



**Ash Development
Association of
Australia**

COAL ASH matters

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APRIL

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Editorial

With 2015 well underway the Ash Development Association of Australia (ADAA) is back at it keeping readers up to date with industry developments, environmental issues and legislation changes affecting our industry. Here at the ADAA we often come across great articles or industry updates that we would like to share, but the next edition is some months off. This year we have introduced our bi-monthly 'Coal Ash Flash' (e-Blast) to keep our members and readers updated on current news and issues from around Australia and the Globe.

This edition of Coal Ash Matters features a mosaic of interesting articles about coal combustion products (CCPs) and other relevant applications. In this month's member profile we interview David Wright of Coal ReUse. Coal ReUse has adopted an 'open market' approach for access to CCPs generated at Stanwell Corporations Tarong Power Stations.

We also have an article from Dr Jane Aiken an environmental scientist from LLS Industrial, about the marketing of coal ash for agriculture through the promotion of a commercial supply success model and a strategically national approach to the supply chain. Aiken further canvases the need for technical guidance and support from professional soil or environmental scientists on appropriate testing suites.

This edition highlights some large-scale projects and developments on home soil and abroad. Beginning with the Omega Bridge on the South Coast of NSW. Opened in February and at over 340 metres long, the bridge is the centrepiece of a \$329 million Princess Highway upgrade between Gerringong and Gerroa. Across the South Pacific Ocean, some 13,000 kilometres away, 34 venues and stadiums have used fly ash for the 2016 Rio De Janeiro Olympics.



Peering into the past, a team of scientists may have discovered the reason that concrete structures such as the Colosseum have lasted thousands of years. Another article looks to the future where the construction of houses and buildings may become autonomous tasks for 3D printers in coming years.

We also have an update from the CRC - Low Carbon Living team on some exciting projects that are on track to be completed soon, as well as a report from the 23rd Australasian Conference on the Mechanics of Structures and Materials and updates on coming Conferences from across the globe.

We hope you enjoy this edition, coupled with editions of *Coal Ash Flash*, in June and August. Happy reading!



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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.

For more information on the Association, visit us at www.adaa.asn.au

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- Adbri Masonry
- AGL Loy Yang
- Alinta Energy
- Boral Quarries & Recycling
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- European Coal Combustion Products Association (ECOPA) www.ecoba.org
- UK Quality Ash Association www.ukqaa.org.uk
- American Coal Ash Association www.aaaa-usa.org
- World Wide Coal Combustion Products Network (WWCCPN) www.wccpn.org

Member Employee Profile

David Wright (Coal ReUse)

In this edition's member profile, we focus on one of our newest company members, Coal ReUse and its Chief Financial Officer, David Wright who has been elected to the Association's Management Committee for the next two years. We recently caught up with David to ask him about his industry involvement, his company's vision for CCPs and his previous experiences and achievements.

Coal ReUse, wants to be recognised as Australia's leading independent provider of Total CCP Solutions to Power Stations. Coal ReUse manages CCP site operations and develops markets for fly ash under its 'Open Market Principles,' including the world's first online CCP marketplace. David is an investor in Coal ReUse and manages its financial and legal operations.

How did you come to work at Coal ReUse?

I have been an investor of companies in the resources and energy sector that either wanted to take on incumbents or had interesting and potentially revolutionary technology. I worked as a competition lawyer at the ACCC and later represented some of Australia's largest companies. I have also had around 20 years experience in the marketing and business development functions of business. After all of this I determined that at this stage of my career I would only work with people I actually like. Coal ReUse is a great intersection of these four things.

Prior to Coal ReUse I have had a long, diverse career full of challenges, achievements and some failures. I have founded eight companies in different industries, throughout my career. I most recently built a successful marketing agency for Higher Education Institutions. I have also been working on a personal project, building a social venture for Higher Education students with disabilities. My private investment company invests in, and advises a small number of companies on financial decisions. I serve on the advisory boards of a small number of technology companies and a multi-national professional services provider. Prior to that I am best known as the former Vice President of Macquarie University.

“ We believe that it is a travesty that the majority of this valuable resource is placed into long-term storage dams or landfilled, when it has incredible performance opportunities and environmental benefits. ”

What have you learnt at Coal ReUse?

I have learnt an incredible amount since starting this journey a few years ago. I believe that the industry has a lot to learn from other sectors. Like many industries, there are the tough players, good guys, the disruptors and a few others. I have learnt not to underestimate the people I meet, as I am learning from a lot of very smart people and I know that there is so much more that I can learn from this industry.

What is the importance of Coal Combustion Products (CCPs) to Coal ReUse?

We believe that it is a travesty that the majority of this valuable resource is placed into long-term storage dams or landfilled, when it has incredible performance opportunities and environmental benefits. For us, our sole focus is CCPs - the management, marketing and development of what we consider to be an incredibly valuable underdeveloped resource. We believe in a future where 100% of all CCPs produced in Australia are taken as a valuable input product and transformed into a diverse range of end-uses.

What do you hope to bring to the Association?

The ADAA is about 'Ash Development' and my career for the past nearly thirty years (hate to say that!) has been about developing businesses, commercialising technologies and removing barriers to industry development. A lot of what the ADAA will continue to achieve is in these areas and I hope to help as much as I can and incorporate some new perspectives to the discussion.



"Putting the customer first"



Coal Ash Interest Group in **Agriculture and Soils**

Opportunities for coal ash use in agriculture are well documented within research literature, but in Australia we lack implementation and a strategic approach. Two papers accepted for oral presentation by Dr Jane Aiken and co-authored by Craig Heidrich at the 2015 World of Coal Ash Conference will address marketing of coal ash for agriculture through 1) promoting a commercial supply success model and 2) presenting a strategically national approach to the supply chain.

For those interested in expanding their utilisation market to include a coal ash supply for soils and the agriculture market, a paper describing reasoning for test methods suited to analyses for soils and agricultural purposes, is currently being developed. If you would like access to this paper, please contact Jane at: Jane.Aiken@lendlease.com

LEAF (Leaching Environmental Assessment Framework) establishes the potential leachate concentration for a given material across a wide pH range. The LEAF methodology was discussed at the recent 2014 International Workshop on use of Coal Ash in Agriculture. The summary report for that workshop describes the strategies by Israel, Greece, Australia, South Africa and India in using coal ash for agriculture. The report will also be posted for download, notes the potential management opportunities for our industry if we adopt and use the LEAF methodology.

Jane is a member of the ADAA National Technical and Education Committee and Convener of its coal ash in agriculture working group and advocate for the use of coal ash in agriculture. Jane is currently employed by Lend Lease Industrial Pty Ltd, a full member of the Association contracted for ash management by EnergyAustralia NSW Mount Piper Power Station in New South Wales.

Jane has partnered interests with Classique Environment Solutions Pty Ltd (CES) also a full member, and operates Jane T. Aiken Consultancy.

For further information, particularly for coal ash in agriculture and soils-based applications or joining the Coal ash in agriculture working group could you please contact Craig Heidrich CEO, Ash Development Association of Australia. www.adaa.asn.au/contact



Industry Members Should Engage Professional Guidance



The suite of analysis required under exemption testing, covers heavy metal and salt concentrations to ensure environmental protection. Test methodologies are drawn from environment and soil science and some interpretation is necessary, for example the methodology for assessing ash electrical conductivity. This test is a 1 in 5 ash in water solution and results reported are as a saturated extract, which requires a multiplication factor not provided with the methodology. Similarly, the characterisation of the ashes through this regulatory test suite will not provide information about performance in application.

The NSW EPA coal ash order 2014 and the coal ash exemption 2014 (<http://www.epa.nsw.gov.au/wasteregulation/orders-exemptions.htm>) are broadly-based regulations developed on the premise that the raw ash material that is a waste, can be deemed to be unsuitable for any or all potential uses - on the basis of a threshold salt or metal concentration, which may or may not be the final case under innovative conditions.

Heavy metal maximum concentrations by the total acid digest test method will identify potentially adverse elements, a result that is not indicative of application rate. A total concentration will not inform as to the soil response, plant growth or indicate an *in situ* acidic concentration of heavy metal leachate that may develop from a different acidic or alkaline condition for target soils. Alternative test methods will provide this information and professional guidance on these matters should be sought.

Given that extensive sampling programs to enable resource recovery is undertaken for compliance, this is an excellent opportunity for additional testing from the bulk sample collected. For example sampling and testing consistent with Australian Standards and therefore valid for green-house and carbon reporting. Similarly the frequency of testing with multiple samples is suited to replication and statistical analyses, raising the prospect of ongoing opportunities to invest in a broader knowledge base for characterisation and ongoing market development. Support from a professional soil or environmental scientist to discuss potential testing suites is recommended.

For further information, particularly for coal ash in agriculture and soils-based applications please contact Ash Development Association of Australia. www.adaa.asn.au/contact

CRC: Low Carbon Living, Leading the Way!

In 2015, the CRC for Low Carbon Living continues to forge ahead with its innovative research on geopolymer concrete as one of the most promising high volume applications of fly ash.

The 2013 Scoping Study identified that the major barriers to geopolymer adoption was the lack of standard specifications, track record and exclusion from current standards (e.g., AS 3600). (<http://goo.gl/8VKp49>)

Another project submitted to the CRC-LCL in 2014 aimed to gather field data from geopolymer real-life constructions to develop greater confidence in geopolymer use. Using the field and laboratory data, a comprehensive Handbook for geopolymer specification will be developed and published through Standards Australia.

Additionally, a pilot program will develop lightweight aggregates based on fly ash to produce lightweight concrete which reduces energy usage in buildings. Current technologies for producing lightweight aggregates using sintered fly ash involve carbon intensive processes. This project aims to develop low carbon processes based on geopolymerisation and alternative methods for producing aggregates from fly ash.

Partner organisations include the ADAA, ASA, UNSW, Swinburne University of Technology, AECOM, Sydney Water and Standards Australia. The project coordinators also obtained letters of support from the main Australian geopolymer concrete suppliers: Zeobond Pty Ltd, Wagners Concrete Pty Ltd as well as RMS Pavement Structures, Transport & Main Roads QLD, Vicroads and Milliken Infrastructure Solutions.

In February 2014, this new project was approved by the CRC-LCL Board with a cash contribution of \$1.1 million in combination with the In-kind contributions from partner organisations of \$1.8 million, totaling over \$3.1 million.

The ADAA will continue to keep members informed of any updates on the CRC-LCL throughout 2015. For more information, visit: <http://www.lowcarbonlivingcrc.com.au>





...and the Winner is, **Fly Ash!**

With the Olympics just around the corner the developers for the Rio De Janeiro, Brazil Olympics are facing the task of completing the 34 venues and stadiums spread across the city by 2016. In 2013 the United Nations Environment Programme (UNEP) agreed that the construction of the new venues needed to include by-products such as fly ash and achieve 100% local sustainability targets.

The main by-products used in the construction include fly ash, silica fume and iron and steel slags. When the UNEP created the guidelines for developers, researchers at the Federal University of Rio de Janeiro began testing the potential use of more locally available pozzolans such as sugar cane ash (bagasse ash), rice husk and believe it or not, ash from burned sewage sludge. Results showed that using a 10-15% blend of bagasse ash as a cement replacement actually increased the compressive strength of the concrete.

The research resulted in multiple by-product and pozzolanic research developments. The University researchers concluded that "the mechanical, hydration and rheological performance of the mixtures presented in this paper could be a blueprint for further development of ecological concrete."

To read more about the use of by-products in the construction of the venues, please visit: <http://goo.gl/NxFPvd>

Another landmark project using fly ash - **Gerringong's Omega Bridge**

The Omega Bridge on the south coast of NSW (Gerringong) officially opened on the 13th of February this year. At over 340 metres long, the bridge is the lynchpin for the \$329 million Princess Highway upgrade between Gerringong and Gerroa. Interestingly, the Bridge was constructed using the same method as the Sea Cliff Bridge construction in 2005. (www.adaa.asn.au/uploads/default/files/adaa-case_study_8.pdf)

The method used is known as incremental launching, in which segments are pushed and added to the bridge so to connect with the previous segment. This method reduced the amount of cranes needed to assemble the bridge, while at the same time, decreasing the environmental impact on the nearby Werri Lagoon. Due to the massive weight of the piers, which support the bridge, a concrete mix was developed containing 30% fly ash.

The inclusion of the fly ash mix increased workability, working time and ensured that the core temperatures and temperature gradients of the concrete were kept at a sufficient level. To read more about the project, visit: <http://www.abc.net.au/local/stories/2014/09/12/4086323.htm>

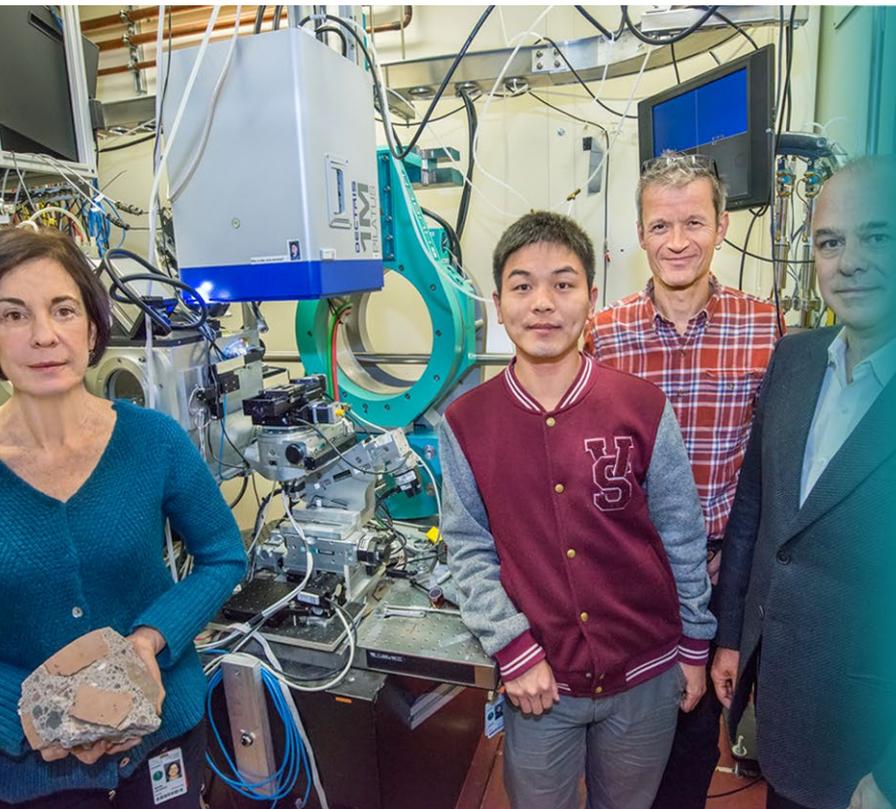
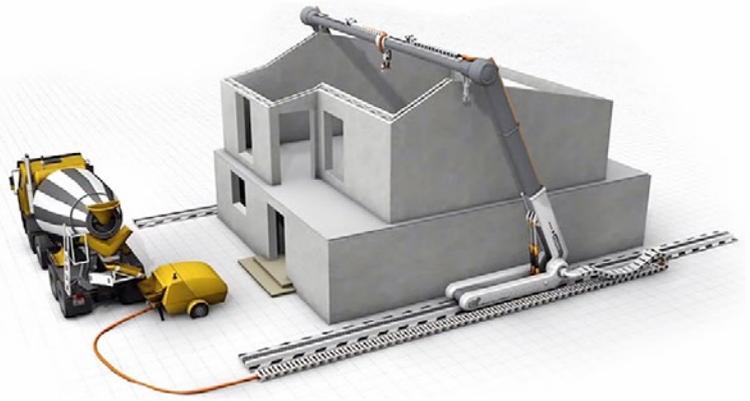


3D printers for Concrete?

3D Printing is the process of making a three-dimensional object from a digital model. The process involves adding successive layers of material on top of one another, using a computer system to create a physical product. Recently 3D printers were created in sizes so that they could print commercial projects, such as homes and buildings at a fraction of the time and cost, using materials such as fly ash, to reduce total emissions by up to 80%.

The most recent building that has been created is WinSun's five story apartment in Suzhou, China. Each floor took only one day to complete. The company has also produced ten houses in 24 hours. The company's recent success has landed them a contract with the Egyptian Government for 20,000 homes to be printed in the near future.

The ADAA will continue to update readers on the newest developments of 3D printers using fly ash in coming editions on Coal Ash Matters. For more information about 3D printers, please visit: <http://goo.gl/1fQL2S>



“Sooner or later, everything old is new again.”

How is it that concrete structures such as the Colosseum have lasted thousands of years yet a modern building is looked at skeptically after no more than 50 years? A group of researchers has possibly answered the question. Using an X-Ray Generator to scan the layers of the 2,000 year old concrete the team discovered that a crystalline binding hydrate caused by the combination of Roman volcanic ash, lime and mortar impedes the ability of the concrete to fracture or crack.

Mary Jackson, the scientist who led the study said that “The mortar resists microcracking through in situ crystallization of platy stratlingite, a durable calcium-alumino-silicate mineral that reinforces interfacial zones and the cementitious matrix.” These results suggest that the smooth surfaces of the crystal structures created from the volcanic blend are the key to the longevity and endurance of the ancient concrete structures.

Jackson believes that the future challenge for other scientists and researchers will be to find ways to activate aggregates such as fly ash, in concretes to create similar stratlingite reinforcements. To read more, visit: <http://goo.gl/XhMeLo>

CONFERENCE

7th IEA CCC Concrete Sustainability Conference on Clean Concrete Technologies



The National Ready Mixed Concrete Association is hosting the 7th International Concrete Sustainability Conference on Clean Concrete Technologies in May this year from the 11th-13th at the Intercontinental Miami Hotel. The Conference invites engineers, researchers, contractors, industry professionals and all those interested, to network with one another and share research. The deadline for early registration is April 20th, 2015, so be sure to mark your calendars.

Session topics for the Conference are as follows:

- Resilience: Strengthening the social and economic community through planning and design.
- Life Cycle Assessment: Assessing the environmental impacts for buildings, concrete manufacture and infrastructure.
- Low Impact Development: Methods such as erosion control structures and pervious pavements.
- Material Science: Designing extended service life models and innovations in durability.
- Corporate Responsibility: Green initiatives used by businesses, manufacturers, designers and building owners as well as incentives and legislation.

During the Conference, a Women in Concrete Alliance Forum will also be held. The forum will feature of panel of guest speakers discussing the role of women in the concrete industry.

For more information about the Conference, or to register, please visit: <http://www.concretesustainabilityconference.org/miami2015/index.html>



CONFERENCE UPDATE

23rd Australasian Conference on the Mechanics of Structures and Materials

The 23rd Australasian Conference on the Mechanics of Structures and Materials (ACMSM23) was hosted by the Southern Cross University (SCU) in Byron Bay at the Lismore Campus between 9-12 December 2014. The ACMSM Conference series has been run biennially since it was first held at the University of New South Wales in 1967.

Each year the Conference targets the similar topics of:

- Each year the Conference targets the similar topics of:
- Analysis and behaviour of structures under static and/or dynamic loading
- Materials, structures and structural element studies in the field of elasticity
- Plasticity and visco-elasticity
- Creep and fatigue performance
- Application of computers to the analysis and design of structures and;
- Advances in computer based applications.

The aim of the Conference is to provide a forum for the presentation of papers and discussion by authors, research workers and other stakeholders. Over 180 presentations were delivered at ACMSM23 including 6 keynote speakers.

The Concrete Institute of Australia, Cement Concrete and Aggregates Australia, Ash Development Association of Australia, the Australasian (Iron and Steel) Slag Association and the Amorphous Silica Association of Australia supported the Conference with information booths that were well attended during session break.

Our thanks are extended to Dr Daksh Baweja for coordinating the Association's presence at the Conference and preparing this report.

To read more about the Conference, click here: <http://scu.edu.au/acmsm23/>

CONFERENCE

WOCA - World of Coal Ash 2015

The 6th biennial World of Coal Ash Conference is almost here! The Conference will take place from 4-7 May 2015 in Nashville, Tennessee, USA. Organised by the American Coal Ash Association in conjunction with the University of Kentucky Centre for Applied Energy Research (CAER) The Conference focuses on the science, application and sustainable use of coal ash globally.

With over 600 participants and 50 vendors expected at the event, a wide range of topics will be covered such as utilisation of coal ash and flue gas desulfurisation, sustainable projects using CCPs, emerging technologies, fly ash management and disposal and much more.

Craig Heidrich along with a small delegation of members will be attending the Conference. Mr Heidrich on behalf members will deliver a paper focusing on aspects of the Australian industry along with joining a panel discussion during the opening session. We encourage our members to attend, given the substantial business exposure and networking opportunities.

Still not sure? Nashville, known as "Music City" is without doubt the centre of the music industry in America. On May 6, during the Conference, a "mecca of live entertainment" is said to be organised at one of the off-site locations, so be sure to bring your dancing shoes.

Early bird registration opened on 1 April 2015. For more information, visit: <http://www.worldofcoalash.org>



CONFERENCE

Concrete 2015: Research into Practice

Concrete 2015 will be held at the Pullman in Melbourne's Albert Park spanning three days (30 August – 2 September) allowing industry-leading stakeholders to share their innovative research in areas including materials, construction and design. The theme for Concrete 2015 is 'Research into Practice.' The Association will be a sponsor and exhibitor, so make sure you visit the ADAA stand!

Concrete 2015 will also be hosting the 69th RILEM Week Conference. RILEM is the highly Respected International Union of Laboratories and Experts in Construction Materials, Systems and Structures and has widely published research on SCMs within the industry.

The Awards for Excellence are one of the most exciting segments of the Conference. The awards recognise industry leaders for their innovative research in areas including design materials and construction. The Awards span three categories: Building and Engineering Projects, International Projects and Technology.

The Kevin Cavanagh Medal for Excellence in Concrete is perhaps the Conference's most prestigious award. At Concrete 2013, Cox Rayner Architects took away the award for the Australian Age of Dinosaurs Museum in Winton, Queensland. The Museum highlights the utilisation of concrete in an incredible way. The medal was awarded due to the creativity and ingenuity of the building.

Registration for the event opened in February. For more information please visit: <http://www.concrete2015.com.au>

concrete
30 August – 2 September
Melbourne, Australia **2015**

construction innovations:
RESEARCH INTO PRACTICE



Do you have a bright idea for an ADAArticle?

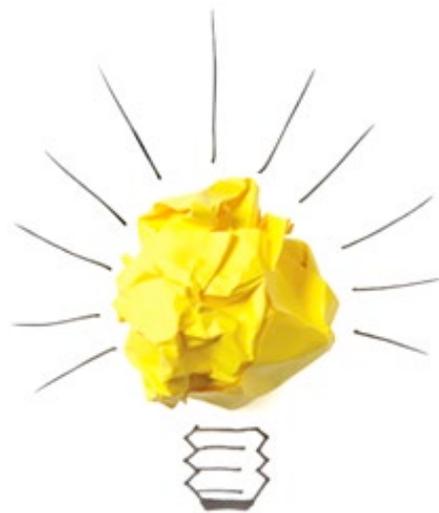
Coal Ash Matters is produced for the benefit of ADAA members and readers. Before each publication is drafted, an email is sent to all members, asking them to contribute stories that they think are of interest.

The kinds of content that would be preferable are:

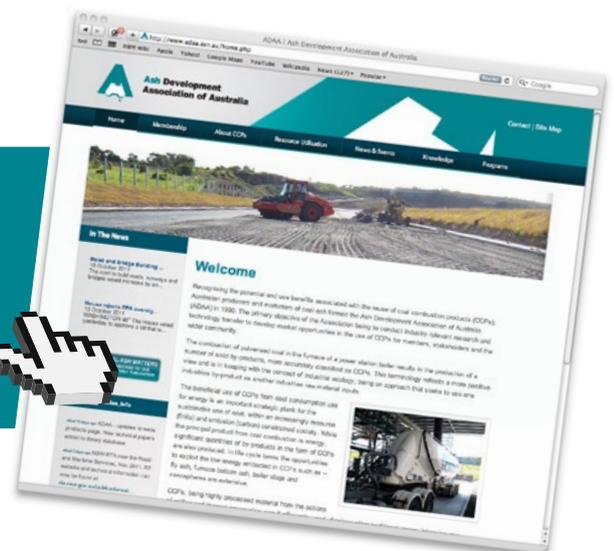
- **Any new projects related to the ADAA and the industry;**
- **Recent developments and innovations in the use of fly ash products;**
- **Recent appointments/key people of interest.**

We also have a Member Profile section which is open to all member companies for contributions on behalf of the business in general or a specific employee.

So, if you have some content that you think might make an engaging article for our readers, get in contact with Editor, Aiden Chilcott today at: marketing@hbmgroup.com.au



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