Mintek control system boosts Anglo gold plant

MINTEK, specialists in mineral and metallurgical research and development (R&D), technology transfer and beneficiation, recently sold its first LeachStar™ system for gold circuits to Anglogold Ashanti’s Mponeng mine near Carltonville.

The LeachStar process control system was successfully integrated with the existing instrumentation of the mine’s gold treatment plant. Installation of this predictive technology has resulted in improved plant stability and substantial savings in the consumption of cyanide and flocculent, two strategic reagents in the gold extraction process.

“The installation of LeachStar enabled the Mponeng Gold Plant to achieve two of its main objectives: a steady feed to the leach, and significant savings in reagent usage as result of improved control and field measurement failure correction,” said Rudi Steyn, plant manager of Anglogold Ashanti’s Mponeng Gold Plant. “In the past, when the field instrument failed, the default condition was to add excess reagent, however, using LeachStar the default is based on that day’s historical process requirements, which eliminates spiking of reagents. An added bonus is that the new system has also greatly improved carbon management.”

“Mintek is delighted with the performance of its LeachStar control system at the Mponeng mine,” said Gareth Smith, control engineer leaching, milling and flotation at Mintek. “The LeachStar suite of controllers incorporates leading technology to optimise the performance of the various process units found on the gold circuits, including thickeners, leaching and carbon circuits. Mintek is continuously developing innovative technology and novel instrumentation for extractive metallurgy.”

Cyanide, which is produced and supplied locally by SASOL, sells at about US$ 1200 per ton on the open market. Apart from being an expensive but vital part of the gold extraction process, the use of cyanide must be carefully monitored and controlled for safety and environmental reasons.

An aerial view of Anglogold Ashanti’s Mпонeng Gold Plant where Mintek’s LeachStar advanced process control (APC) system for gold circuits has been installed with significant benefits to the client.

LeachStar is one of a family of advanced process control (APC) systems developed by Mintek to enhance the operation of a number of different metallurgical operations.

“Mintek is currently supporting more than hundred APC installations worldwide, the largest concentration of which is on the African continent,” said Dr Dave Hulbert, manager of Mintek’s Measurement and Control Division. “Our Star Control System (StarCS) is a widely applicable software platform with modules aimed specifically at metallurgical processes. Mintek has developed specific solutions on the StarCS platform to address typical mineral-processing control challenges in the areas of milling (MILLStar™), flotation (FLOATStar™), furnaces (FurnStar™) and leaching (LeachStar™).”

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Modular MeTRIX technology demonstration plant commissioned

MINTEK and Bateman have commissioned a modular demonstration plant under their collaborative agreement to develop and implement the MeTRIX (Metal Recovery Through Ion-exChange) Technology, commonly known as resin-in-pulp (RIP) for the metallurgical sector.

The plant will be used to demonstrate the potential of RIP technology for improving recoveries at various base-metal plants in southern and central Africa, with a particular application being the re-treatment of residues and waste streams. RIP is particularly suited for this role, since it is effective on low-grade streams (less than 5 g/l), and in the case of re-pulped residues, it lessens or eliminates the costly solid/liquid separation step required in competing technologies. A further important benefit is a reduction in the environmental consequences of the waste.

The skid-mounted MeTRIX demonstration plant, designed and built by Bateman and Mintek, consists of four adsorption stages of 2m³ each and an elution circuit. It has a design throughput of 170 l/min (10 m³/h). A novel resin concentration meter is used to monitor the resin concentration in each stage, and is linked to a PLC/SCADA system that controls the resin inventory profile and the slurry and resin residence times.

The concept of modular, transportable process plants for mining and minerals processing was developed by Bateman nearly three decades ago, and has progressed steadily ever since, with new technology being continually added to the range of modules made available to clients. Most of these plants have been used for diamond recovery, but the range has been expanded to cover other mineral processing applications.

Mintek has been involved in the development of the RIP and associated resin-in-heap (RIL) technologies since the 1980s. Originally envisaged as an alternative to carbon-in-pulp for gold recovery, RIP (using the Mintek-developed gold-selective strong-base resin) has found a niche application for recovering gold from carbonaceous preg-robbing ores, and is used in this role at the Barbrook mine in Mupumbula and at Penjom in Malaysia. More recently, RIP development work has focussed on base metals. Successful laboratory and pilot-plant testwork has been carried out on copper, nickel and cobalt recovery from laterite leached pulp, and Activox® CCD underflows, copper from blastfurnace CDD underflows, zinc from zinc refining residues, and vanadium from waste streams.

MeTRIX is the proposed trade name.

Further information:
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Mintek commissions R4.5-million atomic force microscope

MINTEK has commissioned a R4.5-million scanning probe microscope (SPM) for nanoscience and nanotechnology research in South Africa. This makes Mintek the only facility on the African continent with such a comprehensive capacity for nanoscale research. The SPM, which is now operational, has been funded by the Department of Science and Technology (DST) to build capacity for nanoscience and nanotechnology research in the country. Mintek has the largest nanoscience and nanotechnology programme in South Africa.

“As probably one of the most versatile and comprehensive SPMs of its kind in the southern hemisphere, Mintek offers this technique and its expertise to universities and research divisions, as well as industry and commerce for highly specialised private sector projects over a broad spectrum,” said Dr Dave Compton, senior engineer of Mintek’s Advanced Materials Division.

“Mintek is planning a number of workshops to showcase and promote this highly versatile nanoscience technique to universities and industry, and a number of industrial companies have already expressed great interest in Mintek’s SPM services.

“What makes the SPM technique unique is that it offers an approach to surface characterization that is complementary to traditional electron or light microscopy. Whereas electron or light microscopy can provide image and composition data, SPM provides mechanical, electronic, magnetic and force measurements of the surface of a material, in a number of different environments. This allows a more comprehensive understanding of materials,” said Compton.

“The SPM comprises two main components: a MultiMode and EnviroScope,” explained Ina Claasens, Mintek’s scanning probe analyst and part-time PhD student at the University of the Free State. The MultiMode can be used in different configurations, and allows mechanical properties, such as hardness, to be measured on very small scales (in the order of nanometers). In another configuration, the MultiMode can measure the very small forces that exist on the surface of a material. By changing the configuration of the SPM, it is even possible to measure the electrical and magnetic properties on the surface of a material.

“The EnviroScope component allows the SPM technique to be performed in different environments, for example, in a vacuum, in gases and even in liquids. It also has a heating stage to perform measurements over a range of temperatures. The EnviroScope can also be configured to perform electrochemistry experiments on very small areas,” concluded Claasens.

New APIC jig launched

The latest in the series of APIC modular jigging plants was launched by Bateman Minerals and Metals in February.

The Apic 15 jig, built in Mintek’s Engineering Services workshops, incorporates the latest advances in jigging technology. “Over the past few years, we have made considerable enhancements to the jigging process, systems, and design, taking into account feedback from clients and from our own collaborators, including Mintek,” said Vincent Dieudonné, Manager: Jigging at Bateman Minerals & Metals.

“There is hardly any feature of this unit that bears close similarity to the first APIC jig, constructed here at Mintek eleven years ago.”

Bateman, in partnership with Mintek and JKMRG, Australia, has established a leading position in the world using jigging technology. Early on, under-bed air-pulsed jiggling, originally developed for coal washing, was identified as a highly efficient method for recovering metals from furnace slag. Several large turnkey plants were built in southern Africa for ferro-alloy recovery, and ongoing research to expand the range of applications to include upgrading of coal and ferrous ores. An important breakthrough has been the design and commissioning of industrial-size, purpose-built modular jigging plants. In the past few years, jigs and services have been supplied to clients in Australia, India, Russia, Europe, South America and the USA, as well as in southern Africa.

In 1997, Bateman acquired the world wide rights to the technology that is at the heart of the process from the Fives-Lille Group in France.

The APIC jig is able to handle a wider range of particle sizes than standard jigging equipment, and the density of separation can be adjusted to much higher than is possible, using dense media. A unique Mintek-designed gate discharge system enables a clean product to be obtained at high recoveries. The JigScan controller, which is supplied with every new APIC jig, enables stable operation with very dense materials and with varying feeds, and increases separation efficiency, particularly with difficult materials such as fines and near-density material.

APIC 15 is a 750 mm bed unit with a nameplate capacity of typically 350 t/h for material in the size range between 6 mm and 25 mm. The unit is being shipped to a project in Belgium, where it will be used to recover ferroalloys from slag. The byproduct sand-size slag fraction, produced directly from the underflow of the reject screen, will be sold for use in the construction industry.

The client purchased a similar jig plant from Bateman in 2001, and the new installation is expected to effectively increase their recycling capacity. “It is extremely gratifying to see clients come back to us, as it shows they have obtained positive results with their first experience of the technology,” said Mr Dieudonné.
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Major upgrade for Analytical Services

MINTEK has embarked on a major programme to upgrade its analytical facilities over the next three years.

A budget of R3.1-million has been approved for the purchase of new instruments in the current financial year. A Varian ICP-OES trace instrument for dedicated individual platinum-group metals analysis is scheduled to be delivered to Mintek by the end of March. This will be followed by a further ICP-OES, chiefly for multi-element base-metal analysis, and an ICP-MS. All three instruments should be fully operational towards the end of April.

A similar amount has been budgeted for financial years 2006 to 2007, subject to the sample workload increasing in line with expectations, for additional ICP instruments and to upgrade the XRF and Atomic Absorption facilities.

Over the past few years, the role of Mintek’s Analytical Services has changed significantly, from that of being primarily a services provider to Mintek’s engineering divisions. Reduced assay costs and shorter turnaround have allowed the division to penetrate the external market for ferro-alloy recovery, and ongoing research to expand the range of applications to include upgrading of coal and ferrous ores. An important breakthrough has been the design and commissioning of industrial-size, purpose-built modular jigging plants. In the past few years, jigs and services have been supplied to clients in Australia, India, Russia, Europe, South America and the USA, as well as in southern Africa.

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The Engineering Services construction team with the completed jig.

Vincent Dieudonné, Manager: Jigging at Bateman Minerals & Metals and Abdik. Musa, an expert in coal processing from India, examine the new APIC 15 jig at the launch at Mintek.
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A close-up of a section of the Gold Plant at Mponeng.

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Further information:
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At the MeTRIX launch (from left): Jocelien Wente (Chief Engineer: Ion Exchange, Mintek), John Parker (Senior GM: Technology Business Lines, Bateman), Roger Paul (GM: Technology, Mintek), Dirk Schoen (GM: Special Projects, Bateman) and Bert van Hege (Ion Exchange Coordinator, Bateman).