

Acid mine drainage

– is there a cure?

More than a century of formal mining in South Africa has taken its toll. In Mpumalanga alone there is an estimated 10 000 m² of interlinked mines and in Gauteng, 300 km² of interlinked goldmines. The economy of South Africa depends heavily on mining, contributing the largest component of the Gross Domestic Product (GDP) and gold being one of the largest foreign exchange earners.

But this all comes at a price. The highly saline and acidic water produced by the mining industry drains into local rivers, streams and dams, changing the pH of the water, and so changing the ecology irrevocably for the plants and animals which need more neutral pH conditions to survive. Aquatic life is worst affected, with the impacts felt far downstream. In some cases contamination of the water renders it unfit for drinking and for irrigation due to the radioactive toxins and high salt levels it contains.

Acid mine drainage is possibly the largest environmental problem facing the mining industry across the globe, but even more so for South Africa where water is an already a scarce commodity. The problem is vast and costly, and mines continue to be a liability even after they are abandoned.

According to the "polluter pays" principle and South African legislation, the mining companies remain liable and are responsible for undertaking measures to minimize pollution until a closure certificate for each mine is granted by the Department of Minerals and Energy. The complexity of this issue and the politics with a variety of agendas makes progress slow at implementing ample measures to counter the problem.

Early attempts at solving this major environmental problem have focused on conventional treatments using chemicals and membrane filters, but these are highly expensive and are not an affordable or sustainable option for developing countries. Derelict mines are a cause of major concern when the polluted water from old mine shafts "decant" or flow to the surface, as seen in the Krugersdorp area in 2002.

However, in the midst of this dire situation, biotechnology – defined as the use of living things to make useful products and processes – has enabled South African researchers to develop a

home grown solution that is low cost and sustainable.

This solution is the Rhodes BioSURE® Process which combines the biological treatment of acid mine waste water with human sewage. The sewage is used to help remove the sulphur (the main contaminant) from the waste water and so together, these two waste products result in improved water quality.

The Rhodes BioSURE® Process was launched in 2005, the result of more than eight years of research at a cost of R15 million. The research was done at the Environmental Biotechnology Research Unit at Rhodes University under leadership of Professor Peter Rose and was supported by the Water Research Commission, the East Rand Water Care Company (ERWAT) and BioPAD. "The BioSURE® Process is an example of novel local technology that has been patented internationally," says Rose.

A pilot plant was set up by the local municipality in Springs, close to the Blesbokspruit. This area was placed on the Montreux Record in 1996 (RAMSAR Conservation Treaty) due to the ecological threat to this wetland as a result of the sulphate-rich waste water from the local Grootvlei gold mine. The Grootvlei gold mine waste water is now linked with the municipal sewage outfall via a 2.5 km pipeline.

The process removes heavy metals and radioactive elements; breaks down smelly pollutants, kills pathogens and the final products of this process are all safe. Costs indicate that it is significantly cheaper than any other alternative, reducing costs from about R5/kl to approximately R1/kl.

This technology is being marketed internationally and South Africa is now seen as a global leader in mine water treatment.

If you have any comments on this process, or need more information on biotechnology, visit the Public Understanding of Biotechnology programme website: www.pub.ac.za or email your views to speakup@pub.ac.za; fax: 012 320-7803.



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