PlastoAsh Block: A sustainable solution to plastic pollution

Pratibha Gautam, Darshan Salunke, Snehal Lokhandwala

Department of Environmental Science & Technology, Shroff S.R. Rotary Institute of Chemical Technology, Ankleshwar (Gujarat), 393135, India Keywords: Plastic, fly ash, Plastoash Block, compressive strength.

Presenting author email: Pratibha Gautam (gautampratibha.19@gmail.com, pratibha.gautam@srict.in)

Introduction

Big heaps of municipal waste has become a landmark to indicate peripherical end of a city; and littered plastic on roadside and blocked storm water drains with plastic is becoming a signature mark of most of developing countries. A multi-purpose and most flexible product made by human has become the biggest enemy of mankind where at one end we want to get a world free from plastic and on other hand we have become so dependent on it that every second day we are launching a new plastic product in market. In current scenario, plastic has taken over all the major industry type and everything in sight from "a small pen" to "home furniture" and "big industrial equipment" have plastic in it. Excessive usage of plastic and its irresponsible disposal have created imbalance in our ecosystem and its highest price is being borne by innocent birds, stray animals, fishes and other marine spices. Harmful impacts of plastic pollution are not limited to these only; soil infertility, water body contamination through microplastic and severe air pollution due to open burning of plastic waste are few dangerous and inevitable output of plastic pollution which has attacked the major three dimensions of our ecosystem: air, water and soil. Therefore researchers are trying to find out a sustainable solution of this appalling situation through various methods, majorly including thermochemical and physicochemical pathways.

Another environmental issue being faced by developing countries like India is management of power plant fly ash where coal based power plants are still a significant contributor of power industry and the quality of coal is not very superior (containing high ash content). Both the issues have been addressed separately by different researchers such as utilization of plastic in concrete paver block (Tapkire et al., 2014) or studying the utilization of flyash in brick manufacturing (Gadling et al., 2016) but a promising solution of both the substantial issues are still awaited. Hence, our current study is focused to develop a sustainable product "PlastoAsh block" which can be used as an alternative of regular pavement block and made up from "waste plastic" and "fly ash" as major raw material. Developing this technology at commercial level will not only provide a sustainable pathway to deal with two evil polluters; "waste plastic" and "fly ash", but also decline the extraction of natural resources such as river sand for manufacturing of concrete paver block.

Martials and Methods

Major two raw material for this process are plastic and flyash, for experiment purpose used plastic was collected from commercial sources (packaging material) and fly ash was taken from a power plant.



Figure 1: Overall methodology adopted during study

Plastic waste was first shredded and then heated to soften. The experiments were performed in fuming hood area in order to avoid inhalation of fumes. Fly ash was added in melted plastic in different proportion along with small (varying) proportion of other components. Continuous stirring was done to ensure proper and homogeneous

mixing of all raw material and final hot paste was immediately poured in pre-prepared moulds followed by compression. Compressive strength of all the paver blocks were checked.

Results and Discussion

Final product of the experiments is named as "PlastoAsh" as the two major raw materials of the product are plastic and flyash. Strength of the paver block or "PlastoAsh" made from different proportion was varying from 17 N/mm² to 33 N/mm² during the experiments. As strength of conventional paver block is usually between 28 N/mm² to 31 N/mm², our developed product has enough strength in compare to the conventional paver block.

After studying the results from experiments, it can be concluded that "PlastoAsh" exhibit satisfactory results to be utilized as a sustainable alternative of conventional paver block and provide solution to two major environmental issues. Other Advantages of this product and process over conventional aver blocks are:

- Easy to operate
- Less GHG emission
- Better strength
- Negligible curing time
- Sustainable solution of one of the greatest problem of current time
- Lower production cost than conventional paver blocks
- Shorter payback period

References:

Tapkire, G., Parihar, S., Patil, P., Kumavat, H.R. (2014). Recycled plastic used in concrete paver block. IJRET: International Journal of Research in Engineering and Technology. 03 (09), eISSN: 2319-1163.

Gadling, P.P., Varma, M.B. (2016). Comparative Study on Fly Ash Bricks and Normal Clay Bricks. IJSRD - International Journal for Scientific Research & Development. 04 (09), eISSN: 2321-0613.