

The Extract



From the CEO

The bid for the CRC for By-product Utilisation (CBU) has been invited to Stage 2 of the CRC Program selection process. This is a terrific reward for a lot of hard work by a number of people. Congratulations to all those involved. We have since submitted indicative project plans from each of our proposed research programs for peer review. We will be attending an interview with the selection committee in Canberra on 1 December.

Putting the bid together in such a short time was a tremendous collaborative effort. Tasks included meeting with various alumina, power and cement producers; meeting with MPs and government departments; scoping out the proposed research programs; and estimating the expected impact and value. Success with this bid will allow us to build on much of the work of CSRP particularly in the areas of zero waste, minor elements and sustainable development.

Although we have been working hard on the bid, work has continued on our core areas of research and highlights from recent months are reported on in this newsletter.

The CSRP annual report was submitted on time to the Department of Innovation and hard copies will soon be posted to our Participants. Planning is well underway for the winding up of CSRP (and hopefully transition to CBU) mid next year. Our tasks in the coming months include finalising the work of CSRP and putting our best foot forward for Stage 2 of the selection process for CBU. I will keep you posted on any updates, and as usual, please feel free to contact me.

On behalf of CSRP, I would like to congratulate Zeljka Pokrajcic, a PhD student at the University of Queensland, for being chosen as recipient of the prestigious 2010 Vittorio de Nora Prize for Environmental Improvements in Metallurgical Industries. This award was

established by the Minerals, Metals & Materials Society (TMS) to commemorate Vittorio de Nora, a pioneer in the materials processing field and one of the great Italian technologists for the 20th century. The prize recognises outstanding materials science research and development contributions to the reduction of environmental impacts and particularly greenhouse gas emissions, as applied in global metallurgical industries, especially focussed on extractive processing. Formal presentation of the award will be made at the annual dinner of the TMS during their 139th Annual Meeting in Seattle, Washington, in February 2010. As a recipient of this award, Zeljka will receive a cash award and a certificate and will also make a presentation at the TMS 2010 Annual Meeting.

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MTEC sponsors process design project

Stevan Green presented "Sustainability – Big Picture" on Thursday 30 July to a joint session of extractive metallurgy fourth year students from the WA School of Mines, University of Queensland and Murdoch University.

The session is part of a semester-long course (Process Design Project) which is a collaborative final year course run under the Metallurgical Education Partnership (MEP) sponsored by the Minerals Tertiary Education Council (Minerals Council of Australia). The course focuses on student



groups, comprised of students from the three partner universities, designing a metallurgical processing plant using actual industry data.



Stevan Green presents to fourth year extractive metallurgy students. © CSRP

Greening Australia's roads

We have made some major advances in recent years to develop the technology for converting mining and energy sector residues into potentially valuable construction and agricultural materials. CSRP issued a media release on 21 September to promote two demonstration trials associated with the new Perth Bunbury Highway in Western Australia.

In the first trial, more than 2500 cubic metres of ReSand® was extracted from bauxite residue and used as road base to widen the Greenlands Road access to the new highway near Pinjarra, Western Australia.

ReSand® is a concept developed by CSRP which assesses the ecological footprint or impact of sand sourced from recovered material, such as mineral residues, compared with

conventionally sourced quarry sand. This gives developers, regulators and the community an assurance that the use of these residue materials is in fact the best outcome for the environment and for society.

The recovery of construction sand from mineral residues will have a range of potential benefits including:

- replacement of increasingly scarce supplies of quarry sand;
- reduction in the clearing of natural bushland for sand quarries; and
- reduction in the demand for expensive waste residue containment facilities.

These benefits can lead to reduced costs, less energy and water use and lower greenhouse gas emissions.

In the second trial, a demonstration "nutrient trap" utilising bauxite residue

has been installed by the side of the new road. The trap collects water run-off and removes nutrients such as phosphates and nitrates, to help prevent algal blooms in the surrounding waterways.

These are just two of several exciting CSRP innovations turning mineral processing residues from Australia's mining and energy industries into useful products like concrete, construction materials (such as sand and aggregates), soil treatments and nutrient traps; all with the aim of improving ecological, societal and economic outcomes.

CSRP worked with the Department of Agriculture and Food WA, Main Roads WA, Southern Gateway Alliance, Alcoa, Wallis Water and other project partners to establish these and other projects.

New positron emission particle tracking lab in South Africa

The world's second Positron Emission Particle Tracking (PEPT) facility in Cape Town, South Africa was officially opened on 4 August 2009 with a welcoming address, a tour of the facilities and an informal dinner.

PEPT is based on the tracking of a single tracer particle which has been labelled with a radionuclide that decays via beta-plus decay, within the field of view of a modified PET camera. This

provides the basis for a technique for the characterisation and visualisation of particulate flow within aggressive industrial environments, such as tumbling mills, flotation cells and powder mixers.

The new laboratory is situated at iThemba LABS (national cyclotron centre) and funding was provided in-part by CSRP along with other international collaborators, including the National

Research Foundation of South Africa, Imperial College London, and the University of Cape Town through its Centre for Minerals Research, the Minerals to Metals Initiative, and the Equipment Committee.

Visit www.pept.uct.ac.za for more information on the PEPT facility.



Left to right: Dr Indresan Govender (University of Cape Town) at the PEPT opening; Prof Malcolm Powell (University of Queensland) beside the iThemba cyclotron; Prof Malcolm Powell, Dr Indresan Govender and Dr Aubrey Mainza (University of Cape Town) with the inside of the PEPT camera. © UCT and M. Powell

Sustainability assessment forum

The *Sustainable Development Indicators for the Minerals Industry* (SDIMI) conference was held on 6-8 July on the Gold Coast and was chaired by our Sustainable Development Program Leader, Prof David Brereton, from the University of Queensland.

The event was a huge success, with over 160 delegates attending from over 12 different countries including Canada, South Africa, Germany and Australia. Presentations were varied and covered topics such as sustainability reporting, human development in mining zones, sustainable futures, optimising mine site design, sustainability roadmaps, social conflict and mining, policy development, remote sensing, and life cycle assessments.

Various CSRP staff members chaired sessions – including Stevan Green, Dan Churach, Glen Corder (University of Queensland), Philip Bangerter (Hatch),

Sharif Jahanshahi (CSIRO) and Andrew Murphy (Hatch). Stevan Green chaired the CSRP-run *Sustainability Assessment Forum*. To “plant the seeds” for discussion, a panel of four sustainability practitioners delivered specific examples of sustainability initiatives (successful or otherwise) or vital characteristics, drawing on their experience, needed to drive sustainability initiatives to practical outcomes in the minerals industry. The panel comprised:

- Malcolm Powell – Professorial Chair in Sustainable Comminution at the University of Queensland
- Patrick Crittenden – Principal Sustainability and Climate Change for GHD
- Rick Humphries – Director, Carbon for Greening Australia
- Adrian Abbott – Queensland Regional Manager for Energetics

Important messages emerged from each

presentation – not all on the same theme as the backgrounds of the panel were distinctly different. These messages from the panellists highlighted:

- Perceived risk and technical change can be a critical barrier for new initiatives, even when there are potentially sizeable sustainability and cost benefits;
- A collaborative “whole of business” approach is necessary even when tackling problems that appear to be solely in the technical domain;
- The overwhelming requirement that successful sustainability initiatives need is a “business case” to demonstrate value and a champion at the highest level in an organisation; and
- Improved sustainability performance at site level needs to be established quantitatively through systematic and transparent data monitoring and analysis.



Left to right: Dr Dan Churach (Murdoch University), Prof Malcolm Powell (University of Queensland) and Stevan Green (CSRP) presenting at the SDIMI conference. ©CSRP

Education

The writing course **Writing Clear Science** ran on 8-10 July under the tutelage of Dr Marina Hurley. Seven CSRP and five Parker Centre postgraduate students participated in the course.

Dr Jim Avraamides presented a talk entitled “An overview of the mineral

resource industry in Australia” to the **Australia Student Mineral Venture** school students on Tuesday 7 July.

Dr Dan Churach lectured a group of high school “extended students” from **All Saints College** (WA) on Thursday 9 July, giving them an overview of the mineral resource sector in

Australia and some insight to career opportunities within the extractive metallurgy discipline. Murdoch staff members Dr Aleks Nikoloski and Ken Seymour along with Graeme Thompson (current PhD student) and Sam McDonald (CSRP student alumni) contributed to the hands-on sessions.

Learning from Europe's big mine



Left to right: Prof Magnus Evertsson (Chalmers University) a crushers specialist, with Prof Malcolm Powell standing by the world's largest mill; Prof Marcelo Tavares (University of Rio de Janeiro) from the AMIRA P90 project with Prof Malcolm Powell overlooking Europe's deepest pit; and Prof Evertsson and Prof Powell outside the Aitik primary crusher. © M. Powell

Prof Malcolm Powell recently presented a plenary lecture at the *European Symposium of Comminution and Classification* in Helsinki, Finland. The conference was not dominated by mineral processing, with areas like pharmaceutical and food processing being well represented, but there were very good presentations on comminution research. Malcolm took the opportunity to make some new contacts with top-notch researchers in Europe and met with some other collaborators on the AMIRA P90 project, part of which makes up the CSRP 2B2 Extension project "Comminution Program Research".

After the conference a workshop was held with the aim to rejuvenate the International Comminution Research Association (ICRA), and was followed by a field trip to Sweden. Malcolm visited the famous Aitik Boliden copper mine – the deepest pit in Europe at 400 metres. The mine has a low ore grade at 0.38 percent copper, but makes up for this with the lowest production cost in the world at 80 US cents per pound of copper.

In order to slash transport costs, they are switching to in-pit primary crushing so that they can convey the ore out of the pit via tunnels to the surface. From the surface it travels

3 kilometres on a conveyor to a new processing plant. Although the new plant has the biggest mineral processing mills in the world, the new plant and conveying system combined are expected to reduce production costs to 60 percent of current and dramatically expand the viable ore body, down to a head grade of 0.3 percent.

They rely on their famous gravity feed system direct into a secondary pebble mill. In order to do this they build on a slope and put the primary mills on 18 metre high foundations – using about 10,000 tonnes of concrete. If only they had considered geopolymers to give them a more environmentally friendly footprint!

The processing plant avoids unnecessary pumping, has no steel grinding media, and uses screw classifiers (low pressure feed and thus lower pumping costs) to derive their phenomenally low operating costs. With such a low energy footprint, this must also make them one of the most eco-friendly sites in the world. They are also covering over the old rock dumps with top soil and revegetating them. Aitik Boliden is certainly an example to follow in greater sustainability in mining.