

ASSOCIATION connections

AUSTRALASIAN (IRON & STEEL) SLAG ASSOCIATION

www.asa-inc.org.au

Editorial

Australia has a long history of research involving the properties and use of iron and steel slag in the cement, and broader construction industry. Slag product research around road pavement and concrete aggregate applications extends back to the 1960's. From 1966, with the introduction of Ground Granulated Blast Furnace Slag (GGBFS) to the Australian market, research into its performance in cement became a focus. As with any field of scientific research, the presentation of findings to conferences is an important part of peer review. These conferences also provide an opportunity for collaboration and identification of areas requiring further research. Iron and steel slag researchers from Australia are and have long been part of the international research community. One of the earliest international conferences in which the Australasian slag industry participated was the 1st Process Technology Conference in Washington DC in 1980 where a paper on the then state of the Australian Slag Industry was presented as part of the Recycling in the Steel Industry strand of the Iron & Steel Society of AIME. In 1986, 1987 and 1989, Australian researchers participated in international conferences in Madrid, Toronto and Trondheim. These conferences were conducted under the sponsorship of CANMET and ACI.

Australasian conferences in support of the iron and steel slag products commenced in 1988 with the "International Workshop on the use of Fly Ash, Slag and Silica Fume and other Siliceous Materials in Concrete" in Sydney Australia. Leura in the Blue Mountains west of Sydney was the venue in 1990 for the Concrete for the Nineties – International Conference on the use of Fly Ash, Slag and Silica Fume and other Siliceous Materials in Concrete". In the years since its formation in 1990, the Association has been the vehicle for coordination of significant iron and steel slag research and the publication of results through Connections, the Associations web accessible library, industry journals and the organisation of targeted presentations, publications and events. In 2007, the Association organised the very successful and timely Sustainability and Slag Conference and looks forward to a successful Global Slag Conference in November this year.

6th Global Slag Conference and Exhibition comes to Sydney

Preparations are on track for the 6th Global Slag Conference 'Making the Most of the Recovery' to take place in November 2010 in Sydney, vibrant heart of the industrial powerhouse that is present-day Australia.

This conference is brought to Australia in cooperation with Australasian (iron & steel) Slag Association. Part of a successful international conference series for people involved in the global slag products industry, it follows the successful 2009, 5th Global Slag Conference held in Brussels Belgium, where over 140 delegates from nearly 40 countries assembled at the end of November for the conference and exhibition. As well as attracting representatives from the iron and steel industries in Australia, New Zealand and from around Asia and beyond, this year's conference will also appeal to cement and construction industry personnel who have an interest in increased use of slag and slag-derived products. As always, a high standard of technical presentations industry exhibition and breakout sessions will facilitate excellent networking opportunities. With a Gala Dinner at the Sydney Opera House, the social programme will also be one to remember! Attendees are expected from over 35 countries, with representatives from Australasia, Asia, India, the Middle East, Europe, Africa and North and South America.

A highlight of the Conference will be a field trip to the very modern steelworks of BlueScope Steel in Port Kembla NSW, Australia and the comprehensive iron and steel slag processing facilities of Australian Steel Mill Services.

If your business is related to the production, processing and marketing of iron and steel slag products, then you should certainly attend the 6th Global Slag Conference, in Sydney, Australia. Programme and registration details are now available at www.propubs.com/gsc/



Delegates to 2009 Conference and Exhibition

1. Editorial
2. 6th Global Slag Conference and Exhibition comes to Sydney
2. Speakers confirmed for Sydney Global Slag Conference
2. International slag demand increases as supply declines
3. Insider - Steel Furnace Slag - an economic hard stand construction material
4. Insider - Steel Furnace Slag Fines utilised for removing phosphorus from tertiary treated effluent at Newcastle
5. Association contributes to Sustainability Capacity Building Program in Victoria
6. News Briefs - Australasian & International

CONTENTS

CONNECTIONS EDITORIAL TEAM

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Speakers confirmed for Sydney Global Slag Conference

The 6th Global Slag Conference (GSC) has already attracted a line up of international and Australasian speakers covering a range of topics. This is the first international slag conference to come to Sydney since the "Concrete for the Nineties" in 1990 at Leura. Papers and presenters confirmed by GSC organisers to date include:

A global overview of slag trends - Charlie Zeynel, ZAG International Inc.

A move towards legal certainty - changing the waste paradigm - Craig Heidrich, Australasian (iron & steel) Slag Assoc.

Australia's climate change policy response in the context of the Copenhagen Accord, Cancun and beyond - Mike Michael Hitchens, Chief Executive Officer, Australian Industry Greenhouse Network

An update on Australian GBCA activity - Robin Mellon, Green Building Council of Australia

A review of slag applications in the Middle East, India and Bangladesh - Alexander Koshi, Ultratech Cement, India

An update on the iron and steel slag industry in the United States - Karen Kiggins, ED National Slag Association, US

Study on steel slag in Japan, and the activity of the Nippon Slag Association for sustainability - Dr Tomo Isawa, JFE Steel Corporation

The experience of BOF slag fines application in China - Nick Jones, Harsco Metals Group Limited

A sustainable supply chain approach to creating new EAFS products - Dr A. Woodhead, Link Strategy; C. Heidrich, Australasian (iron & steel) Slag Assoc.; D. Cartwright, Harsco Metals

A new integrated dry slag granulation and heat recovery process - Dr Sharif Jahanshahi, Dr Dongsheng Xie, CSIRO.

Slag cooling and dust control in steelmaking - Edwin Peterson, Dust Control Technology

Stainless steel slags as neutralising products in industrial processes - Dr. Timo Parviainen, Tarja Vanhamaa, Outokumpu Tornio

'Fire resistance of OPC/slag concrete' - Alessandra Mendes, Monash University

'Additive solutions for slag grinding and quality' - Jorg M. Schrabback, Sika Services AG

'Factors affecting the performance of milled slag' - Violeta Paicu and Dr. Warren South, Boral Cement

'Study of the reactivity of blast-furnace slag in cement' - Géraldine Vanhamme, University of Brussels

'Feasibility studies of various steelmaking slags in cement making - JSW Vijayanagar Works, India, D Satish Kumar, T Umadevi, H K Paliwal, Ganapathi Prasad, P C Mahapatra and Madhu Ranjan; JSW Vijayanagar Works, India

'Mixture design and engineering properties of concrete made of new slag ash' - Chao-Lung Hwang, National Taiwan University of Science and Technology

'Crack width calculations with slag blends' - Prof Jay Sanjayan, Swinburn University of Technology.

'A study of in-situ cementation and discolouration of granulated iron blast furnace slag' - Dr. Ihor Hinczak, Cementech Pty Limited, Dr. R. A. Day and Dr. W.J. South, Boral Cement

'The regenerative frictional properties of slag aggregate' - Nick Jones, Harsco Metals Group Limited

'The rut resistant performance of slag aggregates in pavements' - Greg Arnold, Director Pavespec Ltd (NZ)

'The skid resistance performance of a unique iron making slag' - Bill Bourke, Bluescope NZ

'Australian slag in roadmaking - Case studies' - Marc Smith, Dr Vijay Joshi; ASMS



Presentation ASA Sustainability and Slag Conference Sydney2007

This conference provides another opportunity to showcase the extensive and internationally recognised work carried out in the Australasian iron and steel slag industry, building on the ASA Conference Sustainability and Slag held in Sydney in 2007.

International slag demand increases as supply declines

The international drive for lowering the carbon intensity of economies has been driving the uptake of iron and steel making slags as preferred construction materials. This is particularly so as more and more iron blast furnace slag is granulated and ground to replace Portland cement in concrete. There is almost a tonne of greenhouse gas saved for every tonne of cement replaced. Cement Americas (digital) August 2010 publication* quotes a study by InterTechPira, a business intelligence group in the United Kingdom. This study suggests that 'demand for ferrous slag in cement and aggregate industries worldwide stands to outstrip supply.'

Driving forces for this future imbalance are driven by advancements in iron and steel production technology and improved quality control systems. Also driving the market is the pressure on primary cement aggregate and concrete producers on quality and environmental impacts of their processes. Part of the cycle of change impacting on availability of iron blast furnace slag is the closure of a number of blast furnaces around the world as the steel producers move to creating larger companies to get economies of scale. Subsequently marginal facilities are being taken out of service or closed permanently.

At the 2009 5th Global Slag Conference, Brussels Belgium, the first speaker Charlie Zeynel of ZAG Industries stated that in his experience, "the total volume of slag traded around the world has dropped. However, slag supply has become very tight, and slag prices have doubled. Slag is now even being shipped from Japan as far as France and Belgium (after the closure of a European steel works situated next to a slag-grinding plant)."

It is recognised that the inclusion of Ground Granulated (iron) Blast Furnace Slag (GGBFS) above certain threshold levels significantly improves durability of concrete structures placed in aggressive environments. However, the total world supply of iron blast furnace slag approximates 13 per cent of total world cement production. Not all of this is converted into granulate and ground as a cement replacement. The overall supply gap is projected to bring improved benefit for slag producers as the construction industry further recognises the environmental and durability benefits from using slag products.

Source: *Cement Americas August 17, 2010

Steel Furnace Slag (SFS) – an economic hard stand construction material

The Port of Port Kembla NSW has become a designated location for the import of motor vehicles, machinery and equipment into the state following the closure of the Sydney facility. This has necessitated the development of infrastructure for vehicle receipt and storage prior to despatch to distributors and end customers. Depending on the type of vehicles being received, storage requirements and the processes necessary before despatch, the storage pads can be very expensive to install.

Association member SCE group in Port Kembla demonstrated innovation possible from the use of -10mm steel furnace slag to construct a low cost low maintenance self stabilising pavement and associated bund walls. The project aimed to produce a secure vehicle hard stand area and perimeter bund walls economically and with low ongoing maintenance cost.

The pavement material was placed using conventional equipment, trimmed and compacted in place using a smooth 12 tonne roller with appropriate watering. Bund walls around the site were formed in place and smoothed off using conventional excavator equipment.

Self cementing of the bund walls allowed the perimeter fencing to be installed directly into the top of the wall, improving the security of the site.

Steel Furnace Slag's self cementing properties have been a significant benefit, from construction through to long term maintenance. The site has been actively used for 18 months with very little evidence of wear and with low maintenance costs. Bund walls also self cemented after a short period enabling a perimeter security fence mounted on top of the wall, increasing the site security.

Both the property owner and the lessee have benefited significantly from the use of compacted -10mm steel furnace slag in this application.

Source: James Davies SCE Group [e] jdavies@sce-aust.com



Company Members

A primary role of our Association is to bring together Slag Producers, Processors, Customers & Suppliers to the Slag Industry. Our activities cover technical developments, plant operations and processes, education and promotion. If you would like more information on the Association and how you can become involved, simply complete the information section at the end of this newsletter. Current membership is as listed below.

Australian Steel Mill Services Pty
BIS Industrial Logistics
Boral Cement Ltd
Bluescope Steel Ltd (Port Kembla)
Cement Australia
Concrete Pty Ltd
CSIRO
HiSmelt Ltd
Holcim Pty Ltd
Holcim NZ Ltd
Harsco Metal Holdings Pty Ltd

Monash University
OneSteel Limited
Roads & Traffic Authority of NSW
SCE (Steelstone)
Steel Cement Ltd
SteelServ Ltd (NZ)
Swinburne University of Technology
University of Newcastle
University of Queensland
University of Wollongong

Personal Members

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Heaton, B (Hon.)
Hinczak, Dr, I (Hon.)
James, W (Hon.)
Jones, D E (Hon.)
Prosser, S D (Hon.)
Venour, M (Hon.)

Related Associations - Canadian Slag Association | National Slag Association (US) | Nippon Slag Association (Japan) | European Slag Association (EU)

Steel Furnace Slag (SFS) fines utilised for removing phosphorus from tertiary treated effluent at Newcastle

In early June, ASMS' Dr Vijay Joshi visited a newly built light industrial site at Hexham near Newcastle where steel furnace slag fines were used to remove phosphorus from tertiary treated effluent. The phosphorus absorbing capacity of SFS fines was established through external laboratory testing, which concluded that Phosphorus Sorption Index and Phosphorus Retention Index were classed as very high. This means that SFS is able to remove a high percentage of phosphorus from waste water and also retain phosphorus for a long period of time. Our material was blended 1:2 with a local sand and placed under grass. Sprinklers deliver the treated effluent to the grass and phosphorus is removed as it filters through the bed of SFS/sand before entering a nearby waterway. Phosphorus increases the growth of damaging algae in creeks and rivers which reduce populations of native plants and fish. Use of SFS fines in this project allowed our customer to develop the site without the need for an EPA discharge licence, which had previously been the case.

Contact: for further information Dr Vijay Joshi, ASMS



Association contributes to Sustainability Capacity Building Program in Victoria

For the past nine months, the Australasian (iron & steel) Slag Association (ASA) has been actively engaged in delivering a targeted "Sustainability Capacity Building Program" in collaboration with Sustainability Victoria.

Slag is a valuable resource. Barriers to effective utilisation include awareness and understanding of the resource properties and characteristics, unidentified areas for reuse and associated benefits (commercial and environmental) that can be derived. Effective utilisation by associated industries of these resources has the potential to provide long term sustainability. Benefits including a significant carbon reduction accrue when slag products are used to displace finite natural resources.

With the specialist support of Link Strategy, a sustainability policy and strategy consultancy, the ASA has engaged Association members and non-member organisations in a variety of activities taking a supply chain approach to increase utilisation of slag in existing and new product applications. One Steel, Harsco and key industry stakeholders in the slag sector are participating along with key Victorian government agencies. These participating organisations have come to recognise that real benefits can only accrue from the program if they tackle the inherent complexity of the supply chain; challenging old assumptions and practices about utilising the slag in road base and other product applications.

The Sustainability Victoria program has a number of modules:

- Sustainability Engagement Survey to determine attitudes, awareness, interest, current level of engagement and level of commitment towards achieving sustainability amongst members of our industry sector.
- Assessment & Benchmarking processes will measure the resource impact of slag and set benchmarks for resource use across the industry.
- Sustainability Workshops with industry and strategic supply chain partners to explore building partnerships about new products from slag.
- Building Networks A communication strategy to build relationships and the foundation for future cooperation both among industry and with supply chain producers and consumers.



On site inspection of slag products

To date, this 18 month program (June 2009 – December 2010), has delivered an engagement survey, two workshops and two webinars. These have been conducted with 32 participant organisations representing several sectors of the Electric Arc Furnace Slag (EAFS) supply chain including resources, producers, value adders, customers, researchers and the government.

Several new, low carbon product opportunities are under investigation and case studies are in development. The ASA continues to look for opportunities to expand the capacity of its members to increase the effective utilisation of slag in new products and or applications.

The ASA thanks all organisations currently involved in the program for their participation and efforts thus far. For further information regarding the program or its aims, contact Niribi Charker (Project Manager) at the ASA office on 02 4225 8466.



6th Global Slag Conference Sydney 22-23 November 2010

Co-sponsored by the Australasian (iron and steel) Slag Association

'Making the most of the recovery'

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AUSTRALASIAN

Ecocem Planning for the Future

Currently engaged with one of its shareholders, Cement Australia, Ecocem is planning the construction and operation of a new milling plant to be housed in the proposed Port Kembla Outer Harbour expansion. Affectionately tagged the "Mega Mill", the facility will be the largest Vertical Roller Mill (VRM) in Australia and will grind over 1.1 million tonnes per year of both granulated slag and clinker into cement. The preliminary engineering designs and project approvals are being worked on at the present, with the intent to have the project fully underway by mid next year, and the plant commissioned in mid 2013. This \$160m venture will allow an extra +300,000t of Ecocem product into the market each year and will help ASMS to create more value from its slag products.

ASA Environmental Monitoring Program

The Final Report from the ASA's ongoing Environmental Monitoring Program for 2009 has been completed. Results in this report are consistent with results from previous studies, giving confidence in the environmental stability of iron and steel furnace slag. To view these results, the report can be accessed from the Association website at [http://www.asa-inc.org.au/Doc/ASA_EMP_2009\(final\).pdf](http://www.asa-inc.org.au/Doc/ASA_EMP_2009(final).pdf).

Contribution to Australian Standards

Since its inception, the Association has contributed to the development of Australian Standards in the construction materials area. Notwithstanding the reorganisation of Standards Australia (SA) the Association has continued its support and is involved in discussions in line with SA's current pathways to ensure currency of these relevant construction materials standards.

Green – The Colour of Construction

Consideration of a project's environmental footprint is necessary today whether building a house, refitting an office space

or constructing a landmark building. This is driven by increasing Government planning requirements on energy conservation / minimisation and by the raising of community environmental consciousness. Iron and steel slag products have a significant part to play in reducing the embedded energy component of construction. The Association has recently taken up associate membership of the Australian Green Infrastructure Council, ensuring it a place in the ongoing dialogue on green construction.

INTERNATIONAL

USA Slag Cement Statistics

During the last 10 years, there has been over 29 million metric tons of slag cement consumed in the U.S. saved the equivalent:

- Carbon dioxide emissions of 4.1 million passenger cars;
- Energy consumption of 596,000 homes;
- Virgin materials to produce enough Portland cement for 22,000 lane-miles of 8-inch thick concrete roads?

Source: Slag Cement Association: www.slagcement.org

Global Slag Conference comes to Sydney

In November this year, Sydney plays host to the 6th International Global Slag Conference. By invitation from the Australasian (iron & steel) Slag Association the conference 'Making the Most of the Recovery', will be held from 22-23 November 2010 with a visit to Port Kembla Steelworks and adjacent Australian Steel Mill Services facilities. See pages 1 and 2 for information on the program. For conference registration contact: www.propubs.com/gsc/

New Cement assists the environment

Portland limestone cement (PLC) is produced by blending portland cement and limestone or intergrinding portland cement clinker, limestone, and calcium sulfate. Replacement

of portland cement with limestone results in a proportionate reduction in the amount of CO₂ associated with concrete production, and this reduction can be further enhanced through the use of supplementary cementitious materials (SCMs) such as slag cement or fly ash. PLCs can, therefore, significantly minimize the concrete industry's carbon footprint.

Source: *Concrete international* / January 2010 p 35



global slag

6th Global Slag Conference
Sydney 22-23 November 2010
 Co-sponsored by the Australasian (iron and steel) Slag Association

'Making the most of the recovery'

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