Ergo Mining (Pty) Limited (Ergo) is one of the largest gold tailings retreatment companies in the world. After a recent strategic restructuring by parent, DRDGOLD, the company is wholly-owned by Ergo Mining Operations (Pty) Limited (EMO). EMO, which also owns ERPM Exts 1 and 2, is owned by the DRDGOLD group (74%), and BEE partners Khumo Gold (20%) and the DRDSA Empowerment Trust (6%).

Ergo’s assets include the flagship metallurgical plant in Brakpan (treating L29 and Elsburg); the Knights plant in Germiston (treating Cason and, in time, Lycaste); the City Deep plant near Johannesburg (treating 3L42 until the end of calendar 2012) and Crown, formerly a metallurgical plant in its own right. As part of a recent streamlining and rationalisation process, mature plants are being decommissioned and converted to pump and milling stations as the material is depleted. Crown – feeding material from 3A2 to Brakpan – is in the process of being re-engineered, and will be followed by City Deep early in calendar 2013, and Knights in the foreseeable future.

Ergo has other assets as part of its 1 200km² footprint: an extensive pipeline network including the 50km Crown-Ergo pipeline; the Brakpan tailings facility (BTF); and surface rights, licences and rights of access to some 750Mt to 900 Mt of tailings on the eastern, central and western Witwatersrand containing 11 million ounces (Moz) of gold.

At the end of FY2012 DRDGOLD declared attributable mineral reserves of 1.8Moz and attributable mineral resources of 37.6Moz. The company employed 792 people – as well as specialist contractors – including Fraser Alexander Tailings, experts in tailings recovery and tailings dam management. Some 600 people are deployed by Fraser Alexander to manage Ergo’s reclamations and tailings sites.

THE PLANTS

The Brakpan plant, often referred to as ‘Ergo’, was established in 1977 by Anglo American and decommissioned in 2005 by the then-owners, AngloGold Ashanti. In 2007, DRDGOLD entered into a joint venture (JV) with Mintails Limited (Mintails) to re-establish the plant, some 50km east of Johannesburg. A year later, DRDGOLD acquired the Mintails stake in Phase 1 of the Ergo project, taking full ownership in 2010.

The DRDGOLD strategy on acquiring the Brakpan plant was two-fold. Phase 1 involved the refurbishment and recommissioning of the first carbon in leach (CIL) circuit at the plant, as well as the construction of two feeder lines from Elsburg, so that retreatment operations could begin in 2009.

Phase 2, which is almost complete, involved creating efficiencies of scale. It was achieved primarily by building a 50km pipeline and research and development (R&D) for improving gold recovery as well as extracting uranium and sulphuric acid – for which Ergo is licensed.

The primary focus of the Brakpan plant for the next decade is the retreatment of the Elsburg tailings complex and the L29 dump, comprising a total of 186Mt and containing an estimated 1.7Moz of gold.

THE NETWORK AND THE PIPELINE

One of DRDGOLD’s early objectives was to exploit the synergies between the existing DRDGOLD operations at Crown Mines and City Deep and the newly acquired Brakpan plant. Although still functional, the operating capacity of these plants had become restricted. Situated in built up areas, and close to the Johannesburg central business district, they no longer had adequate access to a tailings deposition facility.

DRDGOLD addressed the problem by constructing a 600 000tpm, 50km pipeline at a cost of R350 million within an 18-month period. Built using innovative technology, the pipeline was completed on time and within budget and has been fully operational since early 2012. This streamlining
1977: Anglo American Corporation commissions Ergo to recover gold, uranium and sulphuric acid from surface tailings, using flotation process. A South African ‘first’

1984: Carbon in leach (CIL) plant – the world’s largest – commissioned at Ergo’s Brakpan plant

1990: Ergo’s uranium plant and larger of two sulphuric acid plants closed

1998: Ergo becomes part of AngloGold Limited (later AngloGold Ashanti Limited)

2005: AngloGold Ashanti closes Ergo

1977-2005: Ergo retreats material from 64 surface sites; produces 8.19 Moz of gold (feasibility study estimate: 3.55 Moz); redeposits more than 800 Mt of residue on two consolidated sites; makes a total profit of R2.236 billion (feasibility study estimate: R518 million)

THE ANGLO YEARS

1977
Anglo American Corporation commissions Ergo to recover gold, uranium and sulphuric acid from surface tailings, using flotation process. A South African ‘first’

1984
Carbon in leach (CIL) plant – the world’s largest – commissioned at Ergo’s Brakpan plant

1990
Ergo’s uranium plant and larger of two sulphuric acid plants closed

1998
Ergo becomes part of AngloGold Limited (later AngloGold Ashanti Limited)

2005
AngloGold Ashanti closes Ergo

Legend
- Gold plants
- Gold tailings deposition sites
- Old dumps
- Pump or pump/milling stations
- Slurry line
- Processed water

62 kilometres
of operations will, in time, enable some 600Mt to 700Mt of surface tailings deposited across the central and west rand to be brought to account. Ergo is expected to treat 2.45Mtpm in the period from 2011 to 2016, with a throughput of 143Mt and production of 805 600oz of gold.

In conjunction with the pipeline, the second CIL circuit at the Brakpan plant was refurbished to accommodate the pipeline feed. Capacity was increased from 1.2Mtpm to 1.8Mtpm initially and, in the longer term, can be raised to 2.4Mtpm.

TAILINGS DEPOSITION

In order to accommodate the waste material from the additional pipeline feed, the BTF – some 12km from the Brakpan plant – had to be modified. This is being done in a phased approach; currently the monthly deposition rate is being increased to a minimum of 1.8Mtpm and the capacity of the site by an additional 100Mt to 250Mt.

RESEARCH AND DEVELOPMENT

DRDGOLD had another objective when it re-established the Brakpan plant in 2007 – to improve recoveries from the inert gold in the tailings material. R&D has therefore been a major feature of the DRDGOLD strategy. After confirming that some 40% of gold was in the sulphides, a pilot project was established to determine the best method of liberating the pyrite-encased gold particles. The DRDGOLD board studied the findings and in February 2012 approved R250 million for the addition of a flotation/fine-grind circuit at Ergo. Expected to be operational by February 2013, the addition of these circuits is expected to increase gold production by between 16 to 20%. Work on this project began immediately and is explained overleaf.

BY PRODUCTS: URANIUM

An investigation is also under way into the feasibility of applying resin-in-pulp technology to the flotation/fine-grind circuit in order to extract uranium from the Ergo feed, at substantially lower cost (R150 – R200 million) than conventional extraction technology. Although results are awaited, production is estimated at 11.5tpm of uranium oxide. The added benefit would be the softening of gold production costs by 5 to 8%.
UNDERSTANDING FLOTATION AND FINE-GRIND

The feed into the Ergo plant will first enter the flotation section and be conditioned with reagents. The slurry will then be separated into two streams: the flotation concentrate, containing sulphides enriched with gold and the flotation tails, comprising lower-grade siliceous material. This stream will be treated by conventional CIL, which is the treatment process that has been used for the past 30 years with an extraction efficiency of close to 32%. The flotation concentrate will be subjected to the fine-grind process which involves milling the slurry material with tiny ceramic beads. The milled product, comprising smaller particles of liberated gold, will enable more effective recovery as the gold will no longer be encapsulated and will therefore be exposed to the cyanide during the leach/CIP process that follows. The extraction efficiency of this process is around 76%. The gold in both streams will be collected by carbon adsorption, and this process will be followed by elution. The two separate streams will join prior to being pumped to electro-winning cells on the way to the smelt house.

ERGO PROCESS