



THE SOUTH AFRICAN COAL ASH ASSOCIATION (SACAA)

No 19, Yearend 2007

ASH @ WORK

COMMUNIQUÉ OF THE SOUTH AFRICAN COAL ASH ASSOCIATION
from your Editors and President of the SACAA

Editorial

Hard to believe, but the year 2007 is just about gone! Some newsworthy items have reached us since publication of the previous issue and we are keen to share these with our members before the year is completely gone. All that remains is to wish you all a most enjoyable festive season and for 2008 health and prosperity!

Some technical discussion on acid resistance of concrete

In the Concrete Technology section of the August 2007 issue of the journal *Concrete Plant International (Cpi)* [www.cpi-worldwide.com] under the heading "**Development of high-performance concrete with increased resistance to acids**" authors Lasse Petersen [petersen@ipi-ing.de] and Ludger Lohaus [lohaus@baustoff.uni-hannover.de] describe their experimental experiences. The need for their investigation arose from an air pollution abatement procedure adopted by some thermal power plants where the cooling towers were not only used to cool water, but also to scrub the exhaust gases. This procedure resulted in acid attack of the concrete of the cooling tower shells. The subtitles of their paper are:

- **Basic principles of the resistance of concrete to acid**
- **Design of a test set up for parameter studies of acid resistance**
- **New knowledge with regard to the combination of blast furnace cement and fly ash**
- **Summary**

The latter concludes as follows:

"As an example this report presented examinations of the acid resistance of the well-known bonding agent combination of Portland cement, fly ash and micro silica in comparison with bonding agent combinations of blast furnace cement with fly ash and fine fly ash. The results of these examinations show that the use of blast furnace cement in combination with fly ash and fine fly ash can by all means lead to comparable or even higher resistance to acids."

SACAA's vice-president, Dr Japie Krüger, sourced the above paper for us and we subsequently elicited the following comments from him:

"The authors do not produce anything new that is not known about the acid resistance of cement-bonded products such as

concrete, but the article is a good review of it.

The rotating exposure jig they use is similar to one, which **Everite** used to **study** the durability of fibre-cement sheets.

A misconception is that a dense concrete is resistant to acid attack because acid cannot easily penetrate it. Within limits acid does not penetrate concrete like salts, because it gets neutralised by alkaline material (cement or calcareous aggregate) in the concrete as it tries to penetrate. It, therefore, attacks concrete along a moving front lying between the attacked and unattacked concrete. A dense concrete helps, however, in that more alkaline material is introduced per volume compared with a porous concrete.

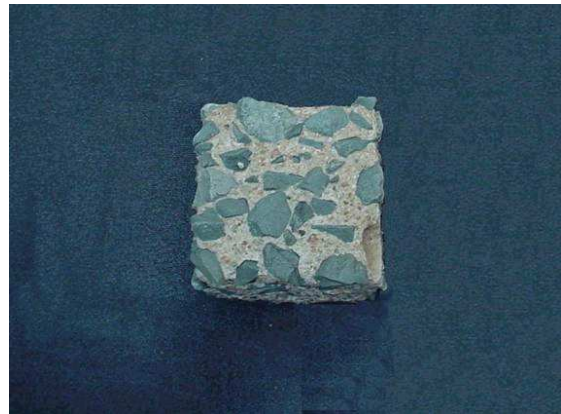
I am surprised that the authors make no mention of the use of calcareous aggregate to increase the acid resistance of concrete.

The authors report some improvement in acid resistance of concrete by using fly ash, but the results they show indicate that the improvement is marginal. This finding is in agreement with the results obtained at the CSIR on cement-bonded products containing fly ash and which were cured at ambient conditions, namely that no improved resistance to attack by soft water is obtained by replacing part of the cement with fly ash (see p 146 of SACAA CD *South African Fly Ash: A Cement Extender*). In fact the resistance of fly-ash concrete to soft water attack was somewhat worse than that of OPC concrete. This is attributed to the fact that a large proportion of the fly ash remains insoluble in acid for a long time because of the low rate at which the pozzolanic reaction takes place and consequently cannot neutralise acid.

A similar result was obtained with fly-ash concrete exposed to dilute sulphuric acid. However, a substantial improvement in acid

resistance of cement-bonded products containing fly ash is obtained if these were autoclaved at steam pressures around 1 MPa and temperature of 184 °C. This is due to the formation of acid-resistant hydrogarnet in the binder (p 146 of CD).

Below is a photograph of a 100 mm concrete cube made with acid-insoluble aggregate and which had been exposed in a 1% (v/v) sulphuric acid solution for 6 months and brushed with a stiff nylon brush at two-weekly intervals. Many people may not know what concrete attacked by acid looks like."



International News of Note

In the previous issue of **ASH@WORK** we asked "**More ash for this new venture?**" when we reported on the Cairo-based Orascom Construction Industries (OCI), investing R3,2 billion in a new, 2 million tpa cement plant in South Africa. In *Business Report*, 11 Dec. 2007 Sudip Kar-Gupta and Aziz El-Kaissouni of Paris and Cairo report: **Lafarge buy Orascom Cement in €8.8bn deal**" The report further states: "Lafarge stock surged 11% to €119,47, its highest level since early October, giving it a market value of €21 billion just above Swiss rival Holcim."

The question now arises whether the proposed new local plant will go ahead as a Lafarge venture or will it be abandoned?

Massive concrete cast

The Salt River Materials Group of Arizona, USA, reports in its February 2007 flyer *Refining Concrete Quality*, that as part of the \$415 million upgrade of Golden Eagle Refinery in Martinez, California, a massive concrete cast was required. The contractor, Rinker Materials, produced and delivered 6500 cubic yards (790 truck loads) in a 23-hour period of continuous concrete production. They used 3 production facilities.

Reader Feedback

SACAA's former treasurer, Ray Kelly, who emigrated to New Zealand responded to the previous issue of [ASH@WORK](#) to our administrator, Val Howard by e-mail as follows;

".....Many thanks for the newsletter. The interview with Prof K. Strauss was very interesting as I've been involved with energy issues here. I agree that coal will be used for power generation for a long time yet. The following comments support his stance.

I assisted the Centre for Advanced Engineering NZ in studying electricity generation coupled with synthesis of ammonia and fuels via Integrated Gasification and Combined Cycle (IGCC) technology using Southland Lignites. Carbon capture and sequestration options were included in the study. Solid Energy has now taken the project further to the pre-feasibility stage. It is a multi million\$ project which could produce liquid fuels (up to 40 000 barrels/day of high quality diesel), urea and electricity. A low-carbon slag would be a by-product.

Also I am looking at smallscale pyrolysis of waste and biomass to recover energy and reduce landfill. This would produce a carbon-rich char that might be useful as a fertiliser for certain types of soil. "

Forthcoming events

ICCX, Sun City, 19 - 21 February 2008

The International Concrete Conference and Exhibition will include 20 presentations by local and overseas experts. *Details are available from Dr. Hans Beushausen of UCT [ICCRRR@eng.uct.ac.za]*

3rd Biannual Coal Ash Professionals Training Course, San Antonio, Texas, USA, 11 - 13 March 2008

The University of North Dakota, in conjunction with the Energy and Environmental Research Institute will be running this course. **Main topics are:**

- how CCBs are viewed from a coal company, electric generating company, marketer, and regulatory perspective
- implications of environmental initiatives and emerging specifications on coal ash
- updates on the industry's latest hot topics including IGCC by-products and FGD materials
- tricks of the trade from those who successfully utilise coal ash
- options for recovery disposed coal ash and disposal site development

For further details contact Richard Kruger: richonne@mweb.co.za

Excellence in Concrete Construction - through Innovation, Kingston University, London, 9 - 10 September 2008

Full details at <http://cmrg2008.kingston.ac.uk>

International Conference EuroCoalAsh 2008, Warsaw, Poland, 6 - 9 October 2008

This conference is organised by the Polish Coal Combustion Union in conjunction with the European Coal Combustion By-products Association (ECOBA). The conference covers all aspects of coal fly ash, especially in the European Union. *Details are available on: www.eurocoalash.org*

ICCRRR 2008, Cape Town, 24 - 28 November 2008

Website: www.civil.uct.ac.za/iccrrr

World of Coal Ash (WOCA) 2009, Lexington, Kentucky, USA, 4 - 7 May 2009

Watch this space in the New Year for further information

YOUR SACAA COUNCIL 2007/8

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**The SACAA Council wishes you all everything of the best for
the festive season and the coming year.**



The editorial team would like to know whether the information supplied in this newsletter is useful. We welcome your comments, suggestions, and especially contributions.

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Disclaimer:

The views expressed in this newsletter are not necessarily those of the Council of the South African Coal Ash Association