

Place into Modern Mining

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Cracking the injection market in SA

Designer solutions for water sealing, crack and rock repair, void filling and ground consolidation

By Lars Hage and Ian Northcroft, BASF Construction Chemicals South Africa

With the widest range of injection products, equipment and accessories in South Africa, BASF Construction Chemicals SA is gaining recognition in the local mining and civils market as a supplier of highly effective solutions for critical projects.

Used primarily for rock and soil stabilisation and to enhance watertightness in underground tunnel construction in civil and mining projects, injection technologies and products do not have a high profile in South Africa. This is in part due to the limited effectiveness of existing local products.

Says Lars Hage of BASF CC SA: "Safety, productivity and economy are key concerns in mining and civils projects. One of the largest problems faced is uncontrolled water ingress. In mining operations this can result in flooding and ground collapse. Contaminated water must also be carefully managed to prevent sensitive environments being negatively affected, while seepage of ground water often needs to be halted to prevent weakening and degradation (chemical and physical friction) of cement based structures.

"However, in some instances the injection products on offer don't extend beyond one-size-fits-all cement and outdated chemical solutions that deliver variable performance. This has resulted in a lack of confidence in these solutions in critical situations. In addition, few companies can provide a complete solution – one that includes not only the right products for different environments but the injection equipment and accessories needed to apply the solution.

"With a global reputation for meeting the demands of a large number of varied environmental conditions, as well as stringent safety and quality standards, BASF Construction Chemicals' wide and technologically advanced range of injection solutions is thus finding a receptive market locally," Hage notes. "A particular advantage is that this comprehensive range has been developed to enable engineers to tailor an injection method to suit their unique problem."

The technology

BASF CC's products are component based and are built on three main technologies:

- three grades of micro cement custom made for pre-injection of soil or rock ;
- polyurethane injection foams for consolidation and water-stopping of large flows in a tunnel; and
- colloidal silica gels for stabilisation and sealing of ultra-fine soils.

Microfine cements combined with the use of plasticisers and an accelerator enable increased penetration as well as the possibility of varying the setting time from seconds to hours, delivering flexibility in the performance of the grout to suit the specific solution in the tunnel. Defining features of these products are their maximum particle size of 0.016mm, the particle grading and fast setting

times (less than two hours). This allows for full penetration of the strata as well as early re-entry for drilling. This is a substantial technical and time improvement compared to normal Ordinary Portland Cement (OPC) grouts.

Polyurethanes are available in single and two component form. They are also designed to meet the requirements of different environments and include a fast foaming solution for cold conditions and various accelerators allows the engineer to “tailor” the material to provide optimum performance to achieve a successful result. There is also a range of non combustible Urea-Silicate products developed especially for ground stabilisation and void filling in mines

Colloidal Silica is an ultra fine “nano” particle used for penetrating and stabilising the finest fissures or fine silty sands. This material is unique as the hardening process is a mechanical rather than a chemical process. It is possible to vary the gel time from seconds to hours depending on the ratio of the two components. The exciting feature of this material is that it is made of sand, salt and water - an incredibly environmentally friendly, non-toxic injection product

Notes Ian Northcroft, Manager Mining Europe; BASF Construction Chemicals: “Currently imported from Europe, our products are more expensive than local alternatives, yet their effectiveness and efficiency are exponentially higher. Although material costs may be higher the benefits achieved using these quality products are orders of magnitude greater. Their credibility is bolstered by an impressive track record of proven performance in Europe and Asia, Australia and North America.”

Project references and reports relating to BASF’s injection solutions can be viewed on the BASF UGC website at <http://www.ugc.basf.com>.

Local footprint & projects

“Our injection products are being used in a number of large projects in Africa and South Africa, with our specialist advisors providing onsite advice and testing, and smoothing project delivery,” notes Hage. “However, the highest demand for injection is currently in mining where we initiated our first projects in 1999 and 2000. While this is not a new technology for the mines, we are introducing new and more refined designer products into this environment for the first time.

“In the civils arena, we are currently assisting in the refurbishment and laying of new sewer and drainage systems in central Johannesburg. Our products are providing considerable relief to contractors stymied by common problems that they cannot resolve with the use of existing local products. In one instance where pipe jacking was taking place (a pipe is pushed into place behind a shield in which workers are located) work was halted for three weeks after hitting ground water. BASF CC SA was called in to assist. Using our polyurethane foam – Meyco MP 355/A3 – the water was sealed off and the ground stabilised in days.”

Another high profile project where our injection solutions are being used is Eskom’s R4.2 billion **Braamhoek Pump Storage Scheme** project in the Drakensberg, which is part of its ongoing continuous electrification drive. It involves the construction of two dams, one at the top and the other at the bottom of the escarpment, underground waterways, an underground powerhouse complex, access tunnels and access roads. The project is expected to be complete by 2012.

Here Rheocem 650 micro cement is being injected into the rock (performance is enhanced with our accelerator and plasticiser additives in the relevant quantities) to quickly stabilise the ground for underground construction to proceed without delays. Because of Rheocem 650’s small particle size and a specially adapted admixture system, it penetrates very well into tight joints, fissures and pore spaces to provide a water-tight grouted rock or soil mass.

At Tsumeb West, Weatherly International’s recently recommissioned copper mine in Namibia, BASF CC products are assisting to halt flooding in the mine that threatens to disrupt production. Meyco MP 355/A3, a two component, solvent free polyurethane injection resin specifically designed for rapid water stoppage and ground stabilisation, is proving highly effective. It is injected into the rock face, filling fissures and cracks, and forming a rigid foam when it comes in contact with water.

However, it’s not just its products that are earning BASF CC a reputation underground. “Training of mine staff and contractors in the use and application of these products - from the assessment of water

volumes to drilling and placing of the materials – is critical,” says Hage. “We have also found that the equipment to apply these solutions, along with all the accessories, are difficult and expensive to source. To ensure we can provide end-to-end solutions with good outcomes, we thus import and stock proven equipment like the Maximator PU and acrylic pumps, Haney grouting equipment and other accessories like hoses, couplings and **injection packers**. This means projects can be initiated immediately.”

Adds Northcroft: “As in mining, injection is not a new technology in the civils arena. We are, however, introducing new products that can be modified to resolve specific problems while delivering standard benefits that far outpace those of rival local products.

“Our products deliver results way beyond expectations -- productivity, economy and safety are primary benefits. More specifically, our products offer greater penetration in water sealing, greater stability under pressure, fast setting times, and no segregation or separation of the mix or bleeding in the grout.

“Drying and setting times are measured in hours -- two hours being the standard time for final setting versus other products that require up to eight hours. This allows work at the face to continue almost immediately using standard ‘blast, inject, drill’ methods.”

Our products

The BASF CC SA’s injection products consist of:

Cementitious

Rheocem 650 800 & 900 micro cement,

Polyurathanes

Meyco MP 355 1k, (one component for low water flow and pressures)

Meyco MP 355 A 3 (two component for high water flow and pressures)

Meyco MP 355A3 Thix (two component for very fast foaming in cold conditions)

Meyco MP 350 for fine crack injection and watersealing

Meyco MP 357 GS for mining ground consolidation

Urea-Silicates

Meyco MP 364 Flex for coal mine ground consolidation with improved bond and setting

Meyco MP 367 Foam for cavity filling in mines where water is present

Colloidal Silica Gels

Meyco MP320 This range can be used in fine grain soils or sands containing silt

Acrylics

Meyco MP 308 A two component high strength grout for penetrating the finest of fissures

SA market potential is huge

Concludes Northcroft: “As the use of our injection products continues to deliver beyond expectations in South Africa, market confidence is growing. The market potential for these products is large as they deliver not only an improvement on the performance of local products but assist contractors to get the job done quickly, safely, easily and economically.”