



Finland

Finland wields considerable influence on the global mining industry. Suppliers from this country are world leaders in underground mining technology, processing and metallurgy

Many of the great names of Finnish mining technology, like Tamrock, Toro, and Rammer have all become Sandvik. While that company is headquartered in Sweden, a great deal of the underground mining technology developments, in particular, come out of Turku and Tampere. The latter also hosts much of the crushing expertise that is part of Metso Minerals (headquartered in Helsinki), which offers so much processing technology to the world. So too does Outotec (that grew out of the one-time state mining company Outokumpu). Outotec is not only a major supplier to the processing sector but is also a leader in metallurgical developments – in both the pyro and hydro segments.

Supporting these giants are myriad smaller companies in many fields.

Metso Minerals has just won a contract to supply crushing equipment to BHP Billiton Iron Ore for the Yandi mine development project in Western Australia's Pilbara. The delivery will be completed by the end of 2009 and is valued at some €12 million. The order comprises five MP type cone crushers for Yandi. The development project aims to increase the iron ore production

at Yandi in order to meet market demand. Once in full operation, the plant is to be capable of processing 150,000 t/d of iron ore daily. The ore is crushed into final product size specifications before transporting to Port Hedland. The cone crushers are an integral part of BHP Billiton phased development program to grow production of iron ore to meet growing market requirements.

Among the latest news from Outotec is the award of two grinding technology orders by Nordic Mines of Sweden and Polymetal of Russia. The total value of the orders amount to approximately €25 million and deliveries will take place during 2009.

Nordic Mines ordered two grinding mills and related spare parts and services for its Laiva gold project in central Finland. The mills are designed to treat 250 t/h of ore and the production is due to begin in March 2010. Polymetal, Russia's largest silver producer and third largest gold producer, ordered six grinding mills and spare parts for the Albazino project and flotation technology and spare parts for the Dukat project, both located in Russia.

Also in gold, Vacon is to deliver a complete

package of AC drives, transformers and soft starters to Barrick Gold, currently busy building Buzwagi, its fourth gold mine in north-western Tanzania. Vacon has been chosen as the variable speed AC drives supplier for the Buzwagi project. Buzwagi will be the second largest mining operation in Tanzania and the largest single open pit in the country. The orebody contains Proven and Probable reserves of 3.59 Moz of gold and 175.3 Mlb of copper. The mine is expected to produce about 250,000 oz of gold annually in its first five years, and production is scheduled to start in 2009.

Lycopodium Engineering has the EPCM contract and Vacon was awarded the contract to supply a complete package of variable speed AC drives, transformers and soft starters. "Vacon had a major advantage here as Lycopodium Engineering preferred to use a 'one-stop' supplier for the complete motor control system. This is also a great opportunity for us to work with Barrick Gold," says Mike Smits, Managing Director, Vacon Pacific, Vacon's Australia-based subsidiary.

Vacon will supply a variety of variable speed AC drives totalling 8 MW, ranging from small



Installing KWH pipe at Talvivaara
(Photo by Arto Tulima)

3-A Vacon NXS units up to the largest 1,500-A Vacon NXC units for pumps, vibrating screens, crushers, conveyors, feeders and dosing. The main advantage from choosing variable speed AC drives is to provide speed control that allows fully automated process control.

The customer found Vacon fieldbus communication simple and quick to configure. All the variable speed AC drive units will communicate with the plant's centralised distribution control systems via Profibus.

Along with the variable speed AC drives package, Vacon will also supply two 1,500-KVA 12-pulse transformers to feed the two 1,500-amp Vacon NXC 12-pulse drives of 690 V as well as ten soft starters of a variety of sizes for blowers, agitators, conveyors and pumps.

Climatic conditions in Tanzania are demanding, as it is hot throughout the year. This sets high requirements on the quality and reliability of the electrical equipment.

Larox is another major player in mineral processing, a world leader in filtration. Its latest news involves the Hoesch range of filter presses. A comprehensive redesign program has resulted in a new modular range available with improved quality and operation and shorter delivery times. In 2006 Larox began a detailed development program to reduce the cost and improve the delivery time of Hoesch filter presses, while at the same time, maintaining or improving technical standards and quality.

The goals were achieved by developing a modular design with standardised options. Common components are now used for both the side bar and overhead beam presses. The following areas of improvement are of note:

1. All drives (plate shifter, washing device and swivel plates) are now installed with electric motors so that additional hydraulic distribution (with the added complexity and potential for failure) is no longer needed for these items.

presses left the chain of the plate shifter uncovered where it could be exposed to the environment or process fluids such as wash water and aggressive slurry ingredients. In the new designs the chain is integrated in the side bar design and is fully protected, thus reducing maintenance and extending the lifetime of the chain.

4. Using Larox know-how the weak point in a many existing side bar presses on the market, the connection between the side bars, head piece and especially the cross head, has been eliminated. The design ensures all structural components will last for the lifetime of the filter.

5. A larger 2000 x 2000 mm plate has been developed for both side bar and overhead beam designs and the operating pressure range is now increased to 30 Bar for the side bar design.

6. The levels for machine control have been standardised to offer a simple and competitive choice. With the fully controlled version the filter can be operated without any additional signals from the process. This version is included in the standard design. A PID or a simple terminal box version can be ordered as options. These customer tailored solutions reduce the risk of programming and logical failures and eliminate the need for extensive programming on site.

Then there is Larox Flowsys, supplier of pinch valves and peristaltic pumps. It focuses on abrasive, corrosive and other demanding shut-off, control and pumping applications serving a wide range of process industries worldwide. The solutions are based on decades of experience in flow control and elastomer technology.

2. All moving parts are now located as far as possible outside of the product wetted areas to prevent both corrosion and product contamination.

3. Previous designs of the Hoesch

Top drillers

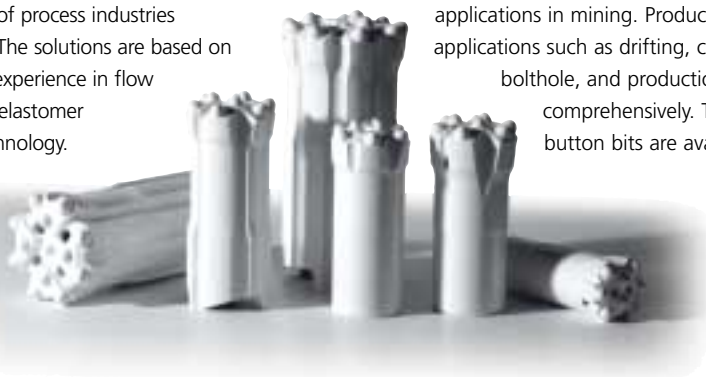
Finland's drilling technology expertise is, by now, legendary and although the Tamrock name, for instance, has gone (but is not forgotten through Sandvik), the tradition continues.

Diamond drilling and mining exploration tools have been Levanto's core business since the company was founded in 1937. When exploring in Finland, Levanto provides diamond drilling tools especially for Nordic markets. The thickness of overburden here is approximately 6m, before starting actual rock drilling. This creates challenges for surface diamond drilling. Levanto responded by creating a quality GD. Then of course there is Oy Kati, specialising in diamond core drilling – one of the largest operators in the Scandinavian region.

Established over 20 years ago, Robit Rocktools manufactures rock and ground drilling tools. Users of the company's signature white drill bits and other products can be found in more than 50 countries around the world today. Robit uses modern 3D CAD systems to match the design of its bits to the needs of its customers, and works closely with key customers to keep its designs as innovative as possible. A highly specified metal structure, combined with Robit's unique fluidised bed heat treatment system, gives superior body wear resistance. Thanks to being both oil- and liquid-free, the system is also environmentally friendly, as is Robit's unique aluminium dioxide cooling system.

Bit bodies are produced on advanced CNC machining centres for consistent quality. As Robit believes that drilling the button holes on bit faces is the most demanding part of the bit manufacturing process, it has developed machining centres specifically for this purpose. These are capable of drilling to an accuracy of better than 0.002 mm to give enhanced button retention and stability, and longer overall bit lifetimes. Rigorous quality control routines are used throughout to measure the hardness of bit bodies, and electronic microscopic analysis to check the tungsten carbide used in Robit's buttons.

Robit Rocktools' offering covers the complete range of drilling and blasting applications in mining. Products cover applications such as drifting, cuthole, bolthole, and production drilling comprehensively. Threaded button bits are available.



Talvivaara technology

One of Finland's biggest current mining projects is Talvivaara, one of the largest known sulphide nickel resources in Europe with the potential to provide approximately 2.3% of the world's current annual production of nickel by 2010. Talvivaara's key technology is bioleaching. Outotec has been awarded a contract for the supply of metals recovery technology for the project in Sotkamo. The total contract value is approximately €40 million.

Outotec's scope of delivery covers metals recovery technology, including reactors and thickener technology, in which nickel, copper, zinc and cobalt are precipitated from the pregnant leach solution to produce saleable metal products. Technologies will be commissioned in two phases; the first phase is expected to be commissioned in October 2008 and the second phase in autumn 2009. "Talvivaara is an important step in the history of bioleaching. Talvivaara's bioheap leaching technology has its origins at Outotec's Pori research centre in Finland and now this technology will be in commercial use and allow economical beneficiation of the low-grade nickel deposits", says Outotec's CEO Tapani Järvinen.

Being a leaching operation, Talvivaara requires huge lengths of durable piping. KWH Pipe was selected to supply these piping systems for the installation. "This method is used a lot in South America, and to some extent in Asia. This project is unique in the Nordic countries, and I am not aware of a similar one elsewhere in Europe either," says Lassi Lammassaari, General Manager, Mine and Infrastructure, of Talvivaara Project Ltd.

The biggest anticipated uncertainty is the effect that the Arctic climate will have on the process. The Nordic weather has been figured into the planning. Encouragingly, the process is already being used successfully at an altitude of 4 km and at below-zero temperatures in Chile. "In our test area, the heap has retained its heat well, and freezing temperatures will not bring the mine to a halt," Lammassaari notes.

This environmentally friendly method requires a huge array of pipes for the leach liquors to circulate. KWH Pipe is currently installing collector pipes which will be buried under the crushed ore heap to collect the runoff fluid, which is then recirculated.

Vesa Ervasti, KWH Pipe's District Manager for northern Finland, has been involved in the project for a couple of years. "Understanding the new leaching method and the process as a whole requires constantly updated expertise and technical know-how. Fortunately, that is what we have," he explains.

"The sheer amount of piping required for

this method is so enormous that when I drew up the first calculations I thought that I must have misplaced a decimal point somewhere," Ervasti says of the vast scale of the project.

Lammassaari notes the site places extreme demands on the materials. "The material requirements for the pipes are strict, because the fluid that runs through them is corrosive. We decided on polyethylene, which is highly acid-resistant. We will need thousands of kilometres of piping all told," he estimates. "We have had significant input from KWH Pipe experts from the very first."

Loading of the production heap will begin in July 2008 and that crushed-ore heap will be huge. It will be a flat-topped heap 800 m

across and 2,400 m long. At its maximum, it will contain a massive 22.5 Mt of crushed ore.

"We are delivering pipes, fittings and chambers to the construction site. We have also invested in new welding machines to make the project self-contained," says Ari Vaarala, Operations Manager at KWH Pipe. The leach system requires an unbelievable amount of Weholite pipe and large chambers. The largest pipes are 1,200 mm in diameter, and the majority of the pipes are large in size.

The installations that will be buried beneath the heap are being undertaken with particular care. The high-quality material is handled under controlled conditions throughout the process, from loading at the Vaasa plant to the welding on site. **IM**



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by Dr. Terry Mudder *It's filling fast...*

Course Summary

This 3 day course will aid those involved in the permitting, design and operation facets of the mining industry to ask the appropriate questions and to make justifiable and practical decisions.

Who Should Attend?

The course will be of particular interest to academics, consultants, agency and regulatory personnel, corporate and operational process and environmental staff, as well as auditors for the new Cyanide Code.

About the Author

Dr. Mudder holds a B.S. and M.S. degree in Chemistry, and a Ph.D. in Environmental Science and Engineering. He has twenty-five years experience in investigation of various aspects of cyanide wastes.

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