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Use of Hospital Waste in Concrete

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Abstract

Concrete is the most common material used in construction. India is one among the many countries facing a serious problem on biomedical waste disposal, hospital wastes mainly consists of needle, syringes, scalpels blades glass & ash from in incineration of any biomedical waste which also includes cotton dressing solid plasters casts & plastic wastes 64% of LDP , 32% of HDP & 4% of polypropylene. In concern of this, a biomedical waste rule 2011 proposed by the Ministry of Environment and Forests (MoEF), According to which hospital wastes contains 8 categories of wastes each as to segregated by single colour bag thus clears the confusion over the colour coding of contains used for disposal of biomedical waste. Now this is a study on uses & performance of hospital waste in concrete.

Keywords: *- Low density polyethene (LDP), High density polyethene (HDP), Bio-medical, incineration, plastic aggregates.*

INTRODUCTION

As the world population grows, wastes of various types are being generated. The creation of non-decaying and low biodegradable waste material combined with a growing consumer population has resulted in waste disposal crisis. One solution to this crisis is recycling wastes into useful products. Hospital waste is special category of waste. It is highly hazardous due to infections and toxic characteristics. The proper collection and disposal of hospital waste will not only reduce the volume infectious waste and cost of treatment but will also promote healthy environment and good living.

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LITERAURE REVIEW

Plastic waste used as coarse aggregates:

Al-Manasseh and Dalai, (1997) in this work researcher are found 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 50%) of plastic 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. (ii) To reducing the bulk density was direct matching to the plastic collection.(iii) Density of material is reducing by 2.5%,6% and 13% respectively 10%,30% and 50% so these are reducing the density was property to the low unit weight of the plastic. 2.2 PET bottles used as fine aggregate: Choi et al. (2005) in this research work author is considered the impact of PET that mean Polyethylene terephthalate. In this study author is focused the PET bottles in this work. He take the water cement ratio varying 45%, 49% &50% the exchanging ratio 0%, 25%, 50% & 75% has taken in this assignment. By capacity of fine aggregate density of material combination reduced with growth the lightweight substance. This assignment the impression of PET bottles lightweight collection on the splitting tensile strength of material was observed. Mix sizes of material were designed. The w/c they examined that (i) splitting tensile strength of material mixes lower by 19%, 31% &54% with gain in PET collection by 25%, 50% & 75% separately and (ii) splitting tensile strength may be increasing to reduce down the water cement ratio. Similarly this research inspected the results of PET bottles lightweight collection on the modulus of elasticity of material mixes reduced with the growth in plastic collection.

Fabriform shape of plastic waste

Ismail and Al-Hashmi,(2008) in this study the opinion of consuming many plastic wastes. Covering almost 80 percentage polyethylenes and 20 percentage polystyrene for example fine collection up to 4.75 mm in material. industrial activities are associated with significant amounts of non-biodegradable solid waste, waste plastic being among the most prominent, this study involves 86 experiments, 254 tests to determine the efficiency of reusing waste plastic in the production of concrete.3kg of waste plastic of fabri form shapes was used as a partial replacement for sand by 0%, 10%, 15% with 800kg of concrete mixtures. These tests include performing slump, fresh density, dry

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density, compressive strength, flexural strength and toughness indices. The result proved the arrest of the propagation of micro cracks by introducing the waste plastic of fabriform shapes to concrete mixtures. This study insures that reusing waste plastic as a sand-substitution aggregate in concrete gives a good approach to reduce the cost of materials and solve some of the solid waste problems posed by plastics.

Hospital waste ash used as partial replacement of cement

To investigate the suitability of use of biomedical waste ash as partial replacement of cement in concrete

Percentage of waste plastic content	Strength after 7 days		Strength after 28 days	
	M15	M20	M15	M20
0	12	18	19.5	24.5
10	17.5	18	20.5	20.5
15	16.5	17	20.5	20.5
20	16.5	16.5	20	20

To prevent hazardous effect into the environment. The permeability and compaction characteristics of soil fly ash mixture made with different percentage of medical fly ash are compared to evaluate the effectiveness of recycled medical waste ash.

Plastic waste used in asphalt mixer

Syed Shahan Ali Shah1, Rawid Khan2 (2016) Main objective of the research was to see the influence of plastic bottles in asphalt concrete. 2%, 4%, 6%, 8% and 10% shredded plastic bottles by weight of bitumen were added. Suitable amount of PET was established to be 6%. Natural aggregates were coated with plastic and their abrasion, crushing values were calculated. Tests conducted on concrete included compressive strength, flexural strength, fresh density, dry density, toughness indices, and slump. Modified and Unmodified asphalt binders were put into rheological test. Marshall Stability tests were also performed. Outcomes exhibited improved values for asphalt concrete. Use of polyethylene terephthalate in asphalt concrete as coarse aggregate replacement resulted in a reduction of bulk density of asphalt mixes

Plastic hospital waste protects concrete from corrosion

Turning hospital waste into longer-lasting concrete through a new recycling project is the goal of researchers with Deakin University (Geelong, Victoria, Australia). Specifically, they plan to use shredded plastic waste from dialysis treatment to help better protect structural concrete from corrosion Concrete can crack and damage

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the internal bond, which can then lead to water penetration and corrosion of the steel bars, critical for providing the strength and integrity of concrete structures," says Riyadh Al-Ameri, Tubes carrying blood and dialyzer are made of plastic designed for single use only, which leads to significant waste from each treatment. Because the waste is potentially infectious, it also must be either burned or sterilized—creating major financial or environmental costs, researchers say. During initial testing, Al-Ameri's team added the shredded plastic waste to a concrete mix at concentrations of 0.5% and 1.0% by weight. Results showed a concrete product that was more durable and significantly more waterproof. "The 30% decrease in water absorption we found is significant and would be expected to improve resistance of concrete to corrosion," Al-Ameri said, We will use our accelerated weather corrosion tanks in the concrete lab to simulate a marine environment," and he said . "Wet and dry cycles can have a big impact on durability, and seawater has chloride, which is very harmful to both concrete and steel reinforcement."

Hospital Ash waste-ordinary Portland cements concrete

Abubakar Tafawa (2016) this work is part of the on-going research work in the Civil Engineering Department of Abubakar Tafawa Balewa University, Bauchi Nigeria. The work is on characterizing and utilization of hospital waste ash (HWA) in the production of concrete the need for adequate study on the data on management, handling and disposal of hospital waste, is of paramount importance to prevent relapse a study on the incineration ash was undertaken in order to assess the material's adequacy for concrete production. The results showed that the ash contains relatively high percentage of CaO (47%), which has cementing value and thus, can be used for cement manufacture. The hydration characteristics showed it is pozzolanic in nature and the setting times values showed that HWA can be used as a retarder, especially for hot weather concreting. The ash was used as partial replacements for cement in proportions of 0 to 40% by weight of cement to make concrete cubes that were cured for periods of 3 days to 90 days. The results showed that water absorption increased with increase in the replacement levels, while the compressive strength decreased accordingly. The work was taken further by developing statistical relationships between the slump, water absorption and compressive strengths.

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CONCLUSIONS

- Utilization of waste materials & its by-products is a partial solution to environment and ecological problem.
- Use of these materials not only helps in getting them utilize in cement concrete & other construction materials, it also helps in reducing the cost of concrete manufacturing
- Concrete with plastic waste can be used for less important works where concrete is not going to bear more loads.
- As percentage of plastic increases workability also increases because the plastics which used as aggregate is smooth, as well as water absorption capacity of plastic is also low.
- Waste plastic can be effectively reused without affecting the mechanical properties of concrete considerably.
- Plastic has more water tightness capacity when compare to natural aggregate this can help in arresting micro cracks
- This type of aggregate replacement is useful where aggregate are in crisis by is we can conserve natural resources.
- By using hospital waste in concrete can reduce the environmental issues
- HWA can be classified as a retarder and thus a good material for hot weather concreting.
- The values of the density of HWA concrete achieved show that it can be classified as a normal weight concrete.
- The compressive strength of HWA concrete decreases with increase in the replacement levels and the best behavior is at 10% replacement.

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