DISCUSSION

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Publishing particulars of paper under discussion

Vol 55 (2) 2013, Pages 2–7, Paper 798: Cradle-to-gate environmental impacts of the concrete industry in South Africa

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COMMENT

On reducing the carbon footprint of the concrete industry

It is suggested that a small, but probably significant reduction in – or actually a more accurate assessment of – the carbon footprint of the industry can be obtained by considering the amount of CO_2 sequestered during carbonation of concrete and cement-stabilised pavement materials.

Both the cement minerals and the free lime released during the hydration of Portland-type cements are subject to carbonation in engineering time.

Although the carbonation of concrete in atmospheric air is slow (about 0.1–3 mm/year), far more cement is used in concrete than in stabilisation. However, that of cement-stabilised soil pavement layers is much faster (about 0.5–2 mm/day on all surfaces exposed to atmospheric air) and about 2–50 mm/year from the bottom of the layer upwards due to reaction with soil air (Netterberg 1991). Although these rates tend to decrease with time, this means that a thickness of 150–300 mm of 2–3% cement-stabilised material can thus become completely carbonated within 5–10 years. In both cases the amount of CO_2 taken up will be approximately equal to the amount of CO_2 released by the now carbonated cement during its manufacture.

The same applies to lime-stabilised pavement layers.

This will enable a "cradle-to-grave" estimate rather than just a "cradle-to-gate" estimate to be made.

Reference

Netterberg, F 1991. Durability of lime and cement stabilisation. In: *Concrete in pavement engineering*, Portland Cement Institute, Halfway House, 27 pp.

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RESPONSE FROM AUTHORS

The authors are in agreement that the sequestration of CO_2 during carbonation of concrete serves in lowering the carbon footprint of the industry.

However, for the amount of CO_2 sequestered to be approximated, there first needs to be a more accurate assessment than that done in the published paper of the end applications of the cementitious materials. The proposed study would give details of the stock of concrete structures of all types in South Africa, including stabilised layers in road construction, and their actual service lives. Based on the findings, one can then approximate the cradle-to-grave environmental impacts of concrete structures in SA.

Regarding road-stabilised layers in particular, there is the question of access of CO_2 to the layer, due to (a) overlying wearing courses, and (b) degree of saturation of the layer.

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