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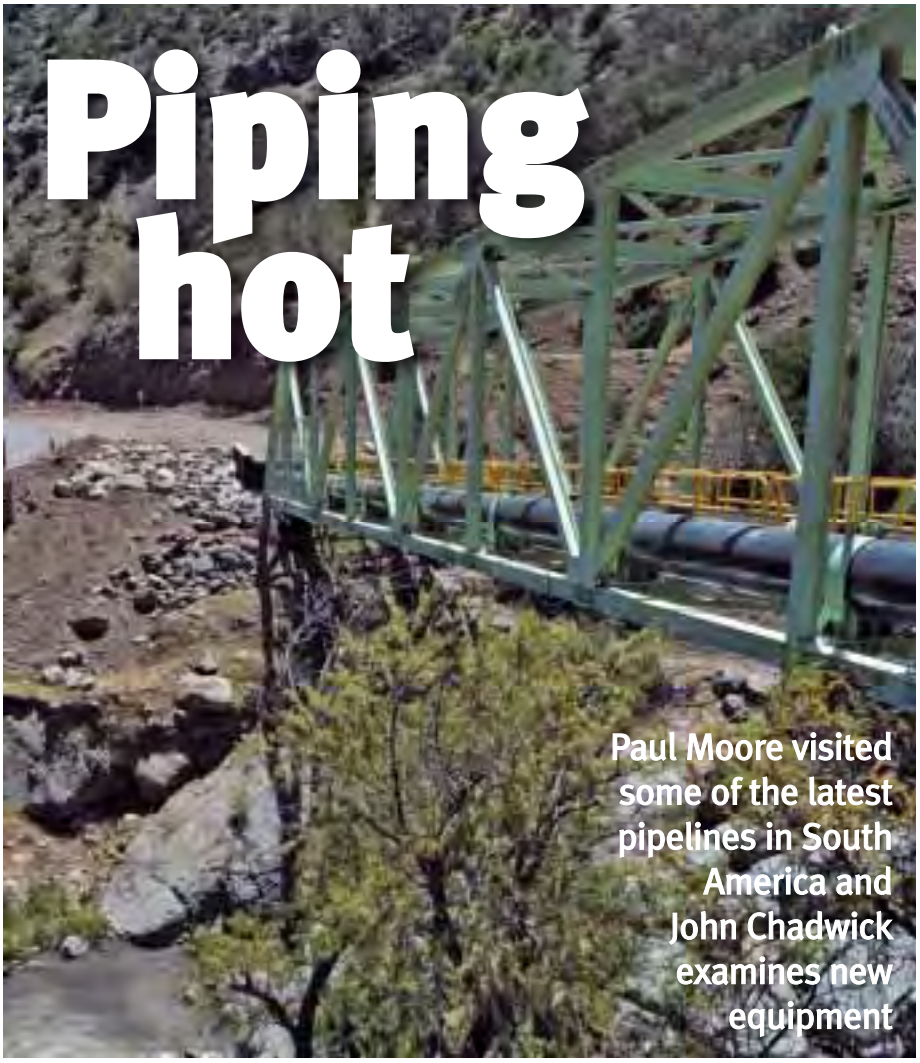
Piping hot



Paul Moore visited some of the latest pipelines in South America and John Chadwick examines new equipment

South America has been something of a hotspot for piped ore slurries over the years, with users of these systems including Paragominas, Samarco, Antamina, Escondida, Esperanza, Alumbrera, Collahuasi, Los Bronces and the new Minas-Rio operation amongst others. The Anglo American Las Tortolas plant is located at 750 m above sea level, and is connected to the two grinding/ thickening/slurry holding operations at Los Bronces (existing facility) and Confluencia (new facility at 3,080 m) by two pipelines that transports ore slurry by gravity over a distance of about 57 km.

The Las Tortolas plant and Los Bronces mining complex, both of which have or are undergoing significant expansions, are discussed in detail in one of this issue's Operation Focus articles. In summary, with Confluencia, the overall ore throughput capacity is being increased from 61,000 t/d to 148,000 t/d. The majority of the concentration in metallic terms happens at the plant, as the ore slurry at about 0.8 to 1 % Cu, has a similar copper grade to the raw ore.

There are two pipelines, one of 610 mm diameter dating from 1991 running 56 km. It carries 36-61% solids at an average flow of 700-800 litres/sec and is capable of transporting 2,380-3,200 t/h from 3,359 m to 765 m. The other second 610 mm diameter pipeline, completed recently as part of the expansion, is 57 km in length, can carry 38-61% solids and has a flow of 950-1,280 litres/sec, with slurry transport of 3,227-4,501 t/h. Both use three tunnels, are mostly buried for the remainder of their lengths, and employ five energy dissipating choke stations. A third pipeline is also being added in order to pump water back to Confluencia from the tailings pond at Las Tortolas, which in the end will eliminate the use of any primary fresh water sources. This new 610 mm water pipeline will transport 785 litres/sec using five pumping stations, each with either four or five large centrifugal pumps; as well as water storage tanks at intermediate points.

A $9 million contract for this and the new slurry pipeline was awarded in 2009 to Ausenco-owned Pipeline Systems Incorporated (PSI) (now Ausenco PSI) for detailed engineering and field engineering support, with the contract awarded by lead EPCM, Bechtel Chile. In addition, CiDRA Minerals Processing supplied SONARtrac process monitoring systems for both the new 711 mm slurry pipeline and new water pipeline. The systems were chosen to provide flow measurements at multiple key monitoring points on the new slurry pipeline, designed by Ausenco PSI. These critical measurements are used for operational control as well as leak detection along the pipeline. The SONARtrac flow monitoring systems were installed at six critical points: at the head station and at all five choke stations, where they provide critical information for operational control and leak detection. Two additional SONARtrac instruments will be installed on the new recovered water pipeline for operational monitoring and control. CiDRA's SONARtrac non-intrusive flow monitoring systems make no contact with the liquid or slurry and can be removed and reinstalled without process interruption. They also demonstrate very stable output and superior levels of performance in the presence of highly variable fluid properties.

Iron ore project Minas-Rio is Anglo American's most important new operation in South America, and incorporates a mammoth pipeline (the largest tonnage and longest for iron ore concentrate in the world) – 525 km, crossing 32 municipalities from the mine and beneficiation plant at 770 m in Conceiçao do Mato Dentro to the filtration plant and iron ore terminal at the Port of Açu in São João da Barra. The single pipeline actually consists of two pipe sizes 610 mm and 660 mm diameter. At its height the pipeline construction has involved over 100 work-fronts and over 11,000 workers. The operation is set to produce 24.5 Mt/y of iron ore from the second half of 2013 and at the time of ***IM***'s meeting with project management in late 2011, final negotiations with 1,308 out of a total of 1,423 landowners along its length had been completed. Some 201 km of pipe had actually been laid and 217 km of the 528 km of earthworks completed. About 2 km of tunnels are needed in four separate excavations. There is one pump station about halfway down the pipeline and another at the start of the pipeline. Ausenco PSI also has the contract for the Minas-Rio pipeline. Ausenco PSI's scope includes conceptual design, feasibility study, basic advanced and detailed engineering, supervision for earthmoving detailed design, procurement support and construction supervision.

The Minas Rio mainline pumps are Weir Minerals Geho Piston Diaphragm types. There are two large pump stations, with Pump Station 1 having eight mainline pumps and Pump Station 2 having 10 mainline pumps. Main high pressure slurry valves up to 24 in are being supplied by ValvTechnologies. The pumps selected for the new Los Bronces pipeline system were manufactured by Goulds/ITT.

New deliverers

Weir Minerals Africa recently dispatched the biggest hose bend manufactured on the African continent — a 1,000 nominal bore (NB) hose weighing 1.4 t and a mandrel weighing 1.4 t —

Last year Weir Minerals Netherlands secured the second largest order in the history of the company for 12 Geho® piston diaphragm pumps, type TZPM 2000, for Samarco Mineracao in Brazil. Samarco Mineracao has been a Geho customer since 2008 when the first Samarco project (for six TZPM 2000 pumps) was successfully commissioned. Samarco Mineracao is regarded within the international long distance pipeline industry as a key benchmark and example for others. The 12 TZPM 2000 pumps are equipped with the latest features, like GLORES™ technology (Geho Load Reduction System). After extensive reviews by both Samarco Mineracao and the engineering design company involved, Ausenco-PSI, the GLORES technology will now be applied in the third long distance pipeline project. The pipeline transports iron ore slurry over a distance of some 400 km from Germano in the state of Minas Gerais to port in Punto Ubu at the coast. There are two pump stations, each with six pumps in parallel (five in operation and one standby)

to a customer in Australia and is currently working on an enquiry for an even bigger unit of 1,100 NB. These orders follow the successful completion in 2010 of what was then the biggest hose bend to be produced on the continent, an 855 NB unit.

"Before we entered this market segment, there were only three suppliers in the world capable of manufacturing hose bends of this magnitude," Weir Minerals Africa's Grant Ramsden, says. "We recognised that demand was greater than supply and took a strategic decision to develop the capacity to produce these units as an additional specialised product line. There's a definite trend in the mining industry worldwide towards hose bends with increasingly larger nominal bores and we're now fully geared up to meet and remain abreast of this requirement."

Weir Minerals Africa has integrated Linatex® high wear, super abrasion resistant rubber into the design of the hose bend, as well as high-strength synthetic fabric with steel reinforcing within the body, for greater flexibility.

Last December Weir Minerals Linatex released two new products and one new product enhancement. "The introduction of these new hose offerings proves that Weir Minerals Linatex is positioned to be the manufacturing leader in the hand-built hose market. Our products are simply better-performing, and provide advantages not offered by the competition," said Andrew Philp, VP Comminution Product Marketing at Weir Minerals. "Plus, relative to the competition our products are competitively priced."

Intended as a replacement for hard walled pipe bends in slurry transfer pipelines, the Linatex® preformed hose bend provides a significant wear life improvement over standard metal pipe, especially when abrasion wear and vibration are issues. The premium Linatex tube provides long lasting wear resistance in a rubber compound for wet slurry applications. This resilient rubber absorbs the energy from moving slurry and returns to its original form whilst dampening vibrations. Linatex hose bends are stocked in 102 to 406 mm internal diameters in both 45^0 and 90^0 3D radii.

Weir Minerals Africa has just dispatched the biggest hose bend manufactured on the African continent — a 1,000 nominal bore (NB) hose weighing 1.4 t and a mandrel weighing 1.4 t

The Linatex wear indicator system provides a solution to many of the traditional issues surrounding the maintenance of hose in highly abrasive environments. It provides 24 hour-a-day monitoring and peace of mind. Installing this system can avoid the need for physical inspections and costly emergency maintenance downtime. Unexpected hose failures that can cause environmental spills, and health and safety incidents, should be substantially reduced.

Unlike other wear indication systems which only check for a break in the wire (continuity) to detect a go/no-go hose failure point, the Linatex system senses a change in resistance as measured by ohms – such precision measurement provides for more accurate results. The company describes it as "a revolutionary early warning system for hose that handles highly abrasive materials."

The company has also enhanced its previous cut end hose by increasing the standard working pressure to 10.34 bar. It has also established a new coupling vendor to provide better aesthetics and performance in its reusable lightweight aluminium flanged couplings.

The Linatex cut end hose system continues provides an abrasion resistant slurry hose designed to provide fast and easy on-site assembly, minimising downtime and maintenance costs.

Monitoring pipe fusion

McElroy recently introduced the latest version of the DataLogger series of quality assurance tools. The DataLogger 4 is a new, smaller version that records and documents key parameters of the pipe fusion process. McElroy DataLoggers are cost-effective devices that are used to verify that the proper pipe fusion procedures have been followed prior to installation. The device consists of a rugged, handheld computer for recording and navigating the data, as well as a data-collection unit that records fusion pressure over time.

The DataLogger 4 has a wide range of enhancements over previous models. One of the major additions is FusionGuide, a feature designed to give a faster visual "go/no-go" interpretation of the graphs presented on the handheld computer and the PC after data download. A trained inspector could look at the generated graphs and determine if a fusion joint was fused with the correct pressures and times according to published standards.

Fusion technicians will also appreciate a smaller size, internal battery within the handheld computer that powers all the included DataLogger equipment, twice the screen resolution as previous models, and a coiled cord between the pressure sensor data-collection unit and the handheld computer that extends to four feet long and stores at a smaller two feet long. The pressure sensor has a 0 to 3,000 psi pressure range. Technicians will also be able to provide temperature readings using their own preference of pyrometer. The DataLogger 4 is expected to have global appeal due to it having multilingual options. The desktop computer software also supports these languages.***IM***

The McElroy DataLogger 4