



**Ash Development  
Association of  
Australia**

# COAL ASH matters

**08**  
DECEMBER

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## Editorial: Elevated use of CCPs around the country

It was only three years ago that the ADAA published the second *Guide to the Use of Fly Ash and Furnace Bottom Ash in Roads and Embankments*, detailing current ash utilisation and recommendations for incorporating CCPs in future projects. Today, as more states in Australia recognise the beneficial reuse of CCPs, we are increasingly seeing CCPs being utilised in a wide range of projects, moving beyond its initial use in projects such as ash pavements.

The importance of utilising ash in a beneficial manner as opposed to disposing it as waste product is becoming more wide-spread, with the industry expanding its mode of production as it continues to find new areas to market the product.

This issue of Coal Ash Matters highlights some of these expansions, featuring profiles on Millmerran, Bayswater and Collie power stations. We have included articles on various projects that are currently underway around Australia, which highlight how CCPs are being effectively utilised- included is an update on the Gateway Bridge Upgrade; a project that sparked interest after featuring in the last edition of CAM, along with a piece on Solidflow- a special grade, ultra-fine, processed fly ash that is being used in a Sydney Desalination Plant.

If you have any projects that are innovatively utilising CCPs, please contact us at the ADAA so we can feature them in the next edition of CAM.

## "NEW" COLLIE ASH

Collie Power Station - located 200 km south of Perth, WA - was opened in 1999, and is WA's biggest power generating unit. Owned by Verve Energy, the black coal for the power station is supplied by Wesfarmers Premier Coal Company.

Flyash Australia has established modern facilities at the site to take selected fly ash and make it readily available for use in the construction and other related industries. The on-site laboratory is used to ensure that quality and consistency of product is supplied to the market. Load out facilities include a 100-tonne weighbridge for bulk distribution and a 300-tonne product silo.

Historically, WA fly ash sources have not been consistently used in concrete applications due to variable quality and unreliable availability. This is no longer the case, as Collie PS produces a fly ash with qualities and consistency comparable to many NSW fly ashes. The base load operation of the power station and the on-site storage ensure a reliable source of appropriate quality fly ash is always available.

Concrete-grade fly ash is being produced for use in the local building market, and can be used in virtually all conventional concrete applications. Benefits include improved plastic and hardened properties, improved durability in aggressive environments, and low heat of hydration. Fly ash inclusion also lowers the cost of manufacture of concrete, and helps the environment by reducing CO<sub>2</sub> emissions associated with cement manufacture.



Above: Collie Power Station



Above: Loading at Collie



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# Membership

## COMPANY MEMBERS

A primary role of the ADAA 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, as well as 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  
Blue Circle Ash  
Cement Australia  
Cemex  
CS Energy  
CSIRO (CMIT)  
Delta Electricity  
Eraring Energy  
Flinders Power  
Flyash Australia  
Golden Bay Cement (New Zealand)  
Heeleys Consulting  
HRL Technology  
Hyrock  
Independent Fly Ash Brokers  
Intergen (Millmerran)  
International Power  
Loy Yang Power  
Nucrush  
Pozzolan Enterprises  
Rio Tinto  
Roads Traffic Authority of New South Wales  
Tarong North Power Station  
Tarong Energy Corporation  
TRUenergy  
Stanwell Corporation  
Verve Energy

## RELATED ASSOCIATIONS

American Coal Ash Association  
[www.acaa-usa.org](http://www.acaa-usa.org)

CCSD (CRC for Coal in Sustainable Development)  
[www.ccsd.biz](http://www.ccsd.biz)

Institute for Water and Environmental Resource Management University of Technology, Sydney  
[www.iwerm.uts.edu.au](http://www.iwerm.uts.edu.au)

UK Quality Ash Association  
[www.ukqaa.org.uk](http://www.ukqaa.org.uk)

# High Durability Concrete For Marine Structures

Solidflow- a special grade, ultra-fine, processed fly ash, is being used as a high durability concrete additive in major components of the Sydney Desalination Plant.

The \$2 billion landmark project is being designed and built by the Bluewater Joint Venture Consortium. When completed, it is projected the plant will be capable of producing 250 million litres of drinking water per day.

Both inlet and outlet tunnels are being constructed out of precast concrete. Each tunnel is around 1.5 kilometres long and formed by precast rings; each ring is made up of six segments, with an internal diameter of 3.44 metres.

The precast segments were manufactured by Georgiou Group at their factory in Sydney. At the height of production, over 120 segments were produced daily, totalling 22,500 for the entire project.

Concrete was the concrete supplier for the precast segments and utilised the properties and benefits of Solidflow in their high performance concrete. Solidflow additive was selected in particular to assist in meeting the high durability and design life requirements of the project. The use of Solidflow also improved workability and slump retention properties of the concrete.

In other projects, Solidflow has also been incorporated in the design of high strength concrete, super workable self-compacting concrete, shotcrete and other high performance concrete works.

Solidflow is produced by Flyash Australia at its manufacturing facility at Bayswater Power Station, NSW.

*Acknowledgements: Manuel Ortiz, Craig Houden – Concrete, Georgiou Group.*



Above: Concrete being placed into steel moulds



Right: Precast Segments

## Fly Ash Classifying & Load Out Facility at Millmerran P.S

Independent Flyash Brokers (IFB), a consortium of independent concrete producers, has recently commissioned an \$8 million fly ash classifying and load out facility at Millmerran Power Station. This newly constructed facility is custom-designed and has the capability to fully supply the demand for concrete grade flyash in the South East Queensland region. The facility has been designed to facilitate a 24-hour load out operation, with truck drivers being able to load out automatically through a key card access system.

Key elements of the facility include:

### MILLMERRAN OPERATING COMPANY (MOC) INTERFACE

Millmerran Power Station, located some 240 kilometers west of Brisbane, consists of two 440MW generating units. Fly ash is collected in bag filters and pneumatically conveyed into two 2,000 tonnes storage bins.

Previously, fly ash was being extracted and mixed with sufficient water to prevent any dust issues and then returned to the mine by dump trucks. IFB with the agreement of MOC, inserted Claudius Peters diverter valves in each of the pneumatic lines that fed the MOC storage bins, redirecting the fly ash as required into a 200 tonne surge bin. The diverter valves operate automatically and redirect unclassified fly ash into the IFB surge bin when the level in the bin falls below a predetermined level. The surge bin incorporates a Micropul dust collector that has been sized to handle the total fly ash output from the Power Station.

### FLY ASH FEEDING, CLASSIFYING AND PUMPING

Fly ash is extracted from the storage bin at a rate up to 150 tonnes per hour using a combination of an impact flow metre that monitors the tonnage extracted and a flow control gate that maintains the flow rate at the set point. The fly ash feeds an 18 foot Sturtevant Whirlwind classifier. The fine product is pumped 350 metres to a separate load out facility and the coarse returns are pumped back into either of the MOC fly ash silos. A bypass that is incorporated into the feed system enables unclassified fly ash to be pumped directly to the load out facility.

### PRODUCT STORAGE AND DISPATCH

Processed fly ash is currently stored in 4 x 200 tonne silos at the load out facility. This product will be dispatched via a single 40 metre weighbridge located centrally under the four in line silos. Each silo is fitted with a "live bottom" flow control gate feeding air slides which transport the fly ash to a common load-out sock. An innovative feature of this system is that loading will be completely automatic and will not require the presence of any operators.



Left: Millmerran load out silos at night



Right: Surge bin, classifier & dense phase construction at Millmerran

### OPERATING CONCEPT

The classifying and dispatch operation has been designed to operate entirely automatically, controlled by a PLC located in the classifier MCC. The overall philosophy behind the control system is as follows:

- 1) When the amount of fly ash in the raw ash bin above the classifier drops to a predetermined low level, the Classifier PLC system will send a signal to the MOC PLC to indicate that ash is required. The MOC PLC for ash handling will begin by purging the fly ash lines before diverting unclassified fly ash into the surge bin above the classifier. Once a high level is reached the "ash is required signal" will be removed, which will then purge the feed lines and switch the valves back to pumping fly ash into the existing Power Station storage bin.
- 2) When the amount of classified fly ash in storage over the weighbridge drops to a predetermined level, the Classifier PLC system will start the classifier, transport blowers and all relevant dust collectors in the required sequence. When this operation has been completed the associated feeding equipment will start up and fly ash will be fed into the classifier at the rate of 150 tph; the classifying and pumping operation will continue until the product silos are full. The classifier feed will shut down but the surge bin will continue to receive ash until a predetermined level is reached.

This is an exciting new advancement occurring at Millmerran; an operation which will be monitored entirely electronically from Brisbane. For further enquiries contact: Alan Forbes via email: alanj1@bigpond.com or Mal MacKenzie: Malcolm.MacKenzie@wagner.com.au

## Around the Power Stations: Macquarie Generation-Bayswater Power Station

Bayswater power station, owned by Macquarie Generation, is situated in the upper Hunter Valley NSW, some 240 km northwest of Sydney. Located adjacent to substantial coal deposits, the station is able to generate significant amounts of base load power and in turn produce more coal ash products than any other Australian power station.

Commissioned in 1985, the power station is comprised of 4 x 660MW boilers; fly ash is collected using large fabric filters with 40 individual cells per boiler unit and over 1100 bags in each cell. Four hyperbolic towers are used for cooling.

The first 10 years of the power station's life saw fly ash and furnace ash directed in a lean slurry form to an adjacent disposal area. To extend the life of this storage, in the mid 1990's a plant was installed to pump fly ash as a paste to disused coal mine voids located 9-11 km away near Ravensworth.

Fly ash is collected locally under the fabric filters using 32 five cubic metre pneumatic conveying vessels with all fly ash pumped to a transfer silo complex. From the transfer silos fly ash is again pneumatically pumped to 2 x 2000 tonne storage silos remote from the station. Fly ash from the storage silos is conditioned with water to form a dense slurry of nominal 72% solids, which is then pumped through two Geho diaphragm pumps without needing to stage the 9-11 km for disposal.

With dry fly ash available for marketing from the 2 x 2000 tonne storage silos, opportunities for marketing were apparent. Next to the silos, Macquarie Generation installed a weighbridge with suitable dry loaders to load road vehicles. This then meant unprocessed fly ash was available to all responsible parties. Macquarie Generation decided that for additional fly ash utilisation they would not choose one processor/marketer as common in other power stations, but encourage multiple and diverse marketers.



Image: Bayswater Power Station

In the late 1990's, Hyrock, a small independent NSW company, was selected to install a processing plant to service the concrete and other industries. Hyrock installed a 14 foot Sturtevant Whirlwind classifier for processing, and a 500 tonne storage silo for finished product. With the abundant volumes of fly ash for processing and the generously sized classifying plant, Hyrock elected to market a fly ash with superior properties in concrete than other NSW fly ashes. This policy resulted in the material being well accepted in NSW, with significant markets also being achieved in Queensland, some as far north as the Sunshine Coast, as well as Victorian sales.

In concert with the Hyrock venture a contract was awarded to Blue Circle Ash to process and market furnace ash. The material is recovered using long reach excavators, then stock piled to drain or screened to suitable fractions for a wide range of end uses.

Over many years Rocla had been developing a process to grind fly ash to a fine powder of similar properties to amorphous silica or silica fume. Following considerable research Bayswater fly ash was found to best suit their process. In the mid 2000's Rocla trading as EFA entered a contract with Macquarie Generation to install a processing plant. A highly sophisticated grinding plant together with storage silos for product was installed to manufacture the material marketed as Solidflow. In the past years the plant and process technology has been purchased by Flyash Australia, with further product refinement carried out.

With 2 million tonne of ash products generated annually at Bayswater, over the years there have been many proposals to utilise more of the material. Schemes from geopolymers to innovative transport options have been proposed. As we enter the era of carbon reduction and challenges for some traditional construction materials, opportunities abound for further utilisation of this excellent material.

# Gateway Bridge Upgrade Project

At the time of its completion in 1986, the original Gateway Bridge in Brisbane was the longest balanced cantilever bridge in the world (see figs 1 & 2). The main span of 260 metres reaching its highest point 65 metres above the water. The current project includes a duplication of a second Gateway Bridge to match both the functional and aesthetic qualities of the existing bridge.

One of the key features of the Gateway Upgrade Project includes the use of concrete piles. These piles have been constructed up to 55 metres deep through the river sediments to rock, with each pile featuring a pile cap that sits atop these piles (shown in fig 4). Each pile cap supports a major column at either end of the main span.

The task of creating these pile caps was conducted a single operation, comprising approximately 2500m<sup>3</sup> of concrete. With such large pours it is always important to manage the build up of heat during the hydration process, as excessive heat can lead to thermal cracking; fly ash has proven to be an effective means of helping to reduce the heat of hydration of the cement.

Fly ash is specified by the Department of Main Roads for all concrete bridge structures in Queensland, as an effective way of providing resistance to Alkali Silica Reactivity (ASR). Many Queensland aggregates have a high potential for reactivity and use of fly ash has been proven to eliminate the destructive reactions which would seriously limit the design life.

The concrete in the Gateway Bridge is required to meet a 300 year design life. Fly ash is an important component in achieving that stringent requirement, with all concrete (including precast) being used on the Gateway Bridge Upgrade Project containing at least 25% fly ash in the binder. The project includes 7 km of new motorways; 12 km of widening (see fig.3), bridge works, and is valued at \$1.88 billion. It is estimated that approximately 157,000m<sup>3</sup> of concrete will be used for the bridge alone.

*Peter Heeley*

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Above (fig. 1): Original Gateway under construction



Above (fig. 2): Original Gateway in Operation



Above (fig. 3): Artist's impression of upgraded Gateway bridges

Image (fig. 4): Pile cap pour for the northern main river pier



The ADAA is currently in the process of conducting its annual Environmental Monitoring program. The testing program is made up of 38 samples consisting of both fly ash and bottom ash from various locations around Australia. This is the third consecutive year the ADAA has conducted the testing program, with the aim of accumulating information that will assist the Association in demonstrating the consistently inert nature of CCPs to regulatory and other interested bodies.

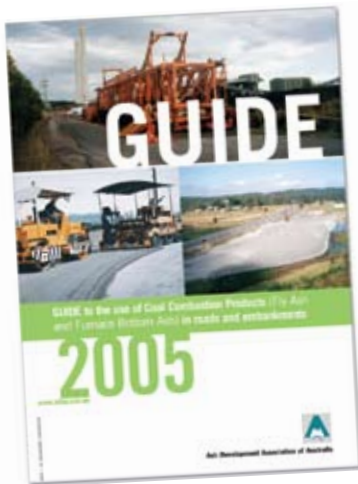
Coinciding with the Environmental Monitoring program is the NORM assessment program, which is measuring levels of naturally occurring radioactive materials in ash. Both of these testing programs are assisting members by providing data to satisfy relevant requirements of established environmental exemption regulations.

The American Coal Ash Association (ACAA) in partner with the University of Kentucky Centre for Applied Energy Research (CAER) is hosting the third World of Coal Ash (WOCA) conference in Lexington, Kentucky in 2009. The conference, to be held from May 4-7 will focus on the science, applications and sustainability of coal ash worldwide. The event will feature international exhibitors and presenters, offering both newcomers and veterans a wide variety of CCB/CCP related topics guaranteed to enhance career and job-related prospects. To register and for more information on the conference, visit WOCA's website at [www.worldofcoalash.org](http://www.worldofcoalash.org)



## ADAA RESOURCES

The following resources can be purchased directly from the ADAA. To place your order please phone 02 4228 1389 or email [adaa@adaa.asn.au](mailto:adaa@adaa.asn.au)



**ADAA Guide - \$25\***



**ADAA Technical CD - \$15\***

\*Plus postage and handling. Inclusive of GST.



**CCP Handbook - \$59\***

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