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BUILDING MATERIAL FROM INDUSTRIAL WASTE

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Abstract

Environmental issues are led by large quantities of solid wastes being generated worldwide from sources such as household, domestic, industrial, commercial and construction demolition activities. Associated problems can be reduced by the utilization of these wastes in making building construction materials. Natural resources and energy are preserved and potentially harmful waste is avoided, when these waste products are used in place of other conventional materials. These wastes can be used as a raw material in civil engineering field, as these wastes are not having any industrial applications. Numerous environmental benefits are there of recycling, which is regarded as the third most preferred waste disposal option, stand as a viable option to offset the environmental impact associated with the construction industry. The potential of using these wastes in building construction material with focus on sustainable development is reviewed by this paper, as the results of laboratory tests and important research findings. There is need to develop standard mix design for solid waste based building materials; the need to study the actual behaviour or performance of such building materials; the need to develop energy efficient method of processing solid waste use in concrete and practical application and the limited real life application of such building materials have also been identified and included in research gaps.

A research is being proposed to develop a lightweight building block from recycled waste paper, without the use of cement, with properties suitable for use as walling unit and environment friendly. This proposed research intends to incorporate, laboratory experimentation and modelling to address the research gaps.

Keywords—Recycling, solid waste, construction, building materials.

1. INTRODUCTION

Solid wastes are being generated from household, schools, hospitals, and business activities and are a major part consist of paper, glass, metal, textile and plastic. Nowadays waste such as concrete and wood waste are other types of waste are found common in environment from construction and demolition.

Due to population growth, rise in living standards and urbanization, large amount of these wastes are generated around the globe from various human activities, in both developed and developing countries[1]. The world cities are generating about 1.3billion tones of solid waste per year and this volume is expected to increase to 2.2billion tones by the year 2035, according to the world bank statistics on solid waste management[2]. This is one of the reason we are facing various environmental problems like air pollution, emission of greenhouse gases and occupation of useful land.

2. CHARACTERISTICS OF WASTE

Any unwanted or discarded material that is not a liquid or a gas is solid waste. Paper, glass, bottles, cans, metals, certain plastics, fabrics, clothes and wood can be called as recyclable wastes. With source and storage condition physical and chemical properties of solid may vary. Household, industrial, domestic, commercial, construction demolition and furniture industry are the major sources of solid waste.

The problems associated with solid waste management can be reduced by productive use of waste material; and

it also minimizes the use of natural resources and can also result in environmental friendly products. By the use of recycled materials such as recycled aggregates, recycled glass, recycled paper, recycled metal, recycled plastic, and recycled textile in building materials.

2.1 Recycled plastics in building material

The steady growth in consumption of plastic maybe attributed to its low density, strength, user friendly designs, fabrication capabilities, long life, lightweight, and low cost characteristics and therefore they have become an inseparable, and integral part of human Daily activity. In municipal solid waste stream large quantities of plastics such as high density polyethylene from milk bottles, polyethylene terephthalate (PET) from beverages bottles, or even unsegregated plastic mixture are available. Annual consumption of plastic materials increased from 5 million tons in the 1950s to 100 million tons in 2001. Using recycled waste plastics from packaging in building materials can be an alternative

A research conducted by reference [3] with the objective of investigating the mechanical properties which includes the flexural strength of polymer concrete, compressive strength, and the splitting tensile strength by using an unsaturated polyester resin based on recycled PET. The mechanical properties were analysed and it was reported that the resin base polymer concrete in recycled PET can achieve the compressive strength of 73.7 MPa, splitting tensile strength of 7.85MPa, elastic modulus of 7 days, that means there exists a relationship

between properties such as elastic modulus, flexural strength, splitting tensile and compressive strength of concrete.

The use of waste in granular form [4] fibrous form [5] [6] and powdery for purposes such as sand and natural aggregate replacement, reinforcement and in combination with other materials were investigated. These studies reported that more research is required to certain the optimum level of substitution but also found improved compressive and flexural strength. The major difference to use them in concrete is its smooth surface, there is therefore need to identify a surface roughening treatment for better bond properties In this we can resolve some of the solid waste problems created by plastics production and in saving energy.

2.2 Recycled paper in building materials

Paper is mostly obtained from wood, rags, and sometimes from plants such as cotton, rice and papyrus for production of special papers. It can also be described as a sheet of cellulose fibre. With uses in many applications due to its versatile properties, the most common such uses being writing and printing upon ,cleaning products, industrial and construction processes. The more it is being used for several applications , the more amount of waste paper generated and in this major percentage find its way to municipal solid waste stream an therefore there is need to recycle paper. Paper and paper board products make up the largest portion of the municipal waste stream , that is 40% of landfill composition.

Reinforced fiber cement composite, low density Board, and composite panel are in its suitability for use. The recommendation is done to improve its problem of high moisture absorption of fiber and composite, low compatibility of fiber with cement and the unsatisfactory physical and mechanical properties of the composite when the waste fiber proportion is increased [7]. Concrete as a lightweight aggregate capable of enhancing the weight to strength ratio, insulation properties, and toughness characteristics of concrete materials from waste paper can be used. Restrained shrinkage crack control and impact resistance were particularly significant to that of virgin fibers when waste paper were used as discrete reinforcement systems in concrete were also improved. Overall, concrete containing paper was observed a high correlation between density and strength of material.

By the use of papercrete in the production of building block , the compressive strength in the range of 0.96-1.1MPa, 1.7MPa, and 1.2-2.36MPa were observed. And a very low tensile strength ranging from 0.195 and 0.052MPa was observed. A much lower thermal conductivity than concrete was observed showing that its insulation value is much higher. This is because the R-

value of papercrete is in between 2.0-3.0 per inch (0.078-0.12 per mm) with thickness of walls 12-16 inches (304.8-406.4 mm) in one or two story house. Similarly, thermal conductivity of concrete was between 1.25 and 1.75 W/(m.K) and that of papercrete to be 0.10 W/(Mk). Results were observed from investigation on the utilization of waste paper as additional materials in concrete mixes to be used for housing projects, in which four concrete mixes containing of the waste , which are control mix , 5%, 10%, 15% as an additional materials to concrete were prepared with ratios of 1:2:3 by weight of cement, sand and aggregate respectively with a 20mm maximum size of aggregate. The observation of the waste was , as the content of paper increased the water to cement ratio for the mix was also increased. The mechanical strength decreased significantly, with the addition of 25% waste paper in proportion to the amount of cement.

3. CONCLUSION

RECYCLING AND REUSE

- PLASTIC TUBS AND LIDS ARE MADE INTO FLOWERPOTS, PLASTIC LUMBER, ROPES , MATS, PILLOWS,BAGS, SHOWPIECES ETC..
- PLASTIC BOTTLES ARE RECYCLED INTO POLYESTER YARN FOR CARPET, CLOTHING OR PACKAGING
- OLD NEWSPAPERS AND MAGAZINES ARE RECYCLED INTO NEW ONES... BY PAPER PULP PROCESS
- HARDBOARD ARE USED FOR PRODUCTS LIKE EGG CARTONS
- ALUMINIUM, SUCH AS SOFT DRINK CANS, IS MADE INTO ALUMINIUM SHEETING FOR THE AUTO TRADE AND GENERAL USE
- STEEL CANS ARE MADE INTO STEEL CONSTRUCTION PRODUCTS
- JUICE BOXES/ TETRA PACKS ARE USED FOR PAPER TOWEL AND TISSUE PRODUCTION

Image no. 1

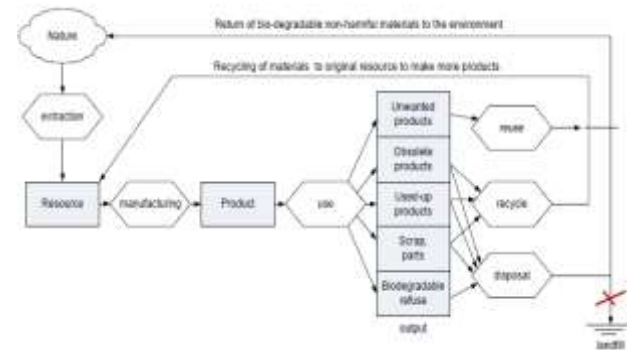


Image no. 2

The constituent of building material were studied by the literatures to establish the possibility of utilizing solid waste materials like, plastic, wood, metal, paper, glass and demolished concrete. The improvement of intrinsic properties of building materials concerned will takes place, because of the use of these wastes at adequate level of replacements or proportions. But there is limited application of these construction materials in

real construction. But there is much more research is to be done, as the properties like durability, which has to do the long term performance can be studied through this means. And there is need to establish an energy efficient method for processing the solid waste to make them suitable for use in concrete standard mix design formulation is also required

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