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Roymec Technologies partners with Skorpion Zinc to solve PLS clarification problems.

Pregnant Leach Solution (PLS) Clarification using Pin Bed Clarifier Technology (PBC).

The Skorpion Zinc mine is located some 25 km North of Rosh Pinah in South West Namibia. The mine is part of Anglo American's Base Metals division and complies with the stringent requirements for all health, safety and environmental issues. The plant has been in operation since 2002 and produces 150,000 tpa of special high grade (99.995%) zinc metal.

"The primary purpose of this particular project was to clarify the pregnant leach solution to enable production of the highest quality zinc metal thereby commanding a premium on the world market" says Skorpion Zinc's project manager Jacques Kruger.

PLS clarification is a perennial problem on most base metal recovery plants with operators employing various methods to aid solution clarification. Suspended solids in the PLS forms crud and affects phase separation in solvent extraction plants and is detrimental to the final metal plating process in electrowinning.

As background, Skorpion Zinc has not been able to reduce the PLS suspended solids to the stringent specification levels required for zinc solvent extraction. The mine has trialed numerous clarification technologies since start up including sand filters, conventional large diameter clarifiers, floating media filters, without success. During extensive PBC trials that were run and supported by Anglo American Research using Roymec's pilot PBC unit, feed to the unit ran at between 50 – 250 ppm. Kathy Sole, Anglo Research Project Manager for this pilot trials said, "The tests demonstrated conclusively that the Roymec pilot PBC could successfully maintain the PLS suspended solids to within the required design specifications.

The trials presented Roymec the opportunity to look in depth at the feed conditioning and chemical dosing process and optimize reagent usage and flocculation, so much so that they were able to reduce overall chemical consumption and achieve improved final overflow results on a sustainable basis.



Pilot Plant Installation at Skorpion Zinc Mine

Similar PLS clarification trials have since been conducted by Roymec at the Kanshanshi Copper and Chambishi Copper and Cobalt plants on the Zambian copper belt, and results indicate similar trends.

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Skorpion Zinc's remote mine site

Jacques continued , "The PLS clarification project encompassed the supply, delivery to site and installation from South Africa to Namibia of a reagent dosing circuit, feed splitter, three pin bed clarifier structures, elevated platforms and elevated tank support structures. The PLS clarification plant treats approx 1000 m³/hr in three PBC's in parallel. The units are 8m diameter steep cone clarifiers, having deep sidewalls and are constructed from carbon steel with polyurethane internal lining. The top of the tank is approximately 18m from ground level."



"Rosh Pinah", Jacques said, "is relatively remote and an expensive site to establish crange and equipment. Skorpion Zinc had maintenance cranes which could be made intermittently available for construction purposes but not over continuous periods. The new PLS clarification plant will process large quantities of the acidic PLS electrolyte which is extremely aggressive towards mild steel and will displace an existing sand filter installation. This meant that the new plant had to be placed as close as possible to the redundant filter installation to allow the reuse of existing pumps and plant infrastructure. In addition, the new plant had to be installed inside existing, working plant without severely interrupting the existing operations, which key to the overall success of the new project. We did not want any plant downtime and loss of production."

Jacques went on to say that Roymec performed well in terms of project deliverables in this regard.

Traditionally, large tanks in PLS service are fabricated either in resistant stainless steels or lined concrete. Skorpion has extensive experience and skills with lined mild steel systems in acid service and was comfortable with building a mild steel tank with impact and working surfaces fabricated in 904 s/s. After weld completion, the inside of the tanks were blasted and coated with a polyurethane lining system.

PBC Overflow Quality

The following additional design criteria were applied in arriving at the construction sequence that was finally used:

- Key components of the tank elements are fabricated in 904 s/s. It was preferable to carry out a maximum amount of stainless steel welding in South Africa.
- Parts of the pin bed clarifier screen deck require accurate fabrication processes which might have been problematic at the elevated levels inside a working plant.
- Escorted provincial abnormal loads are relatively affordable. Elevated transport loads requiring telecom and electrical escorts become prohibitively expensive, especially cross border.
- Using the concrete backwash tank for tank and dosing system support would allow the construction phase to neatly mesh with the arrival of fabricated items from South Africa. All elevated ancillary equipment was supported off the concrete tank.



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- The high spec external coating system required at Skorpion
- requires a shotblast preparation. It was desirable to avoid any major external surface shotblasting on site to prevent atmospheric pollution and process contamination.
- Restricted access to a radius of approximately 100 m of the installation site meant that large portions of the plant would have to be “walked in” by crane wherever possible.

The final erection procedure entailed fabrication, welding and partial painting of the cone and shell in South Africa, completing every longitudinal shell weld in South Africa. All portions were fabricated at less than 4.8 m transport height and the complex wedge wire screen portion of the shell was installed and welded in South Africa at ground level. Shell sections were flanged so that the flange acted as a transport and lifting stiffener and boilermaking alignment tool. After installation, the flanged joint was seal or strength welded as required, with little or no external coating repair.

“It was estimated that the use of South African fabrication and maximizing the use of abnormal transport loads reduced the size of the construction crew on site and the duration of the period on site by approximately 8 weeks and contributed towards the financial viability of the project, ” commented Jacques.

PBC Installation at Skorpion Zinc

“ All in all, approximately 70t of carbon steel was used for the construction, and a smaller amounts of 904 stainless steel” , said Jacques.

The plant was laid out in 2D CAD before the agreed dimensions were passed on to the detailers. The pin bed clarifiers were modelled in AutoCad Inventor and the access steelwork was modelled in Tekla Structures. Tekla Structures detailing allows for extremely accurate detailing and manufacture of non-square structures and minimizes the risk of delays when erecting elevated structures.

Roymec have supplied PBC units to major mining houses over the past few years, based on a combination of superior technology, competitiveness and proven results, including Phelps Dodge’s Tenke Fungurume plant, Anvil Mining’s Kinsevere plant and FQML’s KMT project, all located in the DRC.

Roymec Technologies are suppliers of specialist separation equipment and processes, including thickeners, pin bed clarifiers, filter presses, linear belt screens, flocculant plants, vacuum filters, SX filter plants, ion exchange and elution plants.

Roymec Technologies are the only major supplier in the field of separation equipment that is wholly South African owned.



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