

How peristaltic pump technology brings **water savings to mining companies**



Executive summary

Using peristaltic pump technology in the mining sector can deliver environmental benefits alongside cost reductions.



Water savings of 71% compared to typical centrifugal pumps



Reduction in water treatment also means less chemicals and equipment required



The number of filters required after thickening applications can be reduced by up to 25%



No mechanical seal flush water is required



Less tailings storage required



Reduction of impact on precious water resources

Mining industry faces up to water management responsibilities

Mine operators are increasingly responsible for optimising water consumption. The importance of carefully conserving water resources cannot be underestimated, and mining companies must assess the impact of mining on local and regional water quantity and quality. Best practice water management enhances the mining industry's reputation while minimising the burden of additional costs.



Less water for greater efficiency

Key drivers for reducing water usage and increasing re-use in the mining sector include:

- **Environmental responsibility:** Requirements for tailing storage in the dams are increasingly stringent. Precautionary measures include less water in the dams and pumping back of water from the dams for reuse in mineral processing.
- **Water availability:** Mines located in areas with scarce water resources or densely populated regions require efficient water usage.
- **Risk of contamination:** The ever-present risk of contamination to the local environment.
- **Costs:** Increasing cost of water treatment in pre and post processing operations.

To maintain production and mitigate against rising costs, mining companies must optimise their water treatment processes, and the choice of pump plays a vital role. Peristaltic hose pumps can be considered water-saving devices as they handle high solids-content typically found in mining operations and don't require water for flushing, which reduces the need for treating process wastewater or providing pump service water.

Benefits of peristaltic pump technology

Peristaltic pumps such as Bredel hose pumps from Watson-Marlow Fluid Technology Solutions (WMFTS) can accommodate continuous flow rates up to 108m³/hr (475 USGPM) and are extremely durable, handling pressures up to 16 bar (232 psi). There are no internal universal joints, valves, dead corners or glands to impact flow, and pumps are reversible for back-flushing.



Handling thicker slurry flows

Although using less water in the transportation process is a key objective, this leads to thicker, more paste-like slurries which can lead to other issues. More product can be transferred at lower velocities, but pumps must be capable of handling thicker flows.

Bredel hose pumps can pump undiluted tailings and thickener underflow with up to 80% solids. No seal water flush systems, strainers, dampeners, in-line check valves, run-dry protection devices or other ancillary equipment is needed. Pumps are self-priming to 9 metres (354 inWC) and can run dry without damage.

Annual water usage: peristaltic compared to centrifugal pump

	Rubber lined centrifugal pump	Bredel peristaltic hose pump
Sludge concentration by weight	30%	60%
Concentration of solids by volume	21%	47%
Maximum concentration by weight	50%	80%
Flow rate of slurry	3000 LPM (793 USGPM)	1350 LPM (356 USGPM)
Annual water consumption	1295m litres (342m USG)	371m litres (98m USG)
Water savings with peristaltic pump compared with a centrifugal pump		924m litres/year (244m USG/year) 71%

- Criteria
- Transferring slurry containing 70 tons of solids per hour, operating 24/7, 365 days per year
 - Specific gravity of solids: 1.65
 - Specific gravity of slurry 1.13

Pumping high solids content

Pumping applications in mining involve handling abrasive, corrosive, shear-sensitive, and viscous products. Pumping systems must be able to transfer fluids containing rocks, sand, and ore.

Mining slurries often contain sub-micron solid particles making up 80% of the total weight, with a specific gravity (SG) often exceeding 2.0. In addition to providing dependable pumping of the slurry for extended periods, pumps must also be able to operate at high pressures and flow rates to ensure continuous movement of fluids without settling.

Limitations of centrifugal pumps

While centrifugal pumps have long been widely used in the mining sector, particularly for operations such as thickener underflow applications, they have flaws. The volume of solids which can be handled by a centrifugal pump is limited. In some applications, rotors or impellers last just weeks and membrane pumps clog, leak or fail due to factors such as strong acidity.

The lower the moisture content in the concentrate, the more efficient a filter works. A centrifugal pump needs flushing water to cool and lubricate the seal. This water is partly absorbed by the pumped concentrate, meaning the moisture percentage is higher, which increases water use and impacts operational efficiency.

Peristaltic hose pumps are a convincing alternative with benefits in these applications that include:

- No mechanical seals
- No requirement for seal gland water
- No seal water flush systems
- No moving parts in the product zone
- Low and easy maintenance – just one wearing part; the hose
- Backflow and siphoning are prevented without the need for valves
- Significantly lower power consumption

The longer a pump can operate without maintenance or failure, the better. The wear-free performance of peristaltic pumps is an attribute that results from a unique operating principle. Unlike other pumps, the abrasive nature of the product has no bearing on pump life and the need for routine maintenance and spare parts is greatly reduced.



Hose is the heart of peristaltic pumps

In a peristaltic pump nothing but the hose touches the fluid, eliminating the risk of contamination of the pump. Fluid is drawn in and trapped between two shoes before being expelled. The complete closure of the hose, which is squeezed between a shoe and the track, gives the pump its positive displacement action. The result is a pump ideally suited for the transport of typical mining slurries.



The hose is the pump – single component change and reduced inventory

Multiple layers of nylon reinforcement provide excellent suction and pressure performance



The consistent wall thickness minimises stress on mechanical components of the pump

100% hose compression eliminates backflow, a common cause of hose damage

At the heart of all Bredel hose pumps is a high-performance composite hose constructed from compounded rubbers reinforced with individual layers of braided nylon, providing enhanced suction, pressure and flow performance over its lifetime.

Bredel hoses are manufactured in a wide range of materials to provide maximum chemical compatibility.

The NR Transfer hose has been specifically developed to provide extremely long life and longer process uptime for general fluid transfer applications up to 12 bar (174 psi).

Evidence of growing uptake

Mining companies are using peristaltic technology to provide optimum solutions to specific problems to key challenges including:

- Reducing downtime
- Reducing operating costs
- Minimising impact on local environment
- Meeting environmental regulations
- Managing and reducing water inventories
- Reducing chemical usage
- Lowering maintenance costs

Accurate chemical metering

Another area for cost saving and increasing production uptime is through accurate chemical metering. The range of challenging and expensive chemicals used in mining processes is vast. Utilising microprocessor-controlled brushless DC drive technology, Bredel hose pumps maintain the flotation rates of ore extracts to ensure economical use of chemicals and create significant process efficiencies. Bredel hose pumps are used in mines around the world in applications that include dosing process reagents and pumping shear-sensitive polymers for flocculation and coagulation, abrasive lime slurries for pH control, or corrosive chemicals like cyanide for gold recovery.

Case Study



Jaguar Mining Inc, operates four gold mines in Brazil. The company first adopted Bredel hose pumps at its Turmalina mine when faced with pumping paste backfill comprising 4% cement and 69% solids. A task no centrifugal pump could handle. The mine operator installed a Bredel 100 pump, which transferred the paste with an SG of 2.8 at a rate of 50 m³/hr, over a distance of 420 metres. Turmalina site has since installed multiple Bredel hose pumps for multiple applications including backfill operations; flotation; leaching and dosing reagents.

Case Study



The world's largest trona soda ash mine in Wyoming experienced problems with its diaphragm metering pumps used for dosing flocculant into the trona processing lines. The diaphragm pumps lasted only five to six months due to the highly corrosive nature of the flocculant. Even after trying to add large amounts of water to the flocculants, which subsequently had to be removed from the process, the diaphragm pumps would still fail.

The mine purchased several Bredel hose pumps to address pump maintenance and flocculant wastage problems. The hose pumps' inherent corrosion resistance allows the mine to pump pure flocculant into the discharge lines and holding tanks. With no need to add water, the mine is saving money in water usage, process downtime and maintenance costs.

Conclusion

Moving ores, concentrates and residues in slurry form are essential parts of mining processes. To reduce water usage, chemical consumption, and improve slurry transportation reliability, mining operators should evaluate the simplicity and benefits of peristaltic hose pump technology. With thousands of Bredel hose pumps at work in mines around the world, there is little doubt that hose pumps are a solution that should be considered.





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