properties of the mixtures are comparable to the conventional cement concrete mixture by adding HDPE waste. The strong chloride permeability findings indicate that ion chloride entry decreases with HDPE and the mixes were categorized into low permeability relative to high-permeability cement concrete.

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