

Executive Summary

International Markets

Acid Mine Drainage in South Africa



For individual support on doing business in South Africa, specific questions about market opportunities and to receive the full report, please contact

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Business support is free of charge.

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Introduction

INNOWATER is a public private innovation partnership of innovation agencies, water associations, technology specialists, innovation experts and eco-innovative cluster organisations from Belgium, Cyprus, Denmark, the Netherlands, Spain and the UK, coordinated by the European Water Partnership. INNOWATER is supported by the EC Europe Innova Programme.

The overall objective of INNOWATER is to establish and implement a water innovation partnership that develops and tests new and better support tools and delivery mechanisms for innovative SMEs and first-user industries. A key objective of the project has been to develop a portfolio of tools to assist SMEs in the development of appropriate business models which support growth into international markets¹.

A new model was developed for gathering international market intelligence that is relevant to, and easily accessible by, European SMEs. It uses a small team of independent third party experts to build on existing and available market intelligence to undertake specific in country fact finding missions on behalf of the SMEs, with subsequent feedback and business planning support provided by way of follow up.

The International Business Trip to South Africa was undertaken in March 2013 to identify and understand opportunities for European SMEs to participate in providing solutions to Acid Mine Drainage (AMD).

The main objectives of the trip were to:

- Identify specific innovation needs for which there is a benefit to South Africa in sourcing solutions from international suppliers;
- Identify opportunities that can realistically be met by SMEs (alone or in consortia);
- Understand the drivers and barriers to the uptake of new technologies in this market;
- Map practical next steps for establishing communication between innovators and end users.

Background to AMD in South Africa

AMD refers to polluted water that arises when exposed areas of sulphide minerals, particularly pyrite, come into contact with oxygenated water, primarily in abandoned mine voids (where water levels rise following cessation of pumping), or as a result of seepage through surface mining residues (tailings and slimes dumps). The pollution plumes eventually reach near surface aquifers, or decant to surface bodies. The situation is particularly acute in the Crocodile West and Vaal River catchments (Witwatersrand gold mining basins) and the water scarce Olifants and Komati River catchments (coal mining regions of Limpopo and Mpumalanga).

Treatment to date has primarily been simple neutralisation of polluted water through the addition of lime and limestone to reduce pH and remove heavy metals. Acceptable salt levels are subsequently achieved through dilution within the river systems. Given the increasing concerns over water security, it is widely accepted that this is not a sustainable solution.

South Africa itself conducts world class R&D into AMD prevention, treatment and the disposal of associated waste streams. However, a number of specific challenges remain, including:

- Lack of economically sustainable desalination technologies available at commercial scale;
- Waste reduction and disposal remains a significant issue, and
- Knowledge gaps around the impact of the geo-hydrological environment on the formation of AMD, and its movement and characterisation thereafter.

Both the public and, to some extent, the private sector are therefore also examining solutions from international suppliers.

This is exemplified by the current large scale 'Feasibility Study for a Long-Term Solution to address the Acid Mine Drainage associated with the East, Central and West Rand Underground Mining Basins', lead by Aurecon for the Department of Water Affairs (DWA). The Government has sought input from a wide range of suppliers, and is likely to issue tenders (first half of 2014), for DBOM contracts for desalination plants. In the main, these are anticipated to require *proven* (or bank guaranteed) technologies, but concurrent pilot scale deployment of *emerging* technologies for

¹ See www.innowater.eu for detailed information on all support tools produced by the Innowater project.

treatment and waste reduction/disposal has been recommended by the Feasibility Study in order to ensure optimal solutions in the longer term.

Although overall the market remains relatively conservative and risk averse, there is evidence of an increasing appetite for new and innovative solutions, led by a small number of proactive agencies and mining houses. As the pressure to prevent and treat AMD becomes more acute, mining houses will look to specialised suppliers (Tier 1 suppliers) for solutions.

Drivers and Barriers of Innovation

Key drivers for the implementation of innovative solutions to address AMD include the following:

- Increasing national concerns over water security and an understanding of the potential impact of AMD on the water supply;
- Recent pressure from environmental groups and exposure of pollution incidents by the media (e.g. Acid threat will leave Gauteng a wasteland, warns province²);
- Threat to significant economic areas and activities (including Johannesburg suburbs, and associated tourist attractions) from AMD from the Witwatersrand basin;
- Corporate Social Responsibility (CSR) concerns within the private sector;
- Drive to improve implementation of existing legislation, including the 'waste discharge charge' (which may require some amendments), and flagship water and wastewater certification programmes (Green Drop and Blue Drop).

However, there are also significant barriers to the uptake of new technology:

- The overarching issue of public versus private sector liability for abandoned mines (and therefore funding for solutions to AMD) remains unresolved;
- It is a politically complex subject, with widely differing views between stakeholder groups;
- There are significant competing needs for both innovation and finance within South Africa;
- The majority of solutions are relatively large scale, with high capital and operational costs;
- Legislation for mine environmental management and closure planning is the responsibility of the Department of Mineral Resources (with a primary mandate for mineral beneficiation), and Department of Environmental Affairs (environmental impact of new development) rather than the DWA (water quality and security), leading to a split between objectives and enforcement.
- A conservative, risk averse attitude towards new technology amongst end users;
- A lack of knowledge/perception amongst end users of the interaction of AMD prevention and treatment with wider strategic water/energy management issues.

Potential Opportunities for European SMEs

Consultation with stakeholders from a variety of different organisations, has identified potential broad opportunities for European SMEs in the following areas:

- Real time measuring, monitoring and interpretation of the geo-hydrological environment;
- Mine closure planning and implementation;
- Improved (cost effective) treatment of AMD polluted water (neutralisation and desalination);
- Waste disposal and product recovery from sludge and other waste streams;
- In-stream remediation, including impacts of previous discharges of raw AMD.

In addition to these, **two tangible and current opportunities** have been identified where end users are actively seeking new solutions. These relate to:

- Pilot schemes for emerging AMD treatment technologies in the Western WITS basin;
- Interest expressed by two pro-active mining companies: Mintails Pty Ltd and Anglo American.

Key Stakeholders

A range of stakeholders are involved in the AMD market, which interact at different stages of the innovation chain. Principal amongst these are:

² <http://mg.co.za/article/2011-10-20-acid-threat-will-leave-gauteng-a-wasteland-warns-province>

- Academic and research institutions: e.g. CSIR, TUT, NWU, UFS and UCT;
- Government innovation agencies (e.g. WRC, TIA) and funding departments (e.g. DST, DTI);
- National and local supply chains, e.g. local component suppliers and manufacturers;
- Clients: National and Provincial Government; mining houses and their principal contractors (TIER 1 suppliers).

Potential Routes to Market

There are a number of ways by which SMEs may interact with the market but options include:

- Initial market testing with two innovation support agencies which can provide both advice and potential funding: the Water Research Commission and Technology Innovation Agency;
- Contact with appropriate research institutes to investigate opportunities for collaboration;
- Identification of potential local supply chain partners, for example via local trade directories;
- Direct contact with end users (Mining Houses or their TIER 1 suppliers) or tender submission (Government).

Market development will require investment in time on the ground in South Africa, developing these relationships and gaining additional market intelligence.

Critical Success Factors

Both technological and non-technological attributes will be important for SMEs entering the market. All technological solutions need to be appropriate and/or adapted for the South African environment. In addition to being cost competitive, valued characteristics include:

- Solutions that are economically self-sustaining in the long term;
- Highly robust (suitable for SA climate and terrain), with low maintenance requirements, and few valuable components;
- Low skills requirements for O&M;
- Energy efficient and able to withstand intermittent electricity supply;
- Niche, in solving highly specific requirements, or a platform technology with breadth of application.

However, both public and private sector prospective clients also value broader non-technological attributes. Of particular importance for foreign-based firms is a business model that demonstrates opportunities for long-term local wealth creation and skills transfer, for example through:

- Knowledge transfer via collaboration with local universities and research institutes;
- Sharing of foreground IP;
- Local employment and training, and use of South African based supply chains;
- Adherence where possible to BBEEE principles.

Concluding Comments

AMD in South Africa was chosen as a potentially interesting sector because the issue is an internationally well-known problem that, to date, does not have clear technological solutions.

The drivers to identify and deploy cost effective innovative technologies are indeed strong, and solutions are welcomed from international players. However, it is important to bear in mind that there are also significant barriers to addressing this market, in particular the political controversy over liability for disused mines, the conservative nature of many end users, and competing factors for finance and innovation.

Ultimately, the primary 'buyers' of technology are likely to be the mining houses or their Tier 1 suppliers. However, engaging with these players may require/benefit from early interaction with other key stakeholders such as the WRC.

If companies are able to demonstrate solutions that are clearly adapted to South African requirements, together with a business model that addresses the need for local wealth creation and upskilling, this is a market that is worth approaching.