



Natural-coloured functionally graded rubberised geopolymers system: a cement-less solution for optimised concrete paver manufacturing

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Paving the way for eco-friendly blocks

Manufacturing of concrete paver blocks creates several environmental issues, not only due to the significant consumption of natural resources, but also because of the emission of greenhouse gases during the cement production process. There is a need to enhance the utilisation of locally available materials and simultaneously improve the engineering properties of concrete blocks, such as abrasion and impact resistance.

Objective

To establish a sustainable and economical way to manufacture concrete paver blocks, using cement substitutes developed from industrial wastes such as fly ash and slag and that also utilise locally available waste materials such as stone waste and rubber waste in the manufacturing process. These blocks are expected to have varied material properties along the depth and enhanced overall strength and durability.

Outcomes

Developed a coloured mortar using stone wastes for the top surface of paver blocks.

A prototype of a low-cost functionally graded coloured precast product has been developed and evaluated for performance parameters as a paving product.

Investigated the effects of incorporating industrial wastes (fly ash, slag, rubber fiber, and stone waste), alkaline solution, and aggregates at different proportions on the properties of paver blocks.

A journal article, that provides reviews of the state of art development in the research for industrial scale unfired brick production utilising wastes, has been published in a reputed journal.

Future plans

Another journal article is under preparation. This provides the characterisation of stone processing wastes from western India as an alternative pigment.

Manufacturing process guidelines are being prepared so that the technology can use locally available materials by examining the material characteristics. Guidelines will be approved by standards organisations in both countries before being made widely available.

We also hope that M/s Abhishek Bricks (India), a local manufacturer that has been actively involved with the project, will be able to adopt the research outcomes once it is ready for industry transfer.

Broader impact

The final product will be a durable, sustainable, and economical alternative to existing paver blocks and can be easily used in rural areas. It is being designed in such a way that it can be manufactured using existing manufacturing set-ups without much alteration and additional requirements.

The technology developed through this project can be further investigated for developing additional precast products, that incorporates other types of wastes.