

Conquer Waste Materials Troubles and Utilization in Construction Materials

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***ABSTRACT-** Presently, Human are being used plastics in the form of buckets, jugs, cups, plates, carry bags, toys etc. and after use It's kept in abundance. These waste plastics can not be disposed off easily and brought back to the recycled form, can be burnt or can be filled in a soil pit. Thin plastic bags which once used are dumped in the garbage which fly away and get buried in the soil or through drainage drains and run into drains or rivers. Chemical likes cadmium and lead are used in the manufacturing of plastic bags, which when ignited causes air pollution and water pollution when going into rivers or drains makes life of animals living in it difficult. When pressed inside, it is not decomposed by bacteria for many years and also pollutes the soil, which also pollutes ground water. As such plastic bags are spread in tablets in which water is field when it rains and mosquitoes lay eggs, so there is a possibility of spreading diseases like dengue. Thus the disposal of plastic bags is a major problem. Ceramic Products like cups, plates, wall tiles, floor tiles, sanitary ware after breakage are dumped into the garbage which can not be recycle, it is disposed of by land filling only. When the building made of concrete is not possible to be recycled from the concrete it gets, it is also used in land filling only for which it is necessary to have empty land available.*

In this paper innovative attempt has been devised to manufacture construction materials by using plastic bags found in garbage, ceramic waste and construction waste from demolition old concrete building. There by reducing the problem of pollution and the problem of disposal solid waste can be eliminated.

KEY WORDS - Waste plastic Bags, Ceramic waste, Demolition concrete waste, Pollution,

I. INTRODUCTION

In the environment in which human being live, plastic has been made a part of our daily work without plastic products Human being feel a over selves incomplete. Plastic bags are used to do many things like bringing vegetables, fruits, milk, clothes etc. from the market. Plastic has completely surrounded our lives. Currently, without plastic humans can not even imagine living a high standard of life. There are many types of plastic likes LDPE, HDPE, PP, PET etc. Which are used to make different types of plastic items. Plastics are made using various types of chemicals. After the primary use of plastic bags, people throw them in the open, which pollutes the atmosphere. Presently, plastic pollutes the environment, which has become very important to prevent. Many environmentalists have published very seriously in their research that even if the plastic is suppressed inside the earth for 4500 years, the plastic cannot be completely decomposed. In todays time, quantity of waste plastics and polythene is increasing continuously, they are becoming the causes of many diseases. Plastic diseases are affecting people like breast cancer, abnormalities etc. According to the recent report plastic products such as plastic bags, Cup, Plates, jugs etc. are causing harm to human beings and animals in various ways. According to the Ocean Conservancy report 2018, about 380 million tons of plastic have been used all over the world in a year. From 1950 to 2018, about 6.3 billion tons of plastics were produced world wide, 9% of which was recycled and 12% burned. In a fast developing country like India, 70% of the total plastic that is used goes into waste. Currently, about 5.6 million tons per annum and 15,432 tons per day plastic are used in India, Plastics and polythene have become a major problem in waste management today. Plastic and polythene cannot be destroyed in any way and animals are prone to premature death by eating polythene with food lying in the garbage. A large number of cattle are killed by eating polythene waste. The problem caused by the use of polythene bags has arisen due to the shortcomings of the waste management system. Plastic waste closes the drains and sewage system.

In rivers also, due to these the flow is affected and due to the water pollution the death of fish occurs. Recycled or colored plastic bags contain chemicals that reach the ground and can cause soil and groundwater to become toxic. In industries that do not have environmentally superior technology recycling units, air pollution is spread by the toxic smoke generated during recycling. To save the environment from pollution need an alternative way with the help of which the problem of waste plastic and polythene can be solved. In fact it has become necessary to analyze this problem because the pile of waste plastics and polythene are increasing day by day. The main reasons for increasing pile of waste plastic and polythene are its properties like low density, light weight, strength, long life and low manufacturing cost. In this paper we are mentioning a method under which waste plastics and polythene can be used in construction work as well as in the place of natural resources in construction materials and the pile of rapidly increasing waste plastics and polythene can be reduced. Goods manufactured by this method cost less and the problem of disposal of waste plastic and polythene is easily solved.

II. RECYCLED WASTE MATERIALS USED AS A NATURAL RESOURCES

A. WASTE PLASTIC

The use of plastic has increased since twentieth century because of its durability, light weight and strong properties which facilitate its use. Due to low cost of production, its circulation has increased. Plastic is used in all areas due to its non-electrical conductivity. It is very easy to use in packaging, building construction, auto mobiles, electrical & electronics, agriculture and industries. Disposal of plastic waste after use is done in three ways by landfilling, burning and recycling (Gertsakin and Levis et al 2003). Landfilling requires more land vacant. The land is limited due to which this system of disposal cannot be used for many days. Plastic remains rotten in the ground for many years causing water and air pollution. The process of burning is adopted by many countries, which provides very high heat energy but in this process CO₂ and toxic gases are released which contaminate the entire environments, which prove fatal for all kinds of organisms, plastic recycling is the best method of disposal so that the environment can be protected and global warming can be avoided. Recycling of plastic in concrete is the best method. By this method, reuse of recycling plastic can be done easily in the construction areas without deterioration in its properties. In this process plastics are used as a main component of construction. In the past, waste plastics have been used mainly in concrete in two ways, the first one is to use plastic aggregate in place of natural aggregate, the second way is to use plastic fibers in fibers reinforced concrete. In many previous research plastic aggregate has been used as coarse aggregate and fine aggregate in concrete. One major advantage of using plastic aggregate in concrete is that the bulk density of plastic aggregate which is lower than the bulk density of natural aggregate, help us in the determination of making lightweight of concrete. The specific gravity of all types of plastic aggregate lies between 0.9 to 1.4. The specific gravity of the plastic aggregate is much lower than the conventional natural aggregate commonly used in concrete. Where increase the amount of plastic aggregate in concrete, the density of plastic aggregate concrete decreased (Akcaozoglu et al 2014, Herki, Ge, Juki et al 2013). Similarly when added plastic fibers in concrete, it is observed that there is no significant reduction in the density of plastic fibers when comparing with density of conventional concrete (De-oliveria and Casto- Gomes et al 2011). When plastic aggregate is used in concrete it also influences fresh concrete too. The slump value of fresh concrete decrease with increasing the quantity of Plastic aggregate in the concrete (Rai et al 2011, Albano et al 2009). The amount of Plastic fibers also affects the slump of concrete. In many studies it has been found that if plastic fibers are increased in concrete the slump of fresh concrete is significantly reduced. (Nibudey et al 2013). It is observed that if 0.05% PET fibers are used in concrete, the slump value increased by 50% and further slump value decreases with increasing volume of PET fibers (Pelisser et al 2012). Some research has studied the effect of plastic aggregate and plastic fibers on Compressive strength. It has been reported in these studies that compressive strength of plastic aggregate concrete is influenced by many parameters such as water absorption ratio, amount of plastic aggregate, amount of plastic fibers and shape of waste plastic. If the amount of plastic aggregate is increased then it is seen that the compressive strength and water absorption ratio of the plastic aggregate concrete decreases. The results of previous studies have shown that if the uniformly shaped plastic aggregate in concrete replaced by non uniformly shaped plastic aggregate is used, the compressive strength of concrete decreases significantly. Plastic aggregate which is low elastic modulus when used in concrete, it effectively reduces compressive strength compared to plastic aggregate which is high elastic modulus (Babu et al 2006, Choi et al 2009, Fraj et al 2010).

B. CERAMICWASTE

Concrete is very useful construction materials which are being used all over the world to do the work of infrastructure development big or small. Concrete has been used in infrastructure development for a long time. At present large scale construction work is going on all over the world due to which there is a shortage of limited natural resources. The quality of a concrete is determined by its mechanical properties and its resistance to the degradation of the strength. An opportunity for concrete is to use coarse aggregate such as ceramic waste, Waste materials of demolition building etc. in the production of concrete while replacing the natural aggregate. Ceramic waste is being used in the manufacture of structural and non structural concrete as coarse aggregate and fine aggregate. Many researchers have shown interest in the matter of polluting the environment due to ceramic waste and its accumulation. The main sources of ceramic waste are ceramic manufacturing industries that makes tiles, sanitary wares, cups, plates, decorative items etc. In present decades, at least progress has been made in the use and modification of concrete where cement, sand, stone and water were used as the main components in the construction of conventional concrete, whereas in the current infrastructure development without reducing strength and other properties increasing the quality of concrete. Ceramic is defined as heat resistance, non-metallic, inorganic solids forming new compounds in collaboration with metallic and non-metallic elements (Mohd. Mustafa et al 2006). Different types of ceramic having different properties. Generally ceramic are found corrosion resistant and hard but brittle in nature. The first type of production is made from structural ceramic factories using which red paste is used to manufacture bricks and roof tiles. secondly, wall tiles, floor tiles and sanitary ware are manufactured using stone ware ceramic. Production costs are reduced when concrete is manufactured with ceramic products (Cabrel et al 2009, Paccheco, Targal et al 2009, Hanifi Binici et al 2007). It has been found that the strength of ceramic waste concrete and workability is better if 20% of the ceramic waste is substituted in the manufacture of green concrete (Sharfuddin and Obada Kayali et al 2010). It has been suggested by the former researcher that more than 20% of the ceramic waste when used in concrete as a coarse aggregate and fine aggregate then compressive strength of concrete gradually decrease (Eva et al 2012). When use ceramic waste in concrete production, the density of dry sample of gravel and ceramic waste were 2.63 and 2.39 Kg/M³ respectively. (Medina et al 2012). Cement and aggregate specific gravity are also useful in the calculation of concrete mix design. The specific gravity of natural rocks varies between 2.6 to 2.8. The specific gravity of granite, sand stone and dense line stone are 2.69, 2.56 and 2.60 respectively. According to previous research and reports the specific gravity of ceramic coarse aggregate varies between 2.2 to 2.56. These values affect the density of ceramic aggregate concrete (Sekar et al 2011). Water cement ratio affects the workability of concrete. Good workability depends on the amount of water. Another important aspect to affect water absorption is the porosity of aggregate. If the porosity of recycled ceramic aggregates very high, then they will need more amount of water to achieve good workability. Some aggregate are much more porous and more absorbent because of their absorbency due to the number of holes present inside them. Porosity, permeability, absorption of any aggregate affect the bond formed between aggregate and cement. Using ceramic aggregate in concrete as recycled coarse aggregate helps us to stabilize decreasing amounts of natural resources and water absorption of ceramic aggregate and natural gravel are 0.55% and 0.23% respectively (Medina et al 2012). Ceramic waste can be used as aggregate to make concrete. The crushing value, impact values and abrasion value of ceramic waste are 27, 21 and 28% and for natural coarse aggregate are 24, 17 and 20% respectively (Senthamarai et al 2005).

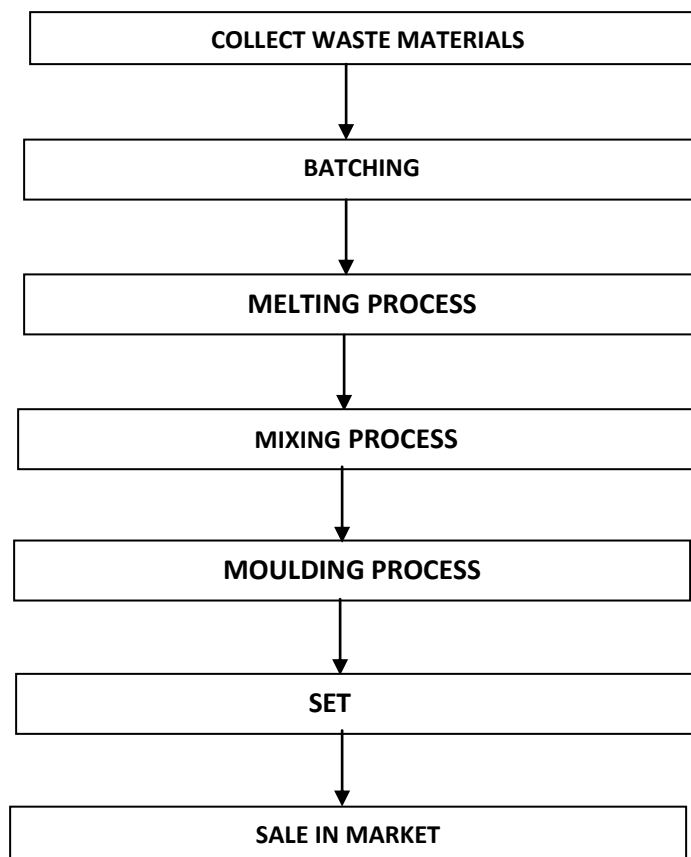
C. CONSTRUCTION & DEMOLITION WASTE

In present circumstances, India has become fastest developing economy all over the World. To maintain the speed of this development need more amount of construction materials. Government of India is constructing multistorey building, dam, bridge, multilane highway etc. to promote infrastructure across the Country. It has put more pressure on limited natural resources. It has also to keep in mind the decreasing amount of natural resources and at the same time to find the alternative of natural resources so that in future also can continue our infrastructure development work. As the construction work is going on in a big way in the whole country and during this process huge amount of C&D waste is also being generated which is a headache for construction industries, contractors and engineers. The generation of C&D waste in large quantities harms us economically and environmentally both way. Presently in India, about 960 million tones of solid is produced in our Country, out of which 14.5 million tones of construction waste and C&D waste are more than about 24 million tones. Its time to take some effective steps to reduce C&D waste because these are directly related to project Cost, storage cost and transportation cost. At this time, old buildings, bridges, roads and other old structures are being demolished all over the country due to which large amount of waste are being generated.

C&D waste volume is also increasing rapidly as the development works are taking place (Jaillon et al 2009). The main reason of increasing C&D waste is excessive construction, Renovation, old buildings destruction process, error design, new building construction etc. (Lu & Youn et at 2011). It creates a lots of C&D waste from above mentioned works. At present, all the construction firms in the country generate about 10-12 million tones per annum of C&D waste (Markandey, Kameswari et at 2015). Substances that fall under C&D waste are classified in two categories. The inert materials are named under which concrete, bricks and sand are placed and the second part is named non-inert under which plastic, glass, paper, Wood and other organic materials are placed(Aynur, Volkan et at 2014). The main reason for the increase of C&D waste in last two decades is on construction field insufficient waste management has to be done (Nagapan et at 2012). Keeping in mind the demand for natural resources to use the 4R techniques (Reduce, Reuse, Recycle and Recovery) of waste management in the construction filed (Karrar Pandy et at 2013). So that it can overcome the shortage problem of natural construction resources and increase reuse or recycling activities in construction industries.

III. METHODOLOGY OF WASTE MATERIALS RECYCLING

Large quantities of solidwaste from sources such as domestic, industrial, commercial and construction demolition activities are generated worldwide that give rise to environmental concerns. The use of these wastes in building construction can reduce the magnitude of other conventional materials, conserve natural resources, energyand avoid costly and potentially harmful waste disposal. Waste materials can be converted into useful and valuable products of building materials. A variety of building materials can also be made in comparison with traditional products which are very economical. Depending on the requirement, various construction materials such as bricks, tiles etc. can be made. Bricks that can be manufactured with this innovative technology have high compressive strength, negligible water absorption, low bulk density and economical construction costs. See how to prepare construction materials from waste materials by the following steps-



(Figure: Recycling process of waste materials in construction industries)

IV. ADVANTAGES OF WASTE MATERIALS RECYCLING

- This study currently provides information about the use of recycling and waste materials in construction industries.
- Focuses on industrial waste and recycling materials inside municipal waste.
- The harmful effects on the environment can also be overcome by the use of waste materials in manufacturing of construction materials.
- The use of waste materials from the municipal waste sector like roofing rash, glass, ceramic products, plastic products etc. Will prove beneficial for the construction industries.
- Construction materials can be made using waste materials and the dwindling amount of natural resources can be reduced to a great extent.
- Many types of construction products can be manufactured from recycled materials and the performance of recycled materials is the same or even better than new products such as bricks made of plastic, ceramic and demolition waste which have higher compressive strength than normal Clay bricks.
- It has highlighted the increasing need to use recycled materials for green building for better tomorrow and healthy life for the coming generation.

V. DISADVANTAGES OF WASTE MATERIALS RECYCLING

- Construction materials prepared by this method can't be used in high temperature places. Due to high temperature the strength of these products decreases which increases the chances of their failure.
- Regarding fire resistance, the product requires fire resistance coating to provide protection from fire, thereby increasing the value of the product.
- While making the construction products with this new techniques, it's to be kept in mind that the mixture ratio should be molded before hardening.
- When plastic bags are heating from 105 degree Celsius to 115 degrees Celsius some toxic gasses will be released into the atmosphere which causes environmental pollution and harmful for all living bodies. Therefore a proper machine equipment should be needed to mass production of construction materials.
- Made in this way construction products like paver blocks can be used only in places with light traffic. Therefore it can only be used as a running track in a park or garden where there is less traffic.

VI. SUMMARY & CONCLUSION

Due to the work of infrastructure development across the world, there has been a shortage in the available natural resources and to overcome this deficiency. It is very important to look for an alternative to natural resources. In order to solve this problem and to free the environment from pollution, a lot of researchers have tried to use waste materials which are spread around human beings in large quantities as resources. An attempt has been made in this research to take forward the determination to use different types of waste materials in place of natural resources. In this endeavor, an appropriate combination of these three types of waste materials, waste plastic bags, ceramic waste products and demolition construction waste has been attempted to produce construction materials in a new way. In this effort, waste plastic bags, ceramic waste products, fine demolition construction waste and unused natural resources have been used in mixing a certain proportion were used to make bricks and interlocking block. It can be said that if waste plastic bags, ceramic waste products and demolition construction waste are mixed in a certain proportion, then better products can be made from conventional construction materials as well as the problem of disposal of waste materials can also be solved. On the basis of previous reviews and research conducted in the present, it has come to the conclusion that if the waste materials which are generated by our activities in large quantities per day, if they are properly used in the construction industries then the day to day increasing demand of natural resources will decrease and its limited quantity can be controlled and at the same time the problem of disposal of waste can be found.

The physical properties like compressive strength, Water absorption etc. of the new products made using the above waste have proved to be very effective compared to the products made with natural resources. Thus it can be said that waste plastic bags, ceramic waste products and demolition construction waste are genuinely recycled nature and can be used better in construction Industries and protect the environment from waste materials and almost all the problems caused by waste materials can be resolved. Waste materials not only promotes reuse and recycling but also promotes the prevention of ever increasing waste materials, as well as drawing attention to reflect on the detrimental effect that the waste products has on the life cycle of the entire product does. These new positive ideas will seek to reduce waste inequality, waste materials use, use of more benign materials, longer product life, repair and end of life disparities. Such effort support sustainability in protecting the environment, reducing cost and arranging additional jobs in management and handling of waste back into the industrial cycle. The maximum amount of waste materials can be applied to business, community, industrial sector, schools, and homes. In addition, the use of waste materials like municipal solid waste, industrial sector waste will protect the environment and create a very productive, efficient and sustainable future.

Following are the advantages of using waste materials for construction of green building-

- Reuse of waste materials is an excellent effort to protect the environment from pollution and especially the implementation of its use can help prevent environmental pollution from spreading.
- Suitable recycling and reuse of waste materials will contribute to the dumping problem of waste materials and reducing waste load at disposal sites.
- The construction industries can contribute to the commitment to protect the environment by encouraging the use of recycled concrete stones and ceramic products waste, plastic products.
- Recycling and reuse of waste materials is found to be a suitable solution to the problem of limited natural resources and dumping problem of thousands tons of waste on earth surface.

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