



90 YEARS STRONG  
1923 - 2013



The Mount Isa Mines Minerals Processing Research team in 1995

## Pioneering Technology

For a period in 1980, Mount Isa Mines was Australia's largest company, having pioneered several significant mining industry innovations which have since been widely adopted around the world.

**T**hese included the ISA PROCESS™ copper refining technology, the ISASMELT™ smelting technology, the IsaMill™ fine grinding technology, and the commercialisation of the Jameson Cell flotation technology.

The focus on paving the way in industrial innovation was a result of the difficult nature of the Mount Isa ore bodies and in response to declining metal prices

and rising operational costs in the 1970s and 1980s. By the 1990s, Mount Isa Mines had become a world leader in innovative mining techniques and state-of-the-art processing technologies.

One of our first major breakthrough innovations came in 1978 when Copper Refineries Limited, then a subsidiary of Mount Isa Mines, developed the ISA PROCESS™ copper refining technology. Today this technology is globally

regarded as the preferred copper refining method, with more than 100 licensees using the technology around the world with an installed capacity of more than 12 megatonnes of high quality copper production. The ISA PROCESS™ revolutionized copper refining by replacing copper cathode-starter-sheets with stainless steel sheets and making what was a labour-intensive process mechanised and more energy efficient.

## Pioneering Technology (continued)



**FAR LEFT TOP:**  
Dr Roger Player, Process Development Manager and Jim Fewings, Research and Development Manager review plans for the Copper ISASMELT™ in 1989

**FAR LEFT BOTTOM:**  
Construction of the Copper ISASMELT™, 1992

**LEFT:** The new ISASMELT™ infrastructure, visible to the right of the iconic copper stack, 1993

**RIGHT:** Copper ISASMELT™, circa 2010

**FAR RIGHT TOP:**  
Jameson Cells pictured adjacent to flotation columns at the Zinc-Lead Concentrator, 1986

**FAR RIGHT BOTTOM:**  
Prominent Hill mine in South Australia used the IsaMill™ and Jameson Cell technologies to produce their copper-gold concentrate

At around the same time, Mount Isa Mines together with the Australian Government's Commonwealth Scientific and Industrial Research Organisation (CSIRO) began developing the energy-efficient ISASMELT™ smelting technology. After laboratory testing of a potential lead smelting process at the CSIRO's Melbourne facility, Mount Isa Mines moved to a 120 kilogram per hour test rig in our Lead Smelter in 1980, then to a five tonne per hour pilot plant in 1983.

This was followed by the development of a copper smelting process and the construction of a 15 tonne per hour copper ISASMELT™ demonstration plant in the Copper Smelter in 1987. Our plant operators' involvement during the development was one of the key contributors to the success of the ISASMELT™ technology, as it ensured the technology was practical and robust, and therefore widely adopted by other operations.

In 1992, Mount Isa Mines commissioned an ISASMELT™ furnace to replace one of two reverberatory furnaces in the Copper Smelter and treat 104 tonnes per hour of concentrate, producing 180,000 tonnes per year of copper. Throughput was

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initially constrained by interactions with the remaining reverberatory furnace, resolved in 1997 with the closure of the fluidized bed roaster and the remaining reverberatory furnace and the addition of a fourth Peirce-Smith converter and a second oxygen plant. As a result, the ISASMELT™ furnace throughput was boosted to more than 160 tonnes per hour of concentrate.

Since then, the simple, flexible and efficient ISASMELT™ technology has been adopted by operations all over the world. Currently, there are 15 ISASMELT™ plants operating in 10 different countries, with many more licensed and under design. These smelters process a variety of minerals and materials including copper

concentrate, lead concentrate and scrap feeds. Together these plants smelt nearly 12 million tonnes of material every year.

In 1985, Mount Isa Mines enlisted Professor Graeme Jameson from the University of Newcastle to improve the performance of the flotation columns used in the recovery process of the Zinc-Lead Concentrator. Professor Jameson came up with the idea of intensely mixing air and concentrate slurry in a specially designed pipe, now known as the 'downcomer', inserted into the flotation column. This resulted in a finer bubble size—important for recovery of the fine minerals present in Mount Isa's ore—a much more robust operation, and a smaller equipment size than traditional flotation columns. This was the birth of the 'Jameson Cell'.

Professor Jameson patented the cell in 1986 and a two tonne per hour pilot cell was tested in Mount Isa in 1986. In 1988, Mount Isa Mines decided to increase the capacity of its Heavy Medium Plant slimes flotation circuit to improve lead recovery. Following investigations of various alternatives, two full-scale Jameson Cells were installed in the Zinc-Lead Concentrator in 1989.



In April 1989, Mount Isa Mines acquired the international rights to the metallurgical applications of the Jameson Cell and began marketing the technology while developing it further. By 2013, there were more than 320 Jameson Cells operating globally in coal and base and precious metal flotation circuits, as well as industrial minerals, oil sands and leach-solvent extraction-electrowinning, or SX-EW process.

The next improvement target was grinding, a process that was long overdue for efficiency improvements. This became critical from the mid-1980s as metal recoveries from the Zinc-Lead Concentrator dropped due to the increasingly fine grain size of the ore. A method for grinding ore more finely was needed to separate the valuable lead and zinc mineral particles from each other and from waste.

After a worldwide search for an appropriate technology, Mount Isa Mines entered a joint development program with the German company Netzsch-Feinmahltechnik GmbH. This partnership led to the development of a highly energy-efficient horizontal-stirred mill known as the IsaMill™. In addition

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to being more efficient, IsaMill™ uses inert grinding medium (like ceramic balls, smelter slag or silica sand) that provide clean mineral surfaces ideal for the subsequent flotation process, further enhancing mineral recovery.

After testing prototypes at various scales, the first full-scale IsaMill™ was installed in the Mount Isa Zinc-Lead Concentrator in 1994, followed by others in Mount Isa and at McArthur River Mine in the Northern Territory in 1995. Once again, developing the technology from concept through prototypes to commercial scale was done within a working plant, with critical input from operators and maintenance personnel. Mount Isa Mines began licensing the technology in 1999.

Almost 20 years on, there are now more than 120 mills installed in concentrators around the world, in zinc and lead applications as well as precious metals, iron ore, PGMs, industrial and copper and molybdenum applications. Furthermore the technology has seen considerable advancement, moving from ultra fine applications to courser regrind applications.

Today Glencore's technology subsidiary XT continues to market and support the ISA PROCESS™ (now known as IsaKIDD™), ISASMELT™, IsaMill™ and the Jameson Cell worldwide in addition to developing and marketing other leading products such as the Albion Process™, HyperSparge™ and ZipaTank™ for the global mineral processing and metals smelting and refining industries. 



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