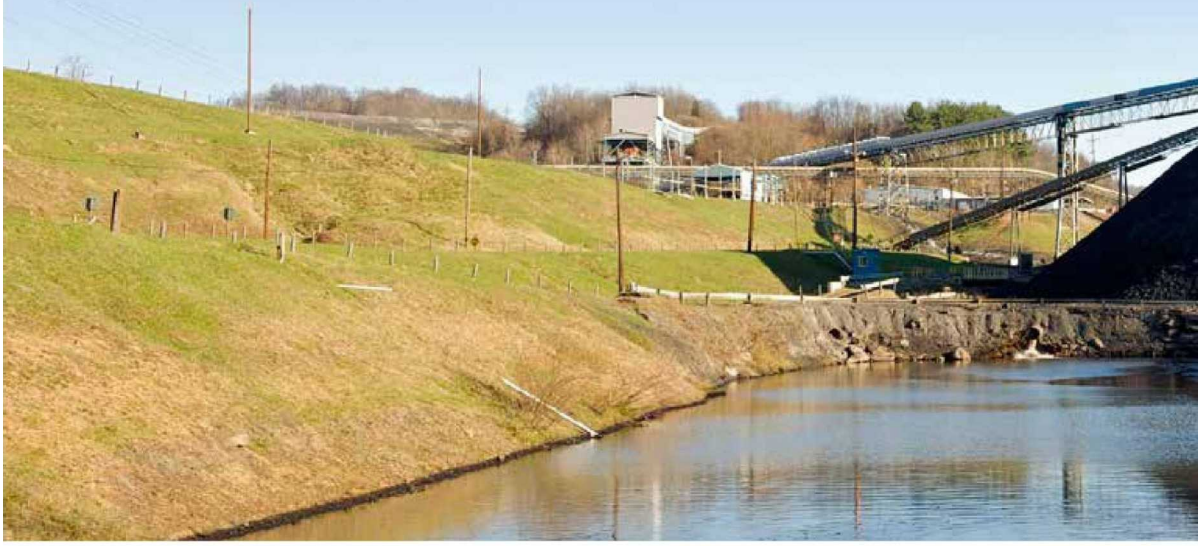
Integration integral to sustainability

For water management on a mine site to be successful, interventions at every level of the water management processes have to be integrated, ***writes MATIMU MAHUNDLA***



The primary step in Water management requires devising a water quality hierarchy

Mining activities impact on hydrological and topographical conditions to a greater or minor degree depending on location, minerals mined, method of mining, as well as the layout of the mine. These impacts affect the quality and quantity of water resources. In order to mitigate the impacts on the water resources environmental laws and water license requirements govern the management of water resources at mining sites.

Thus, as one would expect, due to increasing concerns about water pollution and water scarcity, there is increasing pressure on mines to seek and implement sound water management practices.

Understandably, more than ever, access to and management of water has become a higher sustainability risk, as the reality of 'no water, no mining' becomes a reality. In view of the complexity of water usage on mine sites, where do mines start?

Two specialists from SRK look at the issue. Ismail Mohamed is a partner and hydrogeologist at SRK, and Peter Shepherd who is a partner and principal hydrologist at SRK Consulting.

Shepherd says the primary principle of water management on mine sites that all water users ought to be aware of is the three-pronged R's: reduce the quantities consumed, to re-use as much as possible, and to recycle.

This is in line with a recommendation by the Department of Water and Sanitation which has identified and recommended three main cardinal areas in water management.

The Department pinpoints the following areas: identifying adequate sources of water to use, reducing water consumption and reusing where possible, and managing waste and remediating contamination.

A primary step in water management in mining operations is devising a water quality hierarchy, as water quality is key in mining processes, says Shepherd. This is because some processes are more water quality intensive than others, he explains.

"Water quality hierarchy ensures that water is not unnecessarily treated for applications which do not demand high quality water. Process plants can therefore make better use of poorer quality water, for instance, while the cleaner water can be more optimally channeled. In the flotation circuit, the careful re-use water which still contains reagent can add to cost-efficiency. It just requires a good understanding of the water quality levels required in each treatment circuit."

Another area that mines can consider as part of their water quality hierarchy is compartmentalising return water dams, states Shepherd. This would allow for the storage of different water qualities within the same facilities thus supporting the reuse of water, he explains.

"This hierarchy would ensure that water is only treated or purified according to particular requirements. This would help


Water Management

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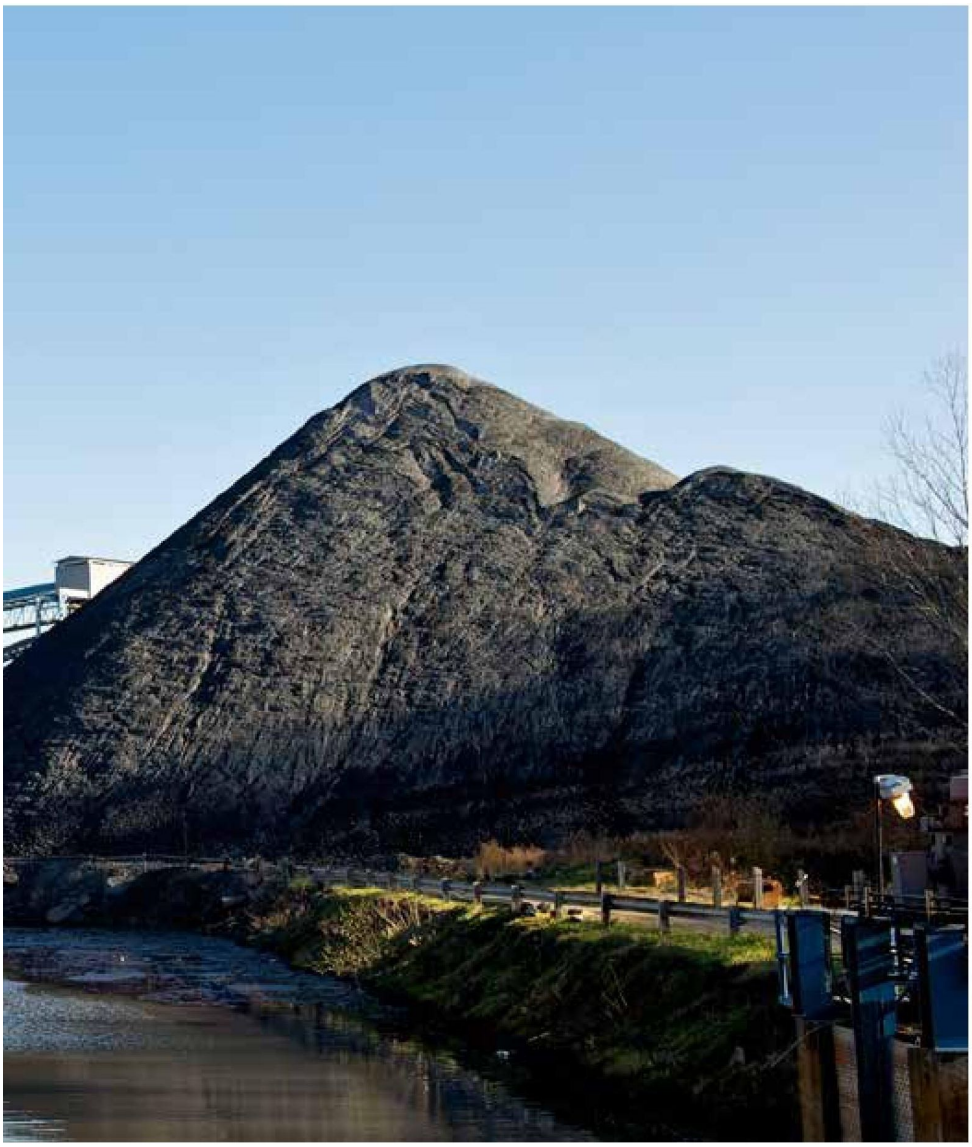

in preserving and economising the use of potable water."

Monitoring and water balance

Mohamed singles out another critical aspect in water management which is maintaining a water balance. He calls mines to be frugal in the managing the usage of surface water and groundwater. Central to this is managing the flow to and from various units as incorporated into the water balance by ensuring that the quantity entering the system corresponds with the quantity leaving it."

A critical area is the collection of flow and water level monitoring data to evaluate the performance of implemented water management measures against design expectation, and to facilitate the optimisation of measures. "Good water management means less pollution and therefore lower liability at closure. So designing and maintaining an appropriate monitoring system from the outset will reap rewards," he says.

Water re-use and recycle

In terms of recycling, Shepherd says the first priority for mines in their recycling should be - as far as possible - to avoid discharging water from the mine to the surrounding water resources. Instead, they need to find ways to integrate the water into the mine's water circuit as far as is possible.

A common problem that mines encounter is that dams can fill up and spill during the rainy season, and in the dry season they can run dry – requiring extra water to be bought into the mine. Thus, to manage this situation sustainably, Mohammed recommends that mines should store enough to avoid spillage and then use the stored water in the drier season to minimise the extra cost of buying water from an outside source. This requires a statistical analysis of both the past rainfall patterns, and the anticipated future risks of flooding and droughts, he says.

"If a mine's dewatering activities are generating excess quantities of clean water, there is often an opportunity to put it to beneficial use where communities may lack a regular supply. While not always a simple process, the availability of excess water could be significant in terms of the mine's broader role as an important stakeholder in the community."

Integrated approach to water treatment

For water management on a mine site to be successful, interventions at every level of the water management processes have to be integrated. Consequently, an integrated water management approach is paramount.

While hydrologists and hydro-geologists have a central role in understanding water flow in mines, there are a range of other disciplines that are central to compliance and water-efficiency, Shepherd points out. This is because the environmental aspects of applying for and complying with a water use licence are more and more onerous, requiring input from specialised environmental scientists, he states.

"Geotechnical engineers work regularly with water experts to ensure the pit slope is stable, while civil engineers become involved in the design and construction of attenuation ponds, pumping facilities, pipelines, sumps and trenches."

Shepherd mentions settling points as one area that needs expertise. "Settling ponds are important stage in the treatment process, but environmental regulations may require settling ponds to be lined with a geomembrane to prevent seepage of contaminated water. This also has implications for water management, as less seepage means more water on surface that must be recycled for on-site use. This may necessitate getting larger water storage facilities and increasing the pumping capacities," he says.

He adds, "To improve quality further, the process may require additional water treatment. In addition, conceptual understanding, data management and numerical modelling tools have improved, allowing for better prediction of performance, optimising of water treatment and remedial action.

The future of sustainable mining

All in all, there been a commitment from mining companies to manage the ecosystem in areas where their operations are located. Thus, once mines fail to mitigate the impact of their operations on water throughout the life-of-mine and post-closure, they will find it difficult to find support for their future projects. It goes without saying that sound water management practices, encompassing reduce, reuse, recycle and recover water are fundamental for mining operations to be sustainable.

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