DISCUSSION

JOURNAL OF THE SOUTH AFRICAN INSTITUTION OF CIVIL ENGINEERING

Effect of grinding time on the particle size distribution of gasification ash and Portland cement clinker

(H du Plessis, E P Kearsley, H Matjie) (Paper 644),
Journal of the South African Institution of Civil Engineering, 49(4) 2007, pp 28–34

Comments from Dr R Amtsbűchler, PrEng, Head of Lafarge Quality Department, Southern Africa

THE AUTHORS are to be congratulated on a very interesting paper.

A correction is however required to the statement in the introduction that 'For every ton of PC produced, approximately 1,35 tons of CO_2 is released into the atmosphere'.

In actual fact the manufacture of one ton of a CEM I gives rise to 700–900 kg of CO_2, half of which is derived from the calcination (decarbonation) of limestone, with the remainder arising from fossil fuels used in the manufacturing process.

Table 1 is also incorrect showing a typical LOI value of 5 % for South Africa fly ash conforming to SANS 1491-2-2005.

Five per cent (5 %) is actually the maximum limit for LOI, with typical values for Lethabo fly ash < 1,0 % and Matla fly ash < 2,5 %.

Finally a word of caution with regard to optimum grinding time: the findings from an experiment in a laboratory mill cannot be directly related to the performance of an industrial mill, especially a closed-circuit mill with a high-efficiency separator attached.

RESPONSE FROM THE AUTHORS

The authors would like to thank Dr R Amtsbüchler for his comments. We appreciate his experience and knowledge in the cement and ash industry, and his observations are valuable to the research.

The statement 'For every ton of PC produced, approximately 1,35 ton of CO_2 is released into the atmosphere' was an average of the world as published in 2005 by the World Business Council for Sustainable Development (WBCSD). Currently, 'One ton of CO_2 is emitted per ton of cement produced worldwide', as stated in www.environliteracy.org/article.2008.

We agree that this figure can be reduced to between 650 kg and 724 kg per ton of cementitious product through the introduction of selected pozzolanic extenders including slag, fly ash, silica fume and limestone. Through their green cement product range Holcim locally achieve less than 650 kg CO_2 per ton of cement (ww.holcim.co.za).

As stated by Dr Amtsbüchler, the firing of raw materials is the primary source of CO_2 emissions during cement manufacturing. First, the heating of limestone and slag in high temperature kilns (1 500 °C) releases CO_2. This 'decarbonation' stage accounts for 60 % of CO_2 emissions per ton of cement produced. Second, the use of fuels (oil, coal) to feed the cement kiln also releases carbon dioxide. This combustion accounts for 40 % of CO_2 emissions per ton of cement (www.lafarge.com).

We also agree that the value of 5 % LOI for South African fly ash, as listed in table 1, is the maximum limit indicated in SANS 1491-2-2005. As the gasification ash we used cannot be classified as a fly ash, the values in the table were used as indicators for the range of typical values that have been successfully used for many years.

For the pilot study a laboratory ball mill was used with a constant mass of steel ball with diameters between 30 mm and 50 mm. Optimum grinding times will vary if there is a change in the mill, mass and size of steel balls, or grinding aids are used. Further tests should be performed to test the result achieved in the laboratory, preferably in an industrial mill.