



Ash Development
Association of Australia

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07

COAL ASH matters

this issue

ash - a valuable resource

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Ash> Constructing Landmarks

After the successful launch and positive feedback from our inaugural edition of *Coal Ash Matters*, it is with great pleasure that we welcome you to the second edition of the Ash Development Association of Australia's (ADAA's) newsletter. This biannual publication endeavours to deliver news, case studies and features on the Association and its members, product developments and effective utilisations of coal combustion products (CCPs).

The use of CCPs in construction is far from a modern innovation. In fact, the Romans used volcanic ash over 2000 years ago to build remarkable structures such as the Pantheon, which still stands today.

More recently, CCPs such as fly ash and furnace bottom ash are increasingly used in the construction industry, especially in projects involving concrete. Fly ash improves Portland cement concrete both in the plastic and hardened stages. It improves concrete pumping and workability characteristics in the plastic stage and improves concrete durability performance in the hardened stage. This is achieved by virtue of the size and shape of fly ash particles, and by way of the pozzolanic reaction between the fly ash and the reaction products of Portland cement hydration. While concrete is the largest application of fly ash today, CCPs are further utilised in road pavements, asphalt, road drainage works and even in improving agricultural soils.

The use of fly ash in construction has far-reaching benefits not only for the industry, but also for the

natural environment. Using fly ash in concrete, for instance, prevents the material's disposal in landfill and reduces the need to extract other resources for the manufacture of concrete.

ADAA research over the past two decades has also demonstrated the significant cost, environmental and crop production benefits stemming from CCP use in amending weak structural soils. Such research has recently received a boost from the NSW's government's recent grant of an exemption to NSW laws on 'wastes' such as fly ash.

With the World of Coal Ash Conference approaching next month, there could not be a better time to highlight effective utilisations and applications of CCPs both in Australia and worldwide. This issue of *Coal Ash Matters* showcases two major road projects utilising fly ash in their concrete mixes: the Illawarra's iconic Sea Cliff Bridge and Melbourne's EastLink Tollway. While these two structures may not have the historical and international stature of the Pantheon, they demonstrate the enduring value of CCPs in the construction sector today.

This issue of *Coal Ash Matters* also touches on the agricultural applications of CCPs and the ADAA's recent research in this area. Such work by the ADAA demonstrates the Association's commitment to advancing the use of CCPs in ways that are environmentally responsible and innovative.

Further information on our Association, its members and the industry can be found on our website, where you can also download an electronic version of our newsletter. You can also subscribe to receive this newsletter by email using the form provided on the back of this newsletter.>



*Constructing the Sea Cliff Bridge,
41 metres above sea-level.*

The 2007 World of Coal Ash (WOCA) Conference will take place on May 7-10 in Covington, Kentucky. This will be the second conference held jointly by the University of Kentucky's Centre for Applied Energy Research (CAER) and the American Coal Ash Association (ACAA).

This year's agenda features a variety of presentation topics pertinent to the science, applications and sustainability of coal combustion products (CCPs) and gasification products worldwide. Approximately 140 presentations and 60 poster presentations are planned for the Conference, which will be divided over three days of four parallel sessions. A short course on the science and technology of CCPs will also be held a day prior to the presentations.

WOCA 2007>



The organisers are anticipating at least 600 participants and 50 vendors to attend the Conference including CCP producers, marketers, architects, engineers, contractors, concrete producers, waste and disposal managers, researchers, academics and government representatives.

Several ADAA delegates will be attending the Conference including Chief Executive Officer, Craig Heidrich. Mr Heidrich will also be presenting a paper discussing CCP applications with the greatest potential in Australia.

Mr Heidrich will be among a number of international speakers presenting on CCP issues from their respective countries, providing attendees with an international perspective on the industry.

The Conference will also address emerging technologies utilising CCPs in non-conventional ways including mercury capture technology. >

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Membership>

Company Members

A primary role of the Association is to bring together producers and marketers of coal combustion products (CCPs). Our activities cover research and development into CCP usage, advocacy and technical assistance to CCP producers and users, and a forum for the exchange and publication of CCP information. If you would like more information on the Association and how you can become involved, please complete the information section at the end of this newsletter. Current membership is listed below.

Adelaide Brighton Cement Ltd
Blue Circle Ash
Cement Australia
Concrete Challenges
CS Energy
CSIRO (CMIT)
Delta Electricity
EFA Technologies Pty Ltd
Energy Supply Association of Australia
Eraring Energy
Flinders Power
Flyash Australia Pty Ltd
Golden Bay Cement Ltd
Heeleys Consulting
HRL Technology Pty Ltd
Hyrock Pty Ltd
Latrobe Valley Generators Group
Macquarie Generation
Pozzolan Enterprises Pty Ltd
Readymix Ltd
Rio Tinto
RTA NSW
Tarong Energy Corporation Ltd
Tarong North Power Station
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Related Associations

American Coal Ash Association
www.acaa-usa.org
CCSD (CRC for Coal in Sustainable Development)
www.ccsd.biz
Curtin University (WA)
www.che.curtin.edu.au
Energy Supply Association of Australia
www.esaa.org.au
Institute for Water and Environmental Resource Management University of Technology, Sydney
www.iwerm.uts.edu.au
UK Quality Ash Association
www.ukqaa.org.uk

Exemption paves way for CCP use in agriculture >>>

Promising research commissioned and sponsored by the Ash Development Association of Australia (ADAA) into the potential agricultural, horticultural and forest applications of coal combustion products (CCPs) has benefited from an exemption granted after three years of consultation between the ADAA and the NSW Department of Environment and Conservation.

Research into the use of CCPs as a soil amendment has been an ongoing area of investigation by the ADAA over the past decade. Our research has been fuelled by evidence demonstrating significant cost, environmental and crop production benefits stemming from CCP use in amending weak structural soils.

Specifically, successful ADAA funded research initiatives conducted by both the University of Western Australia and the University of Technology Sydney have highlighted fly ash's ability to improve water retention in soils with low moisture holding capacity and increase plant growth without additional fertilisers.

Future research into the agricultural applications of CCPs holds considerable potential and is expected to expand given the NSW Government's granting of *The fly ash and bottom ash from burning NSW or Queensland coal exemption 2006*, said Mr Craig Heidrich, CEO Ash Development Association of Australia.

The Exemption provides industry members and researchers with the legal confidence and assurance that any further investment into research and or product development can potentially lead to substantial reuse opportunities.

The Exemption mandates that suppliers of CCPs characterise and assess all products intended for agricultural or horticultural purposes, prior to distribution. The ADAA has eased this process for suppliers by developing industry self-assessment procedures. These procedures have been summarised in the Reference Data Sheet included in this newsletter.

For further information please contact the ADAA. >

ADAA resources >

Technical CD

The ADAA produces a number of high quality technical guides, bulletins, newsletters and general industry information on current issues. The Technical Committee has developed a Technical Compendium on CD – an invaluable reference tool for engineers, specifiers, consultants, government authorities and slag users. These CD's are available to members for \$15.00 each, and to non-members for \$20.00 (plus postage and handling; see back cover for order form). Updated versions will be available for registered users as new material is added.



Guides

Considerable developments in road pavement technology have occurred since the ADAA published its **Guide to the Use of Ash and Furnace Bottom Ash in Roads and Embankments** in 1997. In 2005 for instance, the ADAA conducted extensive research into issues reported in the guide, particularly on the use of coal combustion products (CCP's) in road construction.

As a result of this further research, a revised **Guide to the Use of Coal Combustion Products (Fly Ash and Furnace Bottom Ash) in Roads and Embankments** was produced. This guide is primarily aimed at designers, specifiers and users of road materials, and can be purchased from the ADAA (see back cover for order form).

Taking into account industry developments, the revised guide presents up-to-date information on the properties and uses of CCPs. The guide also directs readers to appropriate sources for additional information.

Solidflow

a new fly ash product used on the Eastlink Tollway

A special grade, ultra fine, processed fly ash called Solidflow has been used extensively in one of the largest infrastructure projects undertaken in Australia: the Eastlink Tollway in Melbourne.

The Eastlink is a \$3.8 billion project which will deliver Melbourne's second fully-electronic tollway and connect the city's eastern and south-eastern suburbs through 45 kilometres of freeway.

Fly ash was utilised in the project, not only for its ability to enhance cement durability and cohesiveness, but also for its cost efficiency.

Solidflow is manufactured by Flyash Australia at its new manufacturing facility at Bayswater Power Station, NSW. Run-of-station fly ash from the station is fed directly to the facility and is transformed into Solidflow using a patented milling production process.

Boral Concrete, the main concrete supplier on the Eastlink project, utilised the properties and benefits of Solidflow in a number of its high performance concrete mixes.

Site applications using this processed fly ash additive have included shotcrete for retaining walls and tunnel linings, concrete piles, slabs, permanent tunnel lining, precast and high strength concrete works.

Boral Concrete has utilised Solidflow's particular characteristics to improve placement, durability and strength properties to meet the requirements of the project.

Solidflow has also been utilised for special applications. Parts of the Eastlink Tollway project specified three separate durability requirements. The product has been incorporated to satisfy the individual requirements of these tests.

In other projects, Solidflow has also been incorporated in the design of concrete requiring super workable self compacting concrete, assisting the concrete to perform to exacting placement requirements as well as meeting all technical specifications. >

Acknowledgements: Bill Bowie, Mario Tabone, Tony Thomas – Boral Concrete. Bob Marks – Flyash Australia.



The Augusta Power Stations in action.

Around the power stations >

Flinders Power – the Augusta Power Stations

The Augusta Power Stations, comprising both Northern and Playford, are the only coal fired power stations in South Australia. They are situated at the head of the Spencer Gulf adjacent to Port Augusta, approximately 300km from Adelaide and, along with the Leigh Creek coalfield, are owned and operated by Flinders Power.

Both stations have recently been upgraded in an effort to improve generation efficiency and reduce environmental emissions. This work included a major refurbishment of Playford where new fabric filters, low NOx burners and a modern distributed control system were installed. The stations currently consume approximately 3.6Mt of coal, with an ash content of 20 percent, which is delivered by a 250km rail link from the dedicated Leigh Creek mine.

Due to the unique nature of the coal and the design of the Northern boilers, 250-300,000tpa of ash reports as furnace bottom ash (FBA) which is currently sluiced to onsite ash ponds. Commercial opportunities for FBA have yet to be identified due to the adverse impact of freight costs on project economics.

Fly ash constitutes most of the remaining ash from Northern which is collected from three zones of electrostatic precipitators.

Fly ash from the first zone is intercepted in a dry fly ash plant operated by Adelaide Brighton Cement Limited (ABCL). This highly pozzolanic fly ash is both blended with cement to produce GB or blended cements by ABCL and also for the manufacture of CLS (controlled low strength grouts) used in the mine stope backfill mix at the BHP Olympic Dam mine.

Fly ash from the subsequent two zones is intercepted in a dry ash collection system operated by Flinders Power and conveyed directly to a silo for sale to the concrete industry. Northern Power Station's fly ash is recognised in the industry for its excellent performance properties when used in combination with cement for concrete manufacture to the extent that demand for this material routinely exceeds supply. As a result, Flinders Power is currently considering the installation of dry ash collection facilities at Playford to improve the availability of this material to the construction industry.

The recovery and use of South Australian coal combustion products (CCPs) in particular fly ash results in significant resource conservation and reduces greenhouse gas emissions from cement manufacture by around 150,000 tpa. >

Fly ash in award winning Sea Cliff Bridge >>>>

The Sea Cliff Bridge, 20 kilometres north of Wollongong, was selected as an overall winner at the 2006 Civil Contractors Federation's awards for excellence in civil construction.

This was one of several awards won by the bridge since its official opening on 11 December 2005.

The 1.35 kilometre project connecting the coastal suburbs of Clifton and Coalcliff replaces sections of Lawrence Hargrave Drive that were regularly closed due to an infamously unstable coastline. The new bridge replicates the natural shape of the coastline, boasting one of the most scenic drives in Australia.

The \$49 million project was constructed under an alliance between the RTA, Barclay Mowlem Construction Limited, Maunsell Australia and Coffey Geosciences. Concrete was supplied by Boral, consisting of Blue Circle Southern Cement's Shrinkage Limited Cement and Eraring Fly Ash, both chosen for their quality, durability and efficiency in construction.

Fly ash was selected for its advantages in ongoing strength gain and ability to reduce the concrete's permeability and consequential chloride ingress by protecting it from aggressive environment conditions. Moreover, Eraring's fine grade fly ash was chosen for its consistency, fineness and effective performance in concrete.

Such a mixture of cement and fly ash was considered crucial in achieving the required shrinkage tolerances and strengths. The specified performance was for a workable, high quality concrete, delivering 25MPa for stressing in 24-36 hours, 50MPa at 28days, and 60MPa at 56 days. The maximum shrinkage allowance was 650 microstrain in some sections and 600 microstrain in others, all measured at 56 days.

Marine cement combined with silica fume was initially considered for the project. Marine cement however, was not chosen due to its low strength gain characteristics, stickiness and additional curing time. This extended curing time would have added several months to the overall construction chain. Instead, the project was completed two months ahead of schedule.



Aerial view of the curvilinear Sea Cliff Bridge.

NEWS BRIEFS

AUSTRALIAN NEWS

Fly Ash Australia's Mt Piper Plant hit a milestone in February earlier this year, where total sales of fly ash hit 1,500,000 tonnes since the plant began operation in October 1995.

The ADAA is in the midst of submitting a "Beneficial Reuse Application" to the Queensland Environment Protection Agency to secure the general approval of CCPs for use in the Queensland jurisdiction under Part 6A of the Environmental Protection (Waste Management) Regulation 2000.

INTERNATIONAL NEWS

The World of Coal Ash (WOCA) Conference will be held next month, May 7-10, in Covington, USA. The Conference, organised by the University of Kentucky's Centre for Applied Energy Research (CAER) and the American Coal Ash Association (ACAA), will focus on the science, applications and sustainability of coal ash worldwide.

Further details of the Conference can be found on WOCA's website: www.worldofcoalash.org

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