

Reducing the Environmental Impact of Concrete

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Almost all concrete in current use contains Portland Cement. This cement is produced in a process which involves heating the raw materials to 1400°C which makes them produce large quantities of carbon dioxide as a product of a chemical reaction. For every 1000kg of cement produced just over 500kg of carbon dioxide arises from the chemical reaction and a further 250-400kg from the energy use. These quantities cannot be reduced.

Numerous methods have been used to reduce the cement content of concrete. Replacing some of the cement with Pulverised Fuel Ash has proved to be very successful. The ash reacts with alkalis which are released during the hydration of the cement but if 40% replacement is used these are exhausted so any further ash will not react. Higher replacement levels can be used with Ground Granulated Blastfurnace Slag but supplies are limited.

This presentation will focus on methods to replace all of the Portland Cement. One system which was used in the UK in the past was Super-Sulphated cement which is a blend of gypsum and slag. Recent research will be presented which shows that a viable cement can be made using entirely waste materials to produce a sulphate or alkali activated hydraulic material. The achievable strength of the concrete with these blends is generally lower than Portland Cement but they still have very substantial potential markets in road bases, foundations and other applications.