

WASTE MANAGEMENT

Sulfidic waste offers hidden mineral wealth

By **BELINDA HUMPHRIES**

CSIRO RESEARCH IS mapping the way for mining companies to exploit hidden mineral wealth within their waste through simple separation processes.

Senior experimental scientist David McCallum says the work could change thinking within industry on how sulfidic waste should be handled – opening the way for significant environmental gains.

“At the moment there’s no real incentive, apart from the desire to be environmentally responsible, for companies to do anything with their tailings,” Mr McCallum says.

“We’re trying to say, ‘Look, some potentially valuable products are in these sulfidic tailings – if you do some extra work you can recover something you can sell, which will pay for the processing costs.’

“It’s a more efficient use of resources.”

He hopes to build an economic case to convince companies to take processing an extra step, thereby cutting their sulfidic waste output and lessening any negative environmental legacy.

Deep ore bodies are usually sulfidic in nature, presenting a risk of acid mine drainage – the formation and leakage of environmentally harmful sulfuric acid when tailings are exposed to oxygen and water.

Companies mining such deposits are forced to guard against this by carefully containing and monitoring the vast quantities of tailings that remain after processing.

In a project completed last year through the Minerals Down Under National Research Flagship, researchers applied four separation techniques – screening, gravity concentration, magnetic separation and flotation – on sulfidic tailings from four mines.

These included an operation processing a predominantly copper ore, as well as nickel, gold–copper and lead–zinc operations.

Researchers began with detailed characterisation work, analysing the samples chemically and using x-ray diffraction to identify mineral phases.

Mr McCallum says the results were a



Magnetic separators were one of the tools used in the research.

PHOTO: CHRISTIAN PEARSON

revelation to some operators, whose own tailings analysis focused on just a few elements.

“Some of the things that came up were quite remarkable,” he says. “One company changed from thinking about the tailings as a waste to thinking of it as a polymetallic resource.”

The research proved that potentially valuable products could be extracted from each sample through simple separation methods. At the same time, sulfide minerals were concentrated, leaving a relatively inert bulk waste.

Screening the copper operation’s tailings produced sand suitable for civil engineering purposes, while halving the sulfidic waste, for example.

“So instead of 10 million tonnes going into the tailings dam each year, they could do a simple screen and have five million tonnes going in – that might be enough to justify putting screening equipment in,” Mr McCallum says.

Magnetic separation was particularly promising in that case, yielding a high-grade iron product.

The research stemmed from the Centre for Sustainable Resource Processing’s (CSRP’s) ‘Towards Zero Waste’ foundation project, which aims to convert minerals industry waste into beneficial byproducts, or at least more benign forms of waste.

CSRP chief executive officer Stevan Green describes CSIRO’s sulfidic tailings research as exciting, saying it addresses one of the industry’s enduring legacy issues.

Mr McCallum is now seeking support from industry body AMIRA International for a larger study.

This would involve scaling-up the separation processes, refining them to better target particular byproducts and assessing those products’ saleability.

“The aim is to achieve the highest quality products and the lowest quantity of sulfidic waste,” Mr McCallum says. “We want to prove that companies can value-add by getting a product they can sell, while saving money on their waste treatment options down the track.”

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