Literature Review on Different Waste Plastic Material and Sand in Paver Block

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Abstract— In this world, now a days everyone is having a mobile phone with them. Mobile phones are day by day becoming very important for us as they have become a part of our life. So, it is also necessary to have our phone battery fully charged or at least half charged. But sometimes there is a situation in which we need our mobile phone very much but we do not have that much battery power in our mobile phone also we are not having a charger or even if we have the mobile battery charger, we do not have AC supply. In such situations this Mobile charging on coin insertion system or machine helps us to charge our mobile phone. This system or machine is having an Arduino Nona with ATMEGA328P microcontroller already present in it. The Arduino Nano is coded or programmed in such a way so that the machine will perform the desired function properly without creating any error.

Key words: Waste Plastic, Sand, Fibre, Compressive Strength, Fly Ash, Testing, Properties

I. INTRODUCTION

Waste Plastic is commonly used in road constructions, formwork, roof covering concrete pavement, paving block and so on. Pavement blocks are also used for decorative method of creating a pavement. So many researchers worked on improving strength of concrete by replacement of crushed sand or find sand by different types of waste plastic and fibre in concrete. Strength properties can be improve by use of fibres in concrete.

II. LITERATURE REVIEW

S. F. Wong, et al. (2010)[1] This paper "Use of Recycled Plastics in a Pavement System" study the use of recycled plastics as partial replacement of aggregate Ingredients, with particular focus on the development of a pavement system for infrastructural applications. In that, type of recycled plastics used are Low-density polyethylene (LDPE), Polystyrene (PS), High-density polyethylene (HDPE), Polypropylene (PP). A chemical admixture was used at a dosage of 0.73% by weight of OPC to improve the workability 0%. and 25% recycled plastics used by replacement of volume of total aggregates. Total 8 mix proportion used P1, P2, P3, P4, P5, P6, P7, P8. The tests performed and their results on pavement materials for LDPE (P1) type of plastic gives maximum strength after 28 days of curing including physical properties such as hardened density is 2158 kg/m3 and water absorption 4.10 %, as well as mechanical behaviour such as compressive strength 34.25MPa, flexural strength 5.77MPa and flexural toughness 1.17J/m3. From the present investigation, mix P3 containing 25% polystyrene PS (by volume of total aggregates) recorded a 28-day compressive strength of 45.50 MPa, which fulfilled the minimum compressive strength requirement of 40 MPa at delivery. Mix P3 also had average water absorption of 0.50%, which was in compliance with the maximum water absorption requirement of 5%. In addition, the good workability (ease of preparation and mix homogeneity) as well as low hardened density (lightweight) of polystyrene PS in P3 helped to enhance the properties of conventional pavement blocks for infrastructural applications. The higher water absorption of spherical low-density polyethylene (LDPE) bead of 1-5 mm made it ideal for use in the sand bedding course; while larger-sized high-density polyethylene (HDPE) of 1-50 mm and polypropylene (PP) of 1-30 mm with high water absorption are suitable for the gravel base material.

Kewal, et al. (2015)[2] This paper "Development of Paver Block by Using Foundry Sand Based Geopolymer Concrete" study the Partial replacement of fine aggregate in different percentage as like 0%, 20%, 40%, 60%, 80% and 100% by used foundry sand in Geopolymer paver block for determining the change in the compressive strength of paver blocks. Study ensure the suitability of using the waste foundry sand as partial replacement of fine aggregate in geopolymer concrete paver blocks. In the present work, normal cement concrete Mix design for M50 grade is used for the construction of Paver Block. IS 10262:2009 (Concrete Mix Proportioning Guideline) was used for design mix and different trials has been performed for deciding the molarity of alkaline solution. Cubes of size 15 × 15 × 15 cm were casted and tested. In this concrete mix fly ash was used instead of cement along with alkaline solution, coarse aggregate and fine aggregate. For NaOH solution 14 molarity decided Casting of trails of paver blocks was carried out at 2 stages hydraulic press machine and table vibrating machine The compressive strength has been determined at the end of 7, 14 and 28 days and water absorption test has been determined at 28 days. Geopolymer Paver Block achieved very early high compressive strength of 66 MPa. The Compressive strength of Geopolymer Paver Block was found to be decreasing with replacement of foundry sand. Upto 60% replacement of fine sand by foundry sand gives slightly high compressive strength was found tobe optimum. Complete replacement by foundry sand decreasing slight compressive strength, lesser value is 41 MPa which can be used for manufacturing of paver blocks for 40 MPa. Maximum strength of Paver block was found at 78 MPa at 0% replacement, which is very high, can be used for very heavy traffic. Water absorbption of Geopolymer paver blocks 4-5%, which is satisfing permissible limits of IS :15658-2006.

Nivetha C., et al. (2016)[3] This paper "Production of Plastic Paver Block from the Solid Waste (Quarry Dust, Fly ash, Pet)" aims to study the possibility of using plastic waste as a binding material instead of cement in the manufacturing of paver blocks. The study bears on plastics with a Polyethylene terephthalate basis. Plastic waste is carried to melt and mixed with a varying proportion of solid

waste fly ash and quarry dust (PET 25-35 % fly ash 25 % and quarry dust 40-50% in weight). Experimental work includes concrete cubes confirming to IS: 516:1964 of size 70. 6 x 70. 6 x 70. 6 mm were cast for determination of compressive strength. After 2 hours the moulds were de-molded and subjected to cooling in room temperature for 3 hours. Crushing loads were noted and average compressive strength of 3 specimens is determined The measurements of physical and mechanical properties show that PET- 30%, Fly-ash-25% and Quarry dust 45 % gives maximum strength 52 N/mm^2. It is found that Plastic waste paver block give's better results than concrete paver block. From that it is concluded that solid waste (Quarry dust, Fly ash & PET) can be used as an main Constitutions for the preparation of paver block with the increased strength.

Dinesh S., et al. (2016)[4] In this paper "Utilization of Waste Plastic in Manufacturing of Bricks and Paver Blocks" study the High-density polyethylene (HDPE) and polyethylene (PE) bags are cleaned and added with sand and aggregate at various percentages to obtain high strength bricks and posses thermal and sound insulation properties to control pollution and to reduce overall cost of construction. Material used for making paver block were waste plastic, river sand, red oxide (ferric oxide). The mix proportion were in the ratio of (1:2, 1:3, 1:4, 1:5, 1:6) These are the ratio which represent the plastic, river sand respectively. In first step collection of waste plastic bags and the polyethylene bags are sorted out and remaining are disposed safely. Next the collected waste bags are cleaned with water and dried to remove the water present in it after this the plastics are burned out by using stones and firewood. In the drum then the plastic bags are added to the drum one by one and the river sand is added to the plastic when it turns into hot liquid. The sand is added is mixed thoroughly using rod and trowel before it hardens. The mixture has a very short setting. In case of Paver blocks, Red oxide is added (less than 10% of the total weight) to impart dark red colour. These mixture is then poured in to the brick mould and they are compacted using steel rod and surface is finished using trowel. Before placing the mixture into the mould, the sides of the mould are oiled to easy removal of bricks. Test results shows that 1:4 (plastic : river sand) proportion gives Compressive strength by UTM 8.19 N/mm^2 and Water Absorption of 1.082%. Efflorescence test, Fire resistance test, Hardness test are taken it shows that this method is suitable for the countries which has the difficult to dispose /recycle the plastic waste. The natural resources consumed for the manufacturing of Plastic sand bricks and Paver blocks are very much less when compared to its counterparts.

Ms. S. Parthini, et al. (2016)[5] The purpose of "Experimental Investigation on Cost Effective Paver Block" study to produce interlocking concrete paver blocks by using manufacturing sand without curing. The main reason for the use of the manufacturing Sand is to reduce the landfill problem and also to control the depletion of the natural resources. For this purpose manufacturing sand is selected and their physical and chemical properties were studied. Various mixes with different proportions of these manufacturing sands were casted and tested as per the standards given in the Indian standards for precast concrete blocks for paving (is.15658:2006). These test results are then compared with the results of the conventional paver blocks. In that, Ordinary Portland cement used of 53 grade. Mix design of M30 grade is done in that river sand completely replaced by manufacturing sand. Test result after 28 days gives maximum Tensile splitting strength- 3.42 N/mm, Flexural strength-7 N/mm^2, Water Absorption Test 6%, Compression strength- 38.6 N/mm^2.

B. Shanmugavall, et al. (2016)[6] The aim of "Reuse of Plastic Waste in Paver Blocks" project is to replace cement with plastic waste in paver block and to reduce the cost of paver block when compared to that of convention concrete paver blocks. In that Plastic waste heated in a metal bucket above 150^{0}c. As a result of heating plastic waste melt. then the material quarry dust, coarse aggregate and ceramic waste added to it in right proportion at molten state of plastic and well mixed. This mixture is transferred into mould. it is in hot condition and compact it well to reduce internal pores present in it. Then the block allow to cool for 24 hours so that they hardened after drying paver block removed from mould and ready for the use. Test results shows that Proportion 1:1.5:2:0.75 (plastic waste : quarry dust: coarse aggregate : quarry dust) gives maximum Compression strength- 13.03 N/mm^2 And Paver block taken in oven for 2 hour Melt At 150^0 C. it is concluded that this paver block can be used in non traffic and light traffic roads.

R. S. Chougule, et al. (2017)[7] This paper "Use of Plastic Waste in Civil Construction" study the use of waste plastics as partial replacement of fine aggregate in M30 concrete. Waste Plastics were incrementally added in 0%, 2%, 4%, 6%, 8% and 10% to replace the same amount of Aggregate. Tests were conducted on coarse aggregates, fine aggregates, cement and waste plastics to determine their physical properties. Paver Blocks and Solid Blocks were casted and tested for 7, 14 and 28 days strength. The result shows that the compressive strength of M20 concrete with waste plastics is 4% for Paver Blocks and 2% for Solid Blocks. The optimum modifier content of waste plastic is found to be 4% for paver block, gives Compressive strength- 70 N/mm^2 after 14 days, The compressive strength of concrete is goes on increasing up to the 4% replacement of sand with plastic further which the strength goes on decreasing as increasing in further plastic content. Further which the strength goes on decreasing as increasing in further plastic content. It is concluded that the modified pavement block would contribute to the disposal of plastics in the world. The cost of construction will reduce and also helps to avoid the general disposal technique of waste plastics namely land filling and incineration which have certain burden on ecology. Both physical and mechanical properties of plastic concrete pavement blocks were affected when plastic was used as a replacement for sand.

R. Mahadevi, et al. (2018)[8] This paper "An Experimental Investigation on Concrete Paver Block by Using PVC Plastic Material" study on the use of plastic in concrete without any admixtures . The aim of this research is to reduce the unit weight, cost of block and also to reduce the environmental pollution. Disposal of plastic in an environment is considered to be a big problem due to its low biodegradability and presence in large quantities. The final result of the M30 mix ratio obtained from the IS 15658- 2006, is 1:1.7:1.82 as cement: fine aggregate: coarse aggregate. The

PVC plastic is used in the form of powder as partial replacement in M-Sand as fine aggregate in percentage of 0, 10, 20 and 30. Using 197x167x61mm bone shaped paver block moulds used and weighting batching done then mixing, compaction, drying and curing done for 7 and 21 days. From test result it is concluded that the It is possible to use PVC plastic up to 20%. Replacement of PVC plastic up to 10% gives maximum compression strength of 54 N/mm^2 and water absorption 4.49%.

III. Conclusion

1) Plastic Waste can be reduced by use of waste plastic in paver block. Different types of Plastic waste can be used effectively as a construction material by replacement of sand or aggregate and also gives better results than conventional paver block.
2) The plastic in concrete reduces the unit weight of concrete.
3) The cost of plastic paver block decreases as compare to conventional paver block.
4) Water absorption of plastic paver block is lesser than conventional paver block.

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