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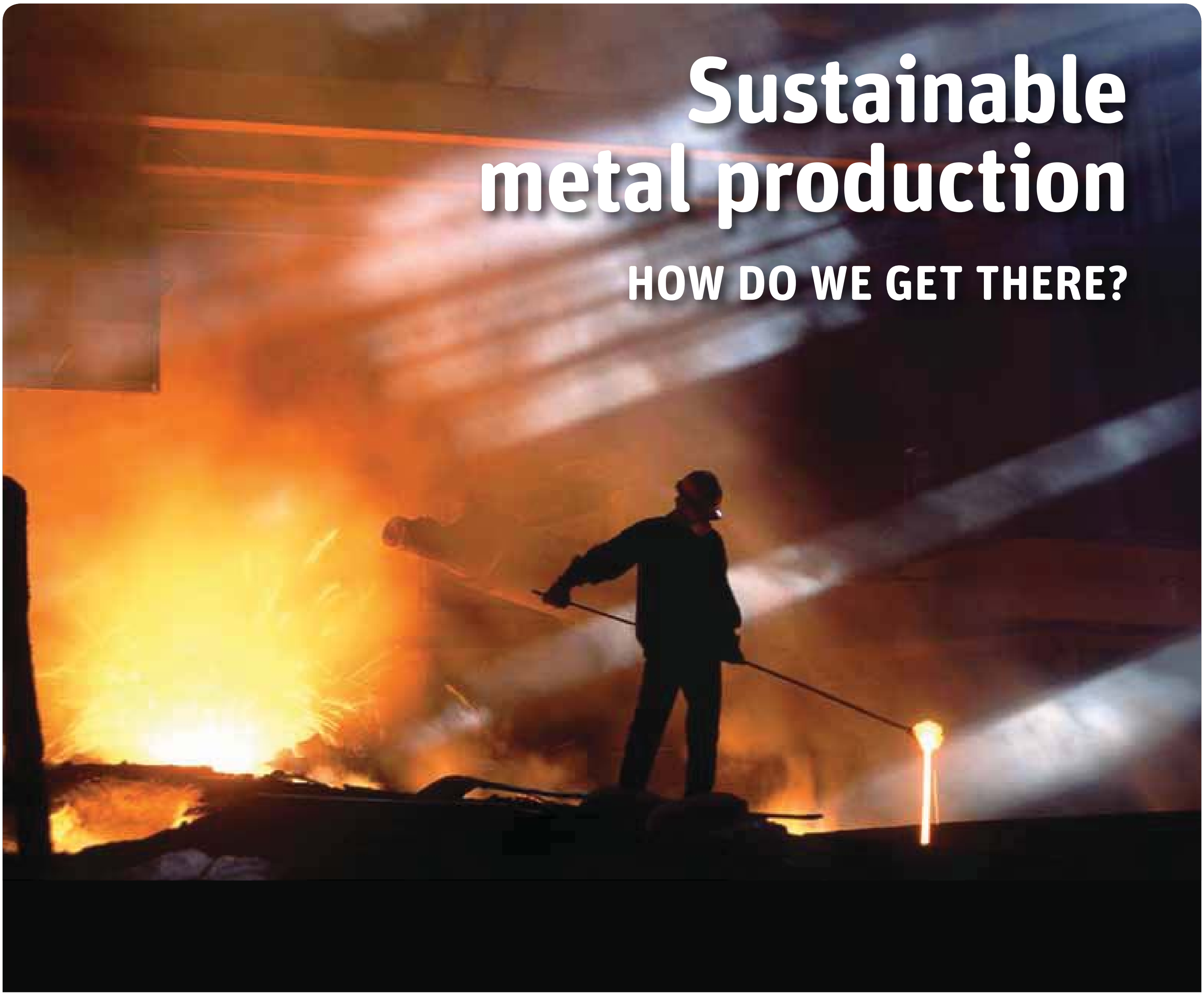
BRINGING CSIRO RESEARCH TO THE MINERALS INDUSTRY



Sustainable metal production

HOW DO WE GET THERE?

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In search of efficiency

Since the dawn of the metal production industry, demand has increased and reserve quality has declined, writes Xstrata Technology Chief Executive, JOE PEASE.

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AS RESEARCHERS, engineers and scientists in the minerals industry, we have a central role in achieving sustainability for the wider community.

We accept that some people don't understand this role and think we are helping 'the big polluters', but we know that society requires vital goods and resources and these must be produced in the most efficient way possible. It is our job to find the smallest environmental footprint for this production.

Sometimes it seems our job has never been more challenging. Demand for resources is growing as more and more communities seek the health and lifestyle benefits that we take for granted. Meanwhile, industry faces declining ore grades and increasing ore complexity. All things being equal, the environmental footprint to make every tonne of product will increase.

This however, has always been the case. Since humankind first hand-sorted alluvial gold and collected oil from surface seeps, demand has increased and reserve quality has declined.

Each generation of researchers and engineers is charged with finding the next efficiency gains – better designed products, improved recycling and more efficient primary production.

Xstrata Technology is one of the players seeking more efficient mineral processing and metal extraction processes. It was forged in Xstrata's Mount Isa Mine and Townsville operations, where the ores demanded better equipment for viable processing.

To be efficient and effective a technology must be robust and practical, which is why it is important to develop it on a site, where researchers work with operators, engineers and maintainers.

The power of this approach is demonstrated by several technologies that enabled previously unviable deposits, including the huge McArthur River mine in the Northern Territory, to be developed.

Since then, Xstrata Technology has continued that heritage. We decided early that improving efficiency is too important to keep our technologies a 'commercial secret', so we made them available to everyone. As a result, environmental improvements that started in Australia are now widely used around the world.

A case in point is the Isasmelt process. It was developed to overcome the high energy use and poor environmental standard of conventional smelting.

By collaborating with CSIRO and after several stages of demonstration at Mount Isa Mines in the early 1980s, a new smelting technology was created. A great improvement on existing technologies, it is now the backbone of many copper and lead smelting operations and is used to treat more than nine million tonnes of copper-bearing materials each year.

Importantly, Isasmelt is used not just in primary production, but in recycling too. Several of the world's biggest metal recycling operations based in Europe use the technology to recover copper and other metal products while meeting the strictest community air quality standards.

Often the gains we seek are found in other fields. We have to look outside our disciplines and be alert to the possibility of crossover into different applications. This was the story of Xstrata Technology's IsaMill.

The incentive to look to other industries was driven by the increasingly fine-grained nature of Xstrata's Australian lead-zinc deposits. They needed grind sizes of seven microns – as fine as talcum powder – to be economic.

Such grind sizes were unheard of in mining and unachievable with conventional ball and tower mills. Yet it was a common size for some manufactured products including paint pigment, printer inks, chocolate and pharmaceuticals.

Our search led to the German company Netzsch, who were the leaders in ultrafine bead milling for manufacturing. Together we worked for several years to transition the technology into mining.

We had to upsize and ruggedise it for large tonnage hard rock applications, with several stages of demonstration in our Mount Isa operations. The transition from 'ink to zinc' was remarkable and it enabled the development of the George Fisher and McArthur River mines.

Since then the technology has been widely adopted around the world, improving the efficiency of zinc, platinum, copper, molybdenum, gold and iron production.

Having crossed over from manufacturing to ultrafine grinding in mining, it is now being used in coarser grinding applications with which we seek to gain better energy efficiency and better metals recovery due to the inert grinding environment.

Good technologies and innovative ideas have a habit of opening new opportunities in different areas. The development of the Albion Process is an example of this.

Many common minerals such as gold-bearing pyrite are difficult to leach, needing a combination of high temperatures and pressure, or a biological agent. These technologies are difficult to operate and have a chequered history of practical failure.

It was found that refractory minerals leach in a simple atmospheric process if they are ground to an ultrafine size. This was just a curiosity until the development of IsaMill made ultrafine grinding possible. In hindsight, this was 'nanotechnology' before it was trendy.

An Albion Process plant is now being installed at a refractory gold operation in Eastern Europe where it will increase gold recovery by 60 per cent. This is the type of efficiency improvement that researchers and engineers live for.

As Sir Isaac Newton once said, 'If I see further than others, it is because I stand on the shoulders of giants'. These examples demonstrate that huge efficiency gains are still available if we know where to look.

They might be in another industry waiting to be adapted, developed and combined for new applications. As researchers and engineers we shouldn't look for the single big breakthrough, we should look for new ways to combine and apply what science already knows.

This isn't trivial. It requires years of development and perseverance, working at all levels of science and operations and across professional and organisational boundaries. But we can do it and when we do we will then ask, 'What else might this mean?'

This is our job and it is an exciting one.