Mining

Dosing heap leaching reagents

At a South African mine, gold is recovered using the heap leaching process - abandoned spoil heaps or tailings are treated with cyanide to separate out the residual gold. Typically, these early 1900s workings still contain around 2% gold and the heap leaching process recovers over 99% of the residual gold.

Three VF25 pumps are used to dose the treatment chemical, cyanide, throughout the recovery process. Firstly, cyanide is dosed onto the spoil heap to dissolve the residual gold, leaching it from the sand and then the initial leachate is treated again with cyanide to increase the reclamation percentage.

The Verderflex range is particularly useful for this application because of its sealless pump design (preventing liquid spills), the ability to pump solids (allowing for imperfect reagent mixing), dosing consistency and a hose which is chemically resistant to hazardous treatment compounds.

Reagent Dosing

A mine in the Peruvian Andes has to dose sodium chromate, sodium cyanide, copper sulphate and xanthate.

They have installed five Verderflex pumps (two VF25s, one VF15 and two VF10s) because of their excellent repeatablity and accurate dosing as well as their ability to handle corrosive media.

Mining is a tough, uncompromising process and the mining industry is equally demanding being driven by the goals of mine profitability, plant efficiency, cost minimisation and yield maximisation.

Pumping challenges in the mining process

Plant must -

- Perform as expected
- Have a low cost of ownership
- Be reliable, be easy to maintain and not require specialist maintenance skills
- Be able to survive the rigours of the mining environment
- Be resistant to operator induced problems

Mining pumps should -

- Deliver repeatable quantities of products into the process, stabilising process variables
- Have high levels of plant availability
- Resist abrasive wear
- Withstand normal pumped product or process variations
- Be controllable via plant control systems
- Be easy to maintain yet require infrequent attention
- Not affect overall levels of plant performance

Benefits of using a Verderflex® Peristaltic Pump to pump slurries

- Traditional low cost solutions such as centrifugal pumps can suffer from severe impeller wear requiring frequent replacement. This brings consequent downtime and high maintenance costs which are often measured in days - A False Economy!
- Attempts to increase maintenance intervals, with such traditional solutions often use expensive wear-resistant alloys, often installing the more costly parts once the pump is in service.
- A Verderflex hose pump, is by definition, rubber-lined and does not suffer abrasive wear – the lifetime of it's only service part, the hose, is primarily related to pump speed.
- Alternative solutions using rotary lobe pumps rely on consistent close tolerances between the rotor and casing to maintain performance and similarly, require extensive maintenance.

Thickener Underflow

- Mining slurries often have sub-micron solid contents in excess of 80% by weight and have slurry specific gravities (SGs) in excess of 2.0 - Usually these slurries are also highly abrasive. A Verderflex peristaltic pump is ideal for slurries of this type.
- In addition to their abrasion resistant slurry pumping performance, hose pumps can be reversed to clear thickener blockages if necessary.
- Peristaltic pumps have a smooth liquid passage, there is no opportunity for the product to settle as the peristaltic action keeps the product in suspension.
- The Verderflex VF125, with a 125mm or 5" internal diameter hose, is the **world's largest** high pressure hose pump with single pump slurry flow rates in excess of 60m^3/hour. This allows larger high SG thickeners to be designed, maximising process plant yields.

Dosing Process Reagents, Coagulants and Flocculants

- Ores have varying mineral contents and recovery systems must accommodate such variations. Pumps must consistently vary their dosing rates to optimise chemical usage and maintain plant throughput. Peristaltic pumps have a linear flow-speed characteristic and excellent repeatability, an ideal complement to plant SCADA systems.
- Process reagents, such as cyanides and acids are often highly corrosive but as the chemically resistive hose is the only part in contact with the pumped product then there are no working parts exposed to the chemical.
- Many process chemicals, including Powder Activated Carbon (PAC), are highly abrasive, creating continual wear problems for progressing cavity pumps leading to ongoing high stator replacement costs and frequent maintenance downtime.
- pH moderating chemicals, such as lime, are usually too abrasive for diaphragm pumps, causing them to persistently clog up, resulting in continual downtime and maintenance requirements. Verderflex peristaltic pumps have an exceptional record dosing lime into process and waste, many being used for bulk dosing to remediate post-mining waste and effluents.
- Reagents may be mixed at the mine or the processing plant leading to less than perfectly dissolved solutions but such solids in the liquid stream are not a problem for a Verderflex peristaltic pump - mine operators can use pumping solutions that allow for mining realities.
- The seal-free design of the Verderflex peristaltic pump eliminates leaks and the consequent risk of workplace or environmental contamination.
- For aggressive activator solutions including Copper Sulphate, pumps can optionally be fully Nickel plated to maximise corrosion resistance and prolong the pump's operational life.
- Flocculants and coagulants can be highly shear sensitive products, where excessive shearing noticeably affects plant performance. Verderflex peristaltic pumps have a gentle pumping action which result in a low shear rate. Mining industry studies have shown that Verderflex hose pumps maintain flocculent particle size. The same studies showed that progressive cavity pumps reduced particle sizes by approximately 50 to 75%, reducing flocculation performance thereby increasing chemical usage to maintain throughputs or requiring longer flocculation times.

VERDER
Solutions in Pumping Technology

The Verderflex Series

Verderflex

- Operating pressures to 16 Bar/230 PSI and flow rates to 90m³ /hour (390 US GPM)
- Simplified hose connection for easy maintenance
- Specially designed hose construction for longer hose service life
- Supplied in close coupled or long coupled (bare shaft) designs
- DIN, ANSI and JIS flanges or hygenic compliant connections
- Certified to EHEDG standards for use in the food and drinks industry
- Can be supplied with accessories including pulsation dampers, dosing controllers even as complete dosing stations
- Supplied with a 2 year warranty covering any defects in workmanship and material under normal use

Verderflex Dura

- Flows from 14 l/h (0.06 US GPM) to 170 l/h (0.75 US GPM)
- Maximum discharge pressures up to 12 bar (174 PSI)
- Longer hose life †
- Quick & easy maintenance †
- Close coupled pump with long coupled advantages
- 70% smaller footprint †
- Up to 25% reduction in operational noise †

† Compared with similar products

The Verderflex Hose

- 12 standard hose sizes from 5mm (3/16") to 125mm (5")
- All are designed to maximise hose life by optimising the hose's fatigue strength
- Hoses are available in Natural Rubber (NR) for general slurries, Nitrile Buna Rubber (NBR) for Crud, EPDM for activators and Hypalon® for cruds involving solvents
- Hoses have colour coded identification tape bonded into the outer during manufacture to clearly identify material type - eliminating the risk of operator confusion.

Verderflex Smart F-Series Industrial Tube Pump Range

- The Smart F-Series is an ideal solution for low pressure dosing
- Flows from 0.25ml/min (0.004 US GPH) to 27 l/min (428 US GPH)
- Industrial style F-series design using standard gear motor unit & optional inverter for process plants and easy SCADA interfacing
- Wide range of tube materials including Verderprene and Silicone
- Easy-fit tube saddle with optional leakage detection
- Industrial gearbox with optional sparkproof and flameproof motors
- Up to 4 pump heads can be fitted to a single drive

Hypalon® is a registered trademark of Dupont Dow Elastomers

Copper thickener slurry

A copper mine in Queensland, Australia has a total of 18 Verderflex pumps (14 VF65s and 4 VF125s) involved in pumping copper thickener slurry. The copper ore is first crushed, milled and mixed in a tank with the leaching solution where it dissolves and is then electrolytically recovered. The residual solution still contains a significant amount of copper and is separated from the leachate using a vacuum belt filter, prior to heating under pressure and being autoclave mixed to increase the copper recovery rate.

The Verderflex VF125 pumps the post autoclave solution from the thickener clarifier into leach residual storage tanks. These variable speed pumps are fitted with 37kW motors and have a nominal speed of 17rpm but are capable of flow rates up to 50 m3/hr (25rpm). During hose changeover, a standby VF65 starts alongside the other VF125 which increases its flow rate to prevent any reduction in overall flow. In addition, two VF125 pumps and a standby VF65 pump the 40% solid content slurry from the storage tank over a vacuum filter and in a three-stage process the liquid is treated in leach thickeners to remove the solids from the solution. Each thickener has two VF65 pumps to pump the solids back into the leach residue filter storage tanks. Finally, the thickened solution is pumped into the electrolyte units.

Five other frequency-controlled VF65s, are used across the plant with a further VF65 pump acting as a standby spare.

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VERDERFLEX®

Pumping solutions for the mining industry

VERDER
Solutions in Pumping Technology