

Focus on the Fundamentals

The last 6 months have been tumultuous. But the mining industry is used to tough times. It knows there are fundamental truths that apply in good times and in bad. One of these is controlling cost – both operating and capital. Improving energy efficiency and making better product grade and recovery are always good. So is improving environmental performance. Projects must start up quickly and successfully, and this needs good design, experienced project management, specialist training, commissioning and ongoing support.

There is no shortcut to achieving this. The critical success factor is experience. The best people to design your plant are those who have managed their own operations and projects to survive tough times. People who specialise in their equipment – who have operated it themselves, and have designed and commissioned dozens of new installations to constantly improve their designs. This results in hundreds of “small” design details that make a huge difference.

This operating know-how and specialisation is Xstrata Technology's strength. So is being part of an operating company with access to full scale installations, and our global network of users keen to share ideas to improve operating efficiency and maintenance for mutual benefit.

We aim to keep our stable core team through good times and bad. This approach will now serve our clients in the tough times ahead. Whether it is for new projects, or for improving the efficiency of existing operations, nothing beats experienced operators.

Xstrata Technology: Solutions from Real Operators

Joe Pease, Chief Executive, Xstrata Technology
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New Personnel at XT



Greg Rasmussen – Principal Metallurgist

Greg is part of our Canadian team, and has been involved in Mineral Processing for over 25 years. He has worked in a variety of operational roles, as well as a metallurgical consultant before joining XT, where he is now focused on the IsaMill™ and Jameson Cell business in North and South America.



Dr Ken Robilliard – Operations Manager – ISASMELT™

Ken is a metallurgist who has had nearly 30 years of experience in base metal pyrometallurgy in research, smelter design and operations management in Australia, Sweden and Peru. Ken joined XT during 2008, and is responsible for training, commissioning and support of ISASMELT™ operations world wide.



Karina Arburo – Senior Process Engineer

Karina is based in our Santiago office in Chile, and is an experienced mineral processing engineer, having worked in operations and projects in Chile. She is responsible for supporting IsaMill™ and Jameson Cell projects in South America.



Addin Pranowo – Senior Process Engineer

Addin has had extensive experience in copper refineries, having worked with ISA PROCESS™ as a customer, before joining up with Tankhouse Technology during 2008. He has over 10 years experience with copper refining, having worked in Indonesia, Japan and Australia.

Jessica Farley – Procurement & Logistics Officer

Jess joined the IsaMill™ Spare Parts Team this year. Jess is experienced in the importing and exporting of freight, and is responsible for Spare Parts Procurement, Transportation and Freight Forwarding for XT's international clients.

Hans De Waal – Consulting Metallurgist

Hans is a qualified metallurgist, based in South Africa with the IsaMill™ team. He has had extensive experience in the South African gold and platinum industry, and now provides commissioning and ongoing plant support to IsaMill™ operations in Africa

Hugo Joubert – Engineering Manager

Hugo joins XT from South Africa, having over 20 years experience in the metal processing industry. Having a Masters in Mechanical engineering and Graduate Diploma in Pyrometallurgy, Hugo has been heavily involved in smelting furnaces and related technologies for much of his career. He is now responsible for ISASMELT™ engineering, and other XT technology packages.

Hernan Perez – Senior Process Engineer

Hernan is a Metallurgical Engineer with over 30 years experience in copper and lead extractive metallurgy in Peru, Belgium and Canada in technical and operating roles. He started working with XT in June 2008, working with XT's Operations Group supporting internal and external clients while being involved with marketing of ISASMELT™ and ISACONVERT™ technology.

ISASMELT™ Package – Further Development Through Licensee Workshops

The sixth ISASMELT™ Licensee Workshop was held in Arequipa, Peru in October 2008 and was hosted by Southern Peru Copper Corporation, the owners of the newest ISASMELT™, that treats 1.2 million tonnes per annum of copper concentrate.

Participants from Australia, Belgium, Canada, Chile, China, Germany, Kazakhstan, Peru, USA and Zambia took part in the event covering discussions on a wide range of Top Submerged Lance (TSL) applications including copper smelting, copper converting, lead smelting, scrap recycling, and nickel smelting and converting.

During the week-long conference development and operating practices were discussed by representatives from licensee companies and engineers from Xstrata Technology, with key topics presented including furnace integrity, rebricking techniques, offgas handling, furnace operation and maintenance and process control. Presentations were made by the licensees showing their latest production data and innovations for improved smelting efficiency, as well as experiences from plant commissioning and new developments for the technology. The subsequent workshop sessions provided an ideal forum for licensees to share ideas for further improvement.

“The workshop sessions were particularly successful in allowing detailed technical discussions to occur between all the sites” said Philip Arthur, General Manager of Pyrometallurgy. “This is the 6th workshop we have held, and it has been one of the most successful due to the high level of interest and commitment to sharing experiences by all the participants. It certainly builds



on the already high level of expertise in the group, and is an important part of the ISASMELT™ package that our licensees value” he said.

A highlight of the workshop was a tour through the Ilo Copper ISASMELT™ plant, that was commissioned in 2007. The ISASMELT™ furnace replaced an El Teniente reactor and two reverberatory furnaces, when more stringent environmental regulations in Peru necessitated an environmentally friendly smelting solution for the site. An ISASMELT™ package was chosen based on its reputation as a clean, efficient technology that can be installed for relatively low capital cost compared to competing technologies, with support provided by a team of experienced engineers and metallurgist.

New Tankhouse Technology Website

The Tankhouse Technology website has been updated with the latest information on all cathodes, stripping machines and cathode handling machines that Tankhouse Technology provides, as well as key regional contacts.

Go to www.isaprocess.com for more information, or go through the Xstrata Technology website www.xstratatech.com.

A screenshot of the Tankhouse Technology website. The header features the Xstrata Technology logo and navigation links: home, about us, press releases, publications, contact us. The main content area is titled "Welcome to Tankhouse Technology" and includes a section "Combining the Strengths of ISA PROCESS™ and KIDD PROCESS" with descriptive text. A sidebar on the right lists "Other Xstrata Technology product websites" including Isanill, Allium Process, ISASMELT, and Jameson Cell. The footer contains copyright information for 2008 Xstrata Plc. and links to Privacy Policy and Disclaimer.

IsaMills™ to Increase Energy Efficiency at Red Dog

High energy efficiency IsaMills™ are on their way to the Red Dog concentrator in Alaska. Two M3000 IsaMills™, powered with 1.5MW motors, will be used to replace 7 existing tower mills, where they will be used to regrind intermediate zinc flotation streams in the concentrator.

The Red Dog mine is one of the most remote mines in the world, and is situated near the Arctic Circle. It produces over 725,000 TPa of zinc concentrate, as well as lead concentrate. The extreme weather conditions where the mine is situated means operations rely on diesel powered generators, with all the diesel being shipped to site for only a limited time during the Arctic summer. Therefore the replacement of the existing grinding technology with more efficient technology will provide significant savings for the site.

The two new IsaMills™ will treat the harder ore from the Aqaluk deposit. The mills will regrind intermediate flotation

streams, one to a product size of 13 microns, the other to 25 microns. The owners selected the mills to replace tower mills after extensive comparative on-site testing by their technical and research teams.

IsaMill™ Technology Manager Greg Anderson said that IsaMills™ achieve high energy efficiency because they use fine ceramic grinding media. This is particularly important for grind sizes below about 70 microns, where the grinding energy required increases exponentially as the grind size decreases. "In practice, operating ball mills and tower mills are limited to about 12 mm ball size, whereas the IsaMills™ are designed to efficiently use 2 mm or 3.5 mm media" he said. Greg also said that flotation benefits were expected from using the inert media, as most sites that had installed IsaMills™ after using tower or ball mills noticed better metallurgy with less reagent consumption after the switch from iron based media to ceramic media.

Albion Process – The Solution to Refractory Leaching

The Albion Process was developed to treat concentrates produced from refractory base and precious metals ores, and is based on the hot oxidative leach of finely ground concentrates at atmospheric pressure. The process does not employ autoclaves, and does not rely on bacterial cultures, resulting in a reliable, low cost and effective way to recover metals in complex ore deposits. It can also treat dirty concentrates, particularly those containing arsenic, which restricts the material from being smelted, as well as being able to treat both low and high grade material.

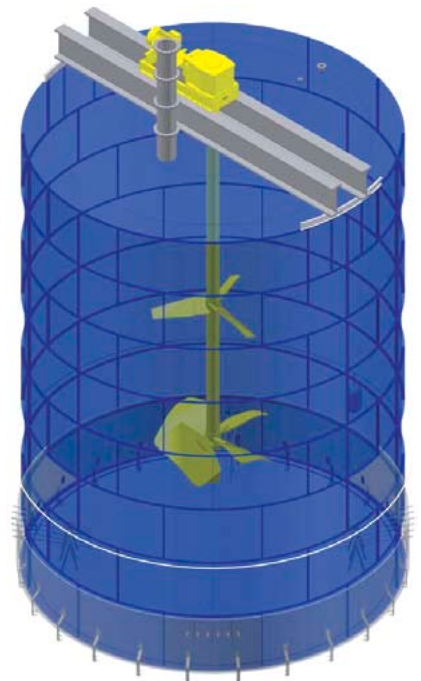
The patented process uses the IsaMill™ to grind the refractory ore or concentrate to ultrafine sizes, which increases the activity of the feed enabling high leaching rates. This results in oxidation being readily carried out in conventional open tanks without the need for high pressures, expensive reagents or bacteria. The technology is simple, robust and offers substantial cost savings over bacterial or pressure leaching, with Albion Process plants being relatively small in area and capital cost, as well as easy to maintain.

The Albion Process oxidative leach step can be carried out in either an acid or alkaline environment, depending on the mineralogy of the feed. Refractory gold deposits using the Albion Process also have the advantage of reduced cyanide consumption compared to other processes due to the controlled alkaline conditions during leaching. Another advantage of the process is that all byproducts created during the process can be disposed of as chemically inert products, ensuring the mine site can be rehabilitated at the end of operations without any risk of leaching of contaminants from tailings. Toxic impurities such as arsenic are fixed in an environmentally stable form within the final leach tailings, and the process does not generate sulphur dioxide.

Two advanced development projects using the Albion Process are **Envirogold's Las Lagunas** tailings treatment project and **European Goldfields' Certej** project. Both operations will be recovering gold and silver from refractory concentrates.



ALBION PROCESS



The Albion Process uses simple open tanks utilizing modern, state of the art, hydrofoil impellers and high pressure gas sparging

New Generation Copper Flowsheet Commissioned at Prominent Hill

The Prominent Hill copper-gold concentrator in South Australia commenced commissioning in early 2009. The flowsheet is an innovative combination of technologies to provide high concentrate grade and recovery and high energy efficiency in a small-footprint circuit.

Design mineralogical and metallurgical test work demonstrated that fluorine-bearing minerals needed regrinding to 80% passing 24 microns followed by efficient entrainment rejection to produce a quality copper-gold concentrate. This was achieved in a small space by an innovative design that combined Xstrata Technology's IsaMill™ and Jameson Cell with conventional grinding mills and flotation cells.

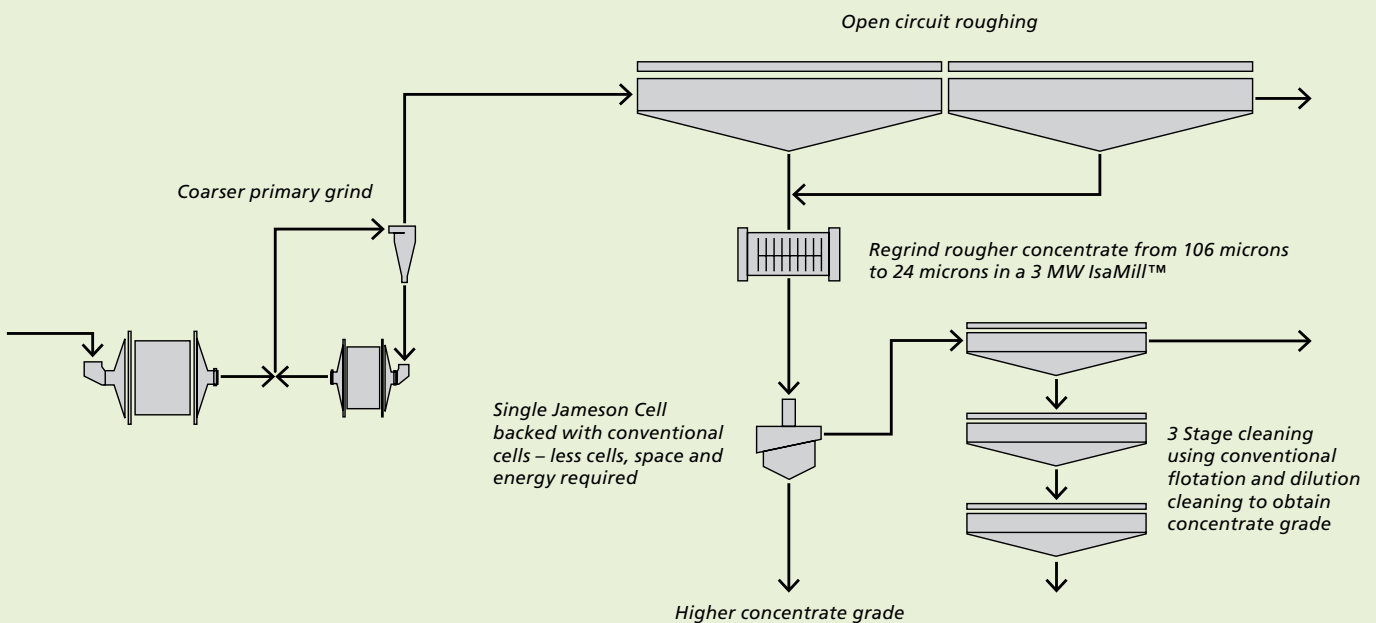
The highly efficient IsaMill™ regrinds rougher concentrate in a compact mill. The inert grinding environment optimises flotation performance by producing fresh clean mineral surfaces. The IsaMill™ product is then "flash" floated in a single Jameson Cell to quickly recover a high grade froth-washed concentrate in a small space. The tailings of the Jameson Cell gravitate to conventional flotation cells to recover the remainder of the concentrate. This combines the best of both flotation technologies – the high intensity, fast flotation and low entrainment of the Jameson Cell is combined with the long flotation time of conventional cells to recover slow floating particles. Conventional cleaning is assisted by lower density and lower circulating loads because of the material already removed by the Jameson cell. This results in a much smaller, more efficient circuit.

This new circuit demonstrates that advances in circuit design aren't just about new technologies. Often the big gains come from combining existing technologies better.



The 3MW, 4000HP, M10,000 IsaMill™ and B5400/18 Jameson Cell installed in the flotation circuit at the Prominent Hill copper-gold concentrator, South Australia

Prominent Hill Flowsheet

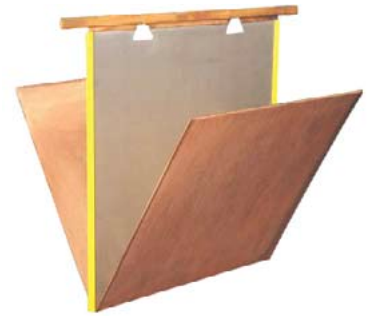


Copper Production at Carlota Mine

The Carlota Mine is the latest operation to be using Xstrata Technology's ISA PROCESS™. The Carlota Mine is located within the Globe-Miami mining district of Arizona, approximately 80 miles east of Phoenix Arizona. The project is owned by Quadra, and involves open pit mining of the copper oxide ore, followed by heap leaching and SX-EW processing to produce LME grade copper cathode onsite.

The electro-winning plant design incorporates the latest ISA PROCESS™ design, and has a design capacity of 34,000 tonnes (75 million pounds) of copper cathode per year. XT supplied ISA PROCESS™ technology for this operation, including the design and technology package.

The BR ISA PROCESS™ cathode plate was selected for this project to provide high electrical efficiency copper production and easy stripping. The plate is designed with better current transfer between the hanger bar and the stainless steel plate, allowing more copper to be produced per amp of current. Also supplied to the project was the ISA PROCESS™ stripping machine, which was manufactured and provided by Xstrata Technology by a subcontractor in England. This proprietary technology is designed for a range of stripping duties for copper EW and refining applications, and provide reliable day to day stripping.



BR Cathode – long life, corrosion resistant cathode, providing energy efficient copper processing

ISASMELT™ Testing Facility

About ten years ago XT designed a fully equipped ISASMELT™ TSL pilot plant for running pilot scale smelting tests for the Freiberg University of Mining and Technology (Technische Universität Bergakademie Freiberg or "TUBF") in Germany. The 250kg/hr facility was designed to allow a wide variety of materials and processes to be tested including lead, copper and nickel smelting, scrap smelting, zinc fuming, as well as copper and nickel converting using the ISACONVERT™ process.

The plant is in effect a compact version of the larger ISASMELT™ plants, and is an ideal unit to demonstrate the versatility of ISASMELT™ technology. It allows full off-take capture using dust cyclones, venturi scrubber and a packed sodium hydroxide scrubber that allows calculation of metal recovery and minor element deportment for all process streams. The university's well equipped chemical laboratory ensures rapid turnaround of process samples, allowing a good understanding of the slag chemistry of the process being studied. Importantly, the use of a pilot plant allows clients to evaluate the full range of operating and process scenarios for their project in a fast and cost effective manner.

Clients are encouraged to see the pilot plant operate using their feed materials, and the trials are managed by experienced ISASMELT™ personnel, with the support of TUBF's metallurgical and research teams.



Pilot plant testing is carried out as the second stage of process development once the client's process has undergone mathematical modelling using specialised thermodynamic modelling software, as well as verification using a database of operational data collected over the last 30 years from ISASMELT™ operations. This step wise process ensures that a robust, tailored smelting solution can be provided for each client's operation, whilst minimising the cost of development.

ISASMELT™ – Over 30 Years of Innovation

ISASMELT™ top submerged lance (TSL) smelting technology has been rapidly adopted by industry since its first developments 30 years ago. Originally based on the Sirosmelet lance, pioneered by CSIRO in the 1970's, the ISASMELT™ process is now an integrated package that provides a complete solution for smelting projects. From its first commercial plant in 1991, ISASMELT™ has plants in 10 countries.

The development of the technology started at Xstrata's Mount Isa Mines operations in the 1980s. Successive stages of demonstration plant led to the first commercial plants treating lead and copper at Mount Isa in 1991 and 1992. The copper industry rapidly embraced the high efficiency and low capital cost of the technology, with furnaces at Cyprus Miami (now Freeport-McMoRan Copper & Gold – USA) in 1992, and in 1996 at Vedanta's Tuticorin (India) copper smelter. The Vedanta operation is widely reported by industry analysts to be the world's lowest cost copper smelter. ISASMELT™ is also suitable for nickel smelting, and has been widely adopted for scrap recycling, including lead batteries and residues in Malaysia, and metals recycling at Norddeutsche Affinerie (Germany) and Umicore Precious Metals (Belgium). Very high environmental standards are achieved at these plants.

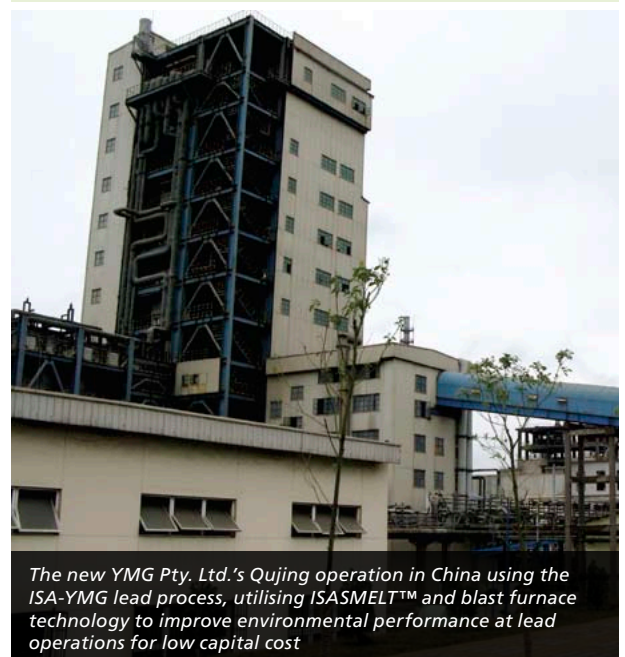
Operating experience on our own plants has optimised designs for refractory and lance wear, fuel consumption, fume capture and operating efficiency. The lance operates at low pressures and can use process air from 21 to 90% oxygen. Post combustion systems minimise green house gas emissions and maximise the heat value of fuels. A wide range of fuel types can be used, from coal to coke by-products, fuel oil or natural gas. Refractory design, materials selection and process control has greatly improved furnace integrity. A conventional bricked copper ISASMELT™ furnace lining lasts about 3 years.

These developments, gained through continuous operation and development, are captured in the ISASMELT™ Technology Package (ITP), an all encompassing technology transfer system that includes the engineering design of the TSL plants, the design and supply of ancillary equipment, refractories, gas handling equipment, process control and operating techniques.

Detailed know-how transfer includes delivery of comprehensive operating and maintenance training programs, as well as commissioning assistance and technical backup by Xstrata Technology's experienced team. This has led to significant increases in throughput rate and stability, reduced operating costs and fuel consumption, and very fast ramp up times.

ISASMELT™ – Versatile Smelting Technology

- Copper, lead and nickel smelting
- Scrap and residue treatment
- Zinc fuming
- ISACONVERT™
 - continuous converting
 - high gas capture, low volume
 - decoupling smelting and converting



IsaMill™ Technology – Developers and Users

In September Xstrata Technology hosted the inaugural Hall of Fame dinner, held to commemorate significant contributors in the development of the IsaMill™. Mr Lindsay Clark, General Manager of Minerals Processing presented plaques to Dr Bill Johnson and Mr Peter Woodall who were intimately involved with the mills being introduced and developed at Mount Isa Mines. Also receiving a plaque was Mr Udo Enderle, the Technical Director for Netzsch-Feinmahltechnik GmbH, XT's partner in developing the technology.

Later that month, the 4th IsaMill™ Users Conference was held in the Barossa Valley, South Australia, where over 70 delegates from around the world took part in four days of technical discussions on IsaMill™ technology. The coming together of all the Users is a unique way for knowledge and learnings to be transferred between operators, so further improvements can be made to the technology. Attendees included representatives from most IsaMill™ operations

along with XT and our technology partners, Netzsch, Linatex, XPS and Magotteaux.

Over the week, presentations were conducted by clients and partners focusing on a range of topics. These included an overview of IsaMill™ operations, maintenance practices, media development, energy efficiency, coarse grinding and fine grinding applications. One of the most popular sessions was the discussion on recent advances in maintenance design and component life.

At the end of the conference a research plan was organised to enable XT and the Users to undertake research on key issues specific to each site.

Over 40 people also attended a site visit to the McArthur River Mine in the Northern Territory after the conference to inspect the M3000 IsaMills™ on coarse and ultrafine duties, as well as the two M10,000 IsaMills™ under construction.

The New Mark IV Jameson Cell

After several years of research and development, the latest model Jameson Cell, the Mark IV, has been released to the market. Amongst other changes, the Mark IV model comes with a light, fully flexible hose for delivering feed into the slurry lens. This does away with several sections of polyurethane lined steel pipe that were used on previous models, and allows for easier and quicker access to the slurry lens for periodic inspections.

For coal applications, the flexible feed hose has been designed to be reversible, so that it can be operated back to front as well as be turned at 180 degrees. There is also a facility to check for wear in the pipe by the use of a continuity circuit in the pipe, which can be easily checked as part of a preventative maintenance schedule.

Another addition to the Mark IV is the option of one clear downcomer on each cell. The clear downcomer is made of heavy duty material that enables the plunging jet, high intensity mixing zone and void fraction inside the downcomer to be observed. It is a very useful tool for operator training, as it allows operators to observe the operation of the downcomer when key variables are changed such as air flowrate or frother dosage

The Mark IV design still incorporates the high wearing slurry lens of the previous model as well as the same downcomer size. This allows the flexible feed hose to be easily retrofitted to Mark III or older style Jameson Cell installations.

The latest installation to use the Mark IV Jameson Cell is the Lake Vermont coal preparation plant, which uses 2 x B6000/20 cells to recover coal fines. Other sites that have recently installed Jameson Cells in coal applications include **Yarrabee** (2 x B5000/16) and the **Carborough Downs Expansion Project** (1 x B6000/20), with all cells being supplied fully automated with wash water to enable optimising plant flotation performance and achieving target product ash grade easily.



The Mark IV downcomer with simplified slurry feed piping against an older Mark III downcomer



Mark IV Jameson Cells installed at Lake Vermont, Australia



IsaMill™ Hall of Fame members, (l to r) Peter Woodall (Mount Isa Mines), Udo Enderle (Netzsch), Dr Bill Johnson (formerly of Mount Isa Mines), and Joe Pease and Lindsay Clark (both of Xstrata Technology). Dan Curry – Xstrata Nickel Australia (formerly with XT), was also inducted into the IsaMill™ Hall of Fame during the Users Conference, while Dr Giacomo Canepa was inducted in a ceremony held in Germany, June 2008.



M10,000 IsaMill™ operating at the Phu Kham operation, Laos. Commissioned in 2008, the mill operates with MT1™ ceramic media, and operates in the copper gold regrind circuit.

XT Office Opened in Vancouver

The Xstrata Technology Canadian office, previously located in Mississauga, was shifted to Vancouver in late 2008. The Canadian team has grown since it was first set up, with Michael Schmidt, Engineering Manager, Greg Rasmussen, Principal Metallurgist and Morgan Mackay, Office Administrator, joining Process Engineers Josh Rubenstein and Mike Larson.

XT also has an office in Timmins, Ontario, which supports the ISA PROCESS™ and Kidd Process business, and is managed by Phil Donaldson.

Contacts for IsaMill™ Testwork

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|----------------------------|------------------|--------------------|
| G&T Metallurgical Services | Canada | www.gtmet.com |
| SGS Lakefield | Canada and Chile | www.met.sgs.com |
| JKTech | Australia | www.jktech.com.au |
| Ammtec | Australia | www.ammtec.com.au |
| HRLtesting | Australia | www.hrltesting.com |
| CSIRO | Australia | www.csiro.com |

Contacts for Jameson Cell Testwork

Xstrata Technology – jamesoncell@xstratatech.com.au

Contacts for Albion Process Testwork

HRLtesting – www.hrltesting.com

Awards Round Up

In December, Xstrata Technology was awarded the 2008 Australian Export Award in the Large Services category. This had followed on from XT being awarded The Premier of Queensland Exporter of the Year Award earlier in the year.

Joe Pease accepted the award from Federal Minister for Trade, Simon Crean, in a ceremony held at the National Gallery of Victoria in Melbourne. Joe said "We are honoured that this award recognizes our commitment to provide high quality technology and services to minerals and metal processing operations around the world. It recognizes the valuable contribution and commitment our people make, as well as acknowledges the support and dedication of our clients who work with us in their projects".

XT's technology was developed at Xstrata's operations by committed engineers and operators who weren't satisfied with existing technology, and so developed new robust technologies to improve energy-efficiency and reduce emissions. This is still important to XT today, to provide real solutions by real operators.



The XT team at the 2008 Australian Export Awards, Philip Arthur (GM Pyrometallurgy), Joe Pease (Chief Executive), Graham Heferen (Tankhouse Technology Regional Manager), and Lindsay Clark (GM Mineral Processing)



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