VIRTUAL GRINDING

In-depth insight to improve mill design

By REBECCA THYER

A NOVEL program used to model rocks in crushing and grinding mills is helping to improve the energy efficiency and processing capabilities of mills, and at the same time is accelerating new machine design.

The collaborative team behind the modelling program includes researchers from CSIRO, the Centre for Sustainable Resource Processing (CSRP), the Julius Kruttschnitt Mineral Research Centre (JKMRC) and the University of Cape Town.

The collaboration's novel approach to improving comminution by modelling at a micro-level involves building a virtual comminution machine (VCM) – a computer simulation program – and draws on CSIRO's simulation skills and JKMRC's characterisation capabilities.

The VCM uses computational modelling inputs, including detailed ore characterisation tests with CAD (computer aided design) drawings, to predict machinery operations, such as progeny, power consumption, forces on internal components and wear rates.

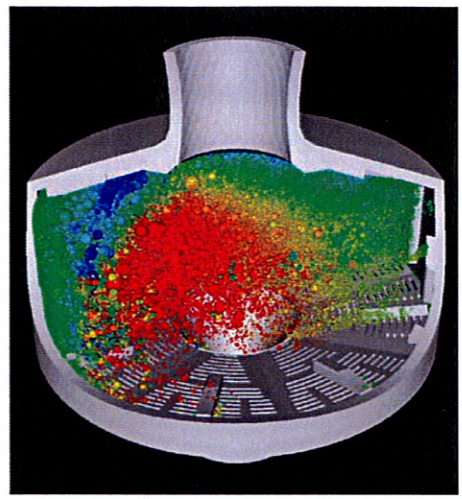
Dr Paul Cleary of CSIRO Mathematical and Information Sciences says the VCM is helping the team better understand what happens inside a mill, impacting on processing, design and energy use.

He says that with comminution devices using five to 15 per cent of Australia's energy, improving efficiency is important.

"Mills have low energy efficiencies because we don't really know what happens inside them," Dr Cleary says. "So, by increasing our understanding, we can improve processing and the design of crushing and grinding machinery to use energy more efficiently."

JKMRC's Dr Rob Morrison says this insight could also accelerate new device development, by allowing prototype comminution machines to be designed and tested using the VCM.

"This has the potential to reduce development time for a new machine from the current 10 to 25 years, to just a few years; it would substantially reduce costs as well as time," Dr Morrison says. "If we can accelerate the design of more eco-efficient equipment, it means a more sustainable future for the industry and its customers."



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Dr Cleary says the collaborative project is ongoing and, over time, the team hopes to answer a wider range of comminution questions.

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RECYCLING

Flowsheeting brings battery recycling a step closer

The recovery and purification of cobalt and lithium from spent batteries could be a step closer through the use of new solvent extraction (SX) processes developed by the Parker Centre for Integrated Hydrometallurgy Solutions through CSIRO Minerals.

CSIRO Minerals researcher Dr Chu Yong Cheng says that although it is possible to recover cobalt and lithium from spent-battery leach solutions, separating them from impurities, such as iron, aluminium and copper, is difficult and complicated.

Through SX process development, Dr Cheng has found that synergistic or mixed SX systems have the greatest potential to separate and recover lithium and cobalt from spent-battery leach solutions.

He says the work is important given the rise in spent batteries and their metal which contains hazardous waste and is an environmental concern. "The growth in portable equipment use – from mobile phones to laptop computers and video cameras – has greatly increased the production and consumption of portable batteries," Dr Cheng says. "Successful recycling could reduce the amount of waste sent to landfill and improve metal resource use."

The Parker Centre SX Technology group has developed a number of processes to recover metals using synergistic or mixed SX systems, including systems to produce pure cobalt and lithium from spent lithium-ion battery leach solutions.

"Now that we've developed the process flowsheet, we are looking for industrial sponsors to develop the technology further," he says.

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