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Development and evaluation of road construction using plastic waste materials

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Abstract
Our studies on the performance of waste plastic material road conclusively proves that it is good for heavy traffic due to better binding, increased strength and better surface condition for a prolonged period of exposure to variation in climatic changes above all, the process helps to dispose waste plastics usefully and easily. The objectives of the dissertation is to identify the optimum percentage of waste plastic materials and sand aggregate in ratio of 1.8:1.2:3.6 used and also the effect of super binder properties are observed to this procedure generated were used for bricks, road construction and paving blocks [3].The plastics were shredded and blended with the sand and aggregate with a shear mixer at a temperature range of 130 °C–150 °C.

Keywords: waste plastic material, recycling waste plastic, paving blocks, road construction

1. Introduction
This research to solve costly construction problems and easy way to construction without cement and bitumen: firstly, the management of municipal solid waste (MSW) plastic materials, particularly with regards to used plastics which have overwhelmed major cities and towns. Plastic waste has started to attract increased public attention, notably due to a growing number of reports about marine litter [1].
This is a great concern in particular since plastic and POPs concentrated on the surface of micro-plastics could enter the food chain. The potential environmental effects of this phenomenon are only beginning to be fully understood, plastic waste prevention, preparation for re-use, recycling and separate plastic waste collection, as well as improving plastic design and plastic product design are all essential contributors to help achieve 'zero plastic to landfill' and move to a circular economy.
Plastic products and plastic waste are two sides of the same coin and recycling already starts in the product design phase. Designers need to be involved in the reflection on the entire life cycle of products including the waste phase. All actors designing, producing, using and disposing of plastic products and handling plastic waste will have to contribute to a less wasteful economy [4]. This research are also help to recycle the waste plastic material for road construction and environment are eco-friendly. This study examines the effect of blending waste thermoplastic polymers, namely High density polyethylene (HDPE) and Polypropylene (PP) in Conventional Sand aggregate at various waste plastic compositions [2].
The plastics were shredded and blended with the sand and aggregate with a shear mixer at a temperature range of 130°C – 150°C. The objectives of the dissertation is to identify the optimum percentage of waste plastic materials and sand aggregate in ratio of 1.3:2:4 used and also the effect of super binder properties are observed to this procedure generated were used for road construction and paving blocks.

2. Related Work
In this work author describe about, Road from plastic waste, The Indian Concrete Journal. His declarative the debate on the use and abuse of plastics vies-a-visa environmental protection can go on, without yielding results until practical steps are initiated at the grassroots level by everyone who is in a position to do something about it [1].
In this work authored describe about, Parametric Study for Replacement of Sand by Fly Ash for Better Packing and Internal Curing. His epitome the use of fly ash as replacement of sand is an economical solution for making green and denser concrete [2].
In this work author describe about, she is currently involved in research into new and innovated building materials, modification of bituminous materials for road values as against relatively high changes for HDPE modified bitumen [3].
In this work author describe about, Assessment of the Leaching of metallic elements in technology of solidification in aqueous solution. His essence in the Results are presented of experiments performed to optimize the solidification/stabilization system for metallic elements in aqueous solution. His summarize, It was observed that polypropylene polymer, showed profound effect on homogeneity and compatibility with slight linear increment in the viscosity, softening and penetration [4].
In this work authored describe about, He is currently involved with Recycling, plastic waste management, composite fabrication and fiber technology research. His give an curtailment in this paper forms part of research to solve two main problems in Ghana: firstly, the management of municipal solid waste (MSW), particularly with regards to used plastics which have overwhelmed major cities and towns; secondly, the formation of potholes on roads due to excessive traffic and axle weight [5].

3. Materials and Methods

Materials

- Waste plastic materials
- Sand
- Aggregate
- Fly ass
- Waste plastic materials

The plastic used was waste plastic (thermoplastics) Polyethylene terephthalate(PET), High Density polyethylene (HDPE), Low Density polyethylene(LDPE), Polypropylene (PP), Poly vinyl chloride (PVC), Polyester(PES), bottles, carry bags, tea cups, ice-cream cups etc.

Methods

- **Segregation**

Plastic waste collected from various sources must be separated from other waste. Maximum thickness 125 microns.

- **Cleaning Processes**

Plastic waste get cleaned and dried.

- **Shredding Process**

Will be shredded or cut into small piece. The different type of plastic wastes are mixed together.

- **Collection Process**

The plastic waste retaining in 2.36mm is collected.

Test

Water Absorption Test

Prepared cube of waste plastic material are weighing before drown in water for absorption test, weight of cube are 5.997kg.
Drown the water for water absorption test for 48hour.
After 48h cube are remove in water and weighing, cube weight are 6.136kg.
This test was observed total water absorption is 2.32%.

Drop Test

Waste plastic material cube are drop in 5feet cube are not broken so, this test are successfully for drop test.

Colour

Color of cube is dark black.

Weight of Cube

Waste plastic material cube weight are 5.997kg.

Surface Test

Surface of cube are hard and rigid form.

Toughness Test

Waste plastic material are strong and hard surface.

Soundness Test

The plastic coated aggregate, did not show any weight loss, improvement in the quality of the aggregate.

4. Experiment & Result

The compressive strength of waste plastic material & aggregate, sand was determined using 150mm concrete cubes. Standard concrete cubes and waste plastic cubes without cement were cast for comparison. For concrete cubes 1.315, 1.832 part of waste plastic was mixed with 1.999, 1.216 parts of sand and 3.99, 3.664 part of aggregate. For concrete cubes a ratio of 1.3:1.9:3.9, 1.8:1.2:3.6 for waste plastic material: sand: aggregate by weight was used. Cubes were made with standard sand and well-graded aggregates, mixed by a mechanical mixer and compacted by means of standard vibration machine. The cubes were cured and crushed for compressive strength for each mix at different curing periods. Compressive strength results of concrete waste plastic cube 5.952N/mm sq., 11.600 N/mm sq. This result are more than for fly ash bricks and cement paving blocks.

Study of compressive strength of plastic concrete using plastic waste, sand, aggregate, Fly-ASH

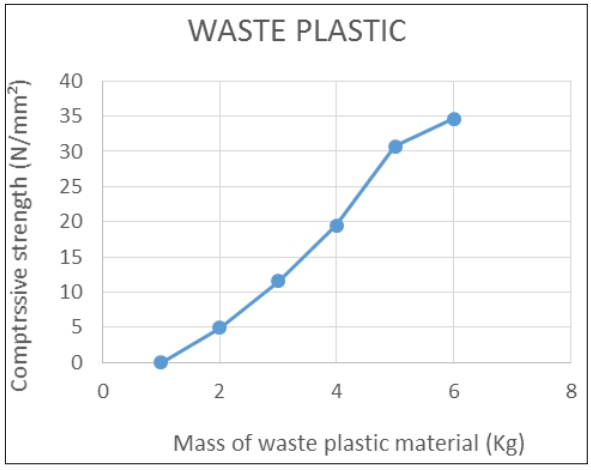

Fig 1: Variation of single load or mass due to waste plastic

Above graph (fig.1) shows that an experimental study the amount of plastic are increased in different ratio, single load or mass are increase their bonding strength so, amount of waste plastic ratio depend their bonding strength.

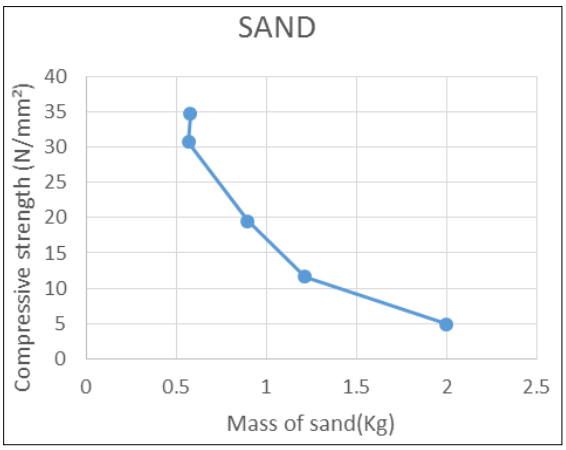

Fig 2: Variation of single load or mass due to sand.

Above graph (fig.2) shows that an experimental study the amount of sand are decrease in different ratio, single load or mass are increase their bonding strength.

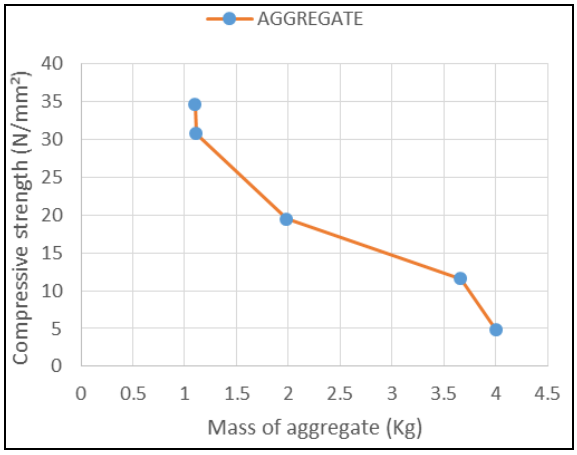

Fig 3: Variation of single load or mass due to aggregate.

Above graph (fig.3) shows that an experimental study the amount of aggregate are decrease in different ratio, single load or mass are increase their bonding strength.

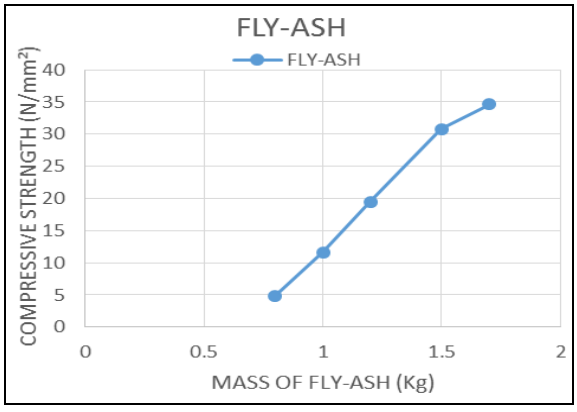

Fig 4: Variation of single load or mass due to fly-ash.

Above graph (fig.4)shows that an experimental study the amount of plastic are increased in different ratio, single load or mass are increase their bonding strength so, amount of fly-ash ratio depend their bonding strength.

Comparative view of compressive load of plastic concrete using plastic waste, sand, aggregate, fly-ash
All material

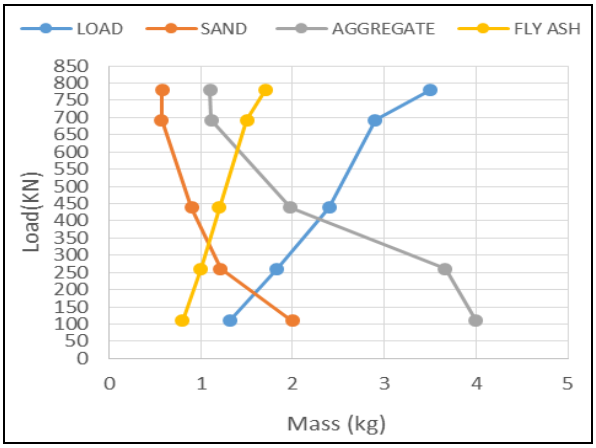

Fig 5: Variation of load, sand, aggregate and fly-ash.

Above graph (fig.5) shows that an experimental study of compressive load of model. Above graph show the quantity of waste particle material which give maximum value of compressive load. using various the amount of aggregate, sand are decrease & amount of waste plastic, fly-ash are increased in different ratio so, load are increased.

5. Discussion

This experiment, with the help of Mix design procedure adopted for Control concrete and the studies carried out on properties of various materials used throughout the Experimental work. Also the details of method of Casting and Testing of Specimens are explained.

The compressive strength of waste plastic material & aggregate, sand was determined using 150mm concrete cubes. Standard concrete cubes and waste plastic cubes without cement were cast for comparison. For concrete cubes1.832 part of waste plastic was mixed with 1.216 parts of sand and 3.664 part of aggregate. For concrete cubes a ratio of 1.8:1.2:3.6 for waste plastic material: sand: aggregate by weight was used. In this experiment we a make Cubes were made with standard sand and well-graded aggregates, mixed by a mechanical mixer and compacted by means of standard vibration machine. The cubes were cured and crushed for compressive strength for each mix at different curing periods. Compressive strength results of waste plastic concrete cube 12N/mm2. This result are equivalent for second class clay bricks.

6. Conclusion

The addition of thermoplastic modifiers to conventional waste plastic materials is known as the viscoelastic behavior of the waste plastic material and change its rheological properties used like a HDPE, PP etc. be observed to display different amount of influence that is increasing the Softening to decreasing penetration value enhancing the overall dynamic and absorption of the binder. Our studies on the performance

of waste plastic material road conclusively proves that it is good for low traffic due to better binding, increased strength and better surface condition for a prolonged period of exposure to variation in climatic changes above all, the process helps to dispose waste plastics usefully and easily. Waste plastic materials to be used for road construction replacement of bitumen & cement, waste plastic material used with fly ash for bricks and paving blocks.

7. References

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