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Modular Plants: Doing More with Less

Single-source convenience, quicker delivery and efficient use of space and materials attract growing interest from project owners

By Russell A. Carter, Managing Editor

The precise definition of the term "modular" mineral recovery plant is somewhat elusive, with examples ranging from small, skid-mounted units that perform specialized tasks to much larger, prefabricated component systems that, when installed and commissioned, serve as a principal processing facility. What is much more easily definable, however, is the continued level of industry interest in modular plant technology to solve project-design challenges posed by increasingly remote mine locations; rising transportation, energy and materials costs; and scarcity of skilled tradespeople in less-developed regions of the world.

And, although the concept that usually comes to mind when "modular plant" is mentioned is gravity separation systems for gold and other precious metals, the scope of modular applications is actually much wider, encompassing recovery of diamonds, coal, copper, and other mineral commodities. Bateman Engineering, for example,

originally designed modular plants used mostly for diamond recovery, but has expanded its range to applications for coal, graphite, magnesite, andalusite, chromite, platinum, tantalite, copper and cobalt oxide. The pool of modular plant suppliers ranges from full-range providers such as Metso, Telsmith, and FLSmidth—which late in 2009 acquired modular plant specialist Summit Valley Equipment & Engineering—to more specialized vendors such as Gekko, Consep, DRA, ADP and others.

It's an industry segment that regularly spawns innovations. Recent technological developments in modular plant design range from simple—such as an ingenious fastening system for tank construction that eliminates conventional bolting or welding—to complex, involving completely modular pre-concentration plants that can be towed down an incline or lowered down a shaft to carry out crushing, screening and gravity/flotation processing underground.

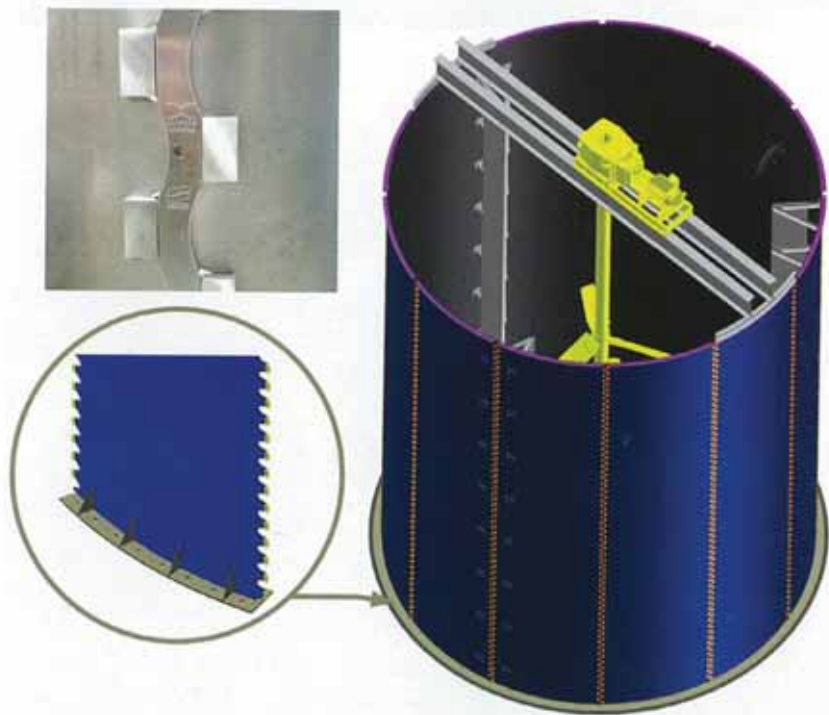
Less Labor

In a modular world, "less" is a key concept—less infrastructure needed, less equipment and parts, and less need for specialized installation skills. Moving in that direction, Xstrata Technology, developers of ISASMELT and ISACONVERT smelting processes, IsaMill grinding mills, the Jameson Cell flotation machine, and other mineral processing systems, recently introduced an innovative, modular storage tank system for slurry applications, called ZipaTank. According to the company, ZipaTank uses a novel locking mechanism to provide watertight sealing of pre-fabricated vertical panels, eliminating the need for welding to assemble the tank panel walls.

Mike Hourn, business manager-hydrometallurgy at Xstrata Technology, said the ZipaTank system was designed to overcome the limitations of current slurry tank design, in particular the high capital cost and lengthy installation times currently associated with slurry tanks. "The ZipaTank system can reduce the capital cost of conventional welded slurry tanks by up to 35%, with installation of large ZipaTanks being one to two weeks compared with upwards of six weeks for welded tanks. The system is also very simple to use; a 100 m³ tank will only require six vertical panels to put together. No welding is needed in the construction of the tank, so minimal skilled labor is required," Hourn said.

The ZipaTank consists of vertical panels locked together to form the tank shell using a compression joint. The cylinder is then bolted to the base, eliminating any welding at heights and the need for scaffolding. Each vertical panel is manufactured from a single cold-rolled section of mild or alloy steel to the total height of the tank. The width of the panel is rolled to match the tank diameter, with all panels designed to fit in a standard shipping container, reducing the transport costs to site.

The key to joining the panels together is the proprietary Joinlox joining system. The Joinlox system is an innovative mechanical method of joining rigid or semi-rigid com-



Xstrata Technology's ZipaTank uses the Joinlox panel-joining system to provide modular slurry storage tanks in various capacities that can be assembled without welding.

ponents together. The joint consists of two interlocking sinusoidal sections fabricated on each edge of the tank panel, which are brought together and then locked with a tensioning key, resulting in a spring-loaded joint. As the tensioning key is pushed into place, it wedges the two panels together and locks the joint. The mating surfaces of the joint are rubber lined, providing a water-tight seal between the panels. No bolts are used for the panel connections, significantly decreasing the installation time. This joining system also allows the panels to be taken apart if required, so at the end of the project's life, the tanks can be disassembled and used again at another operation.

A major advantage of this type of tank construction, according to Xstrata Technology, is it enables all components of the ZipaTank to be fabricated and lined off site, under controlled conditions, so high quality lining can be achieved.

Hourn said that one of the issues facing tank installation is the failure of site-applied linings due to variable local weather conditions during installation. The ZipaTank panels, however, employ lining systems that are applied under controlled factory conditions. This reduces the cost of the lining, and allows lower-cost lined panels to be used in the place of more expensive alloy steels. A large range of rubber and GRP/FRP lining systems can be used.

The ZipaTank can be used for a wide range of applications, such as storing concentrates, reagents, repulping and conditioning duties, flotation tanks, thickeners and clarifiers as well as all types of leaching applications in mining and non-mining operations.

Xstrata Technology said it designs and supplies the tanks specifically to suit a client's application, providing loading details as well as foundation design if required. Fully modular ancillaries can also be designed into the tanks, such as baffles, slurry risers/downers, nozzle and sparger inlets, lids, launders, surrounding structural steel work and stairways, platforms etc outside the tank. All equipment is designed to be containerized for ease of transport. Xstrata Technology can also provide the tanks as a complete package inclusive of the agitator, impellers and agitator support beams.

"We have only really scratched the surface as to what we can provide with the ZipaTank technology," said Hourn. "It is such a simple system, but has the potential to provide substantial savings in both cost and in-

stallation times for our clients. While most mining equipment has undergone continual advancement, slurry tanks have not advanced significantly over the last century. With the ZipaTank, we are planning to improve tank quality and modernize the fabrication techniques for large slurry tanks, resulting in a step change in tank technology."

Original inventor of the Joinlox concept, Dean Cameron, reportedly got his inspiration for the technology from the way clams attach themselves to rocks via hooks on the end of hundreds of silk-like filaments. Joinlox, too, uses a series of interlocking hooks, which are joined together by a "key" that slides between the hooks. The hooks on Joinlox convert shear forces into tensile and flexural forces, dramatically increasing the strength and pressure rating of the joint.

The patented technology does not use traditional fasteners, welding or adhesives, all of which Joinlox said are expensive, time-consuming, irreversible or lead to weaknesses in the joints. The system is claimed to be adaptable to suit almost any linear or complex joint, providing rapid, strong and pressure sealed joints across a broad range of materials and combinations without need of costly equipment or skilled labor.

Joinlox said the system can be used for a wide range of applications, from the construction of storage tanks and structures to returnable containers and crates, electrical enclosures, large diameter pipes, rapid formwork and bridge piles, and a range of building materials and construction methods.

"Before commencing any new project, we carry out an initial engineering and cost analysis that involves comparing Joinlox with all other available methods, designs, costs and processes," said Joinlox CEO John Pettigrew. "From this we are able to provide a clear indication of the savings and benefits our clients may expect to realize by implementing the Joinlox system for their products or applications."

Pettigrew said Joinlox is continuing discussions with other international manufacturers across a wide range of industries, exploring ways of using its technology to overcome joining problems.

ZipaTank™

- Strength • Low Maintenance • Speed • Relocatable • Low cost

Simple compression joint technology for trouble free operations and maintenance



- Slurry Storage
- Leaching
- Reagent storage
- All mining and industrial applications



Vertical Modular Panels for rapid assembly



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