

Multifaceted mine closure and rehabilitation at Rietspruit

RIETSPRUIT MINE IS SITUATED between Ogies and Bethal in Mpumalanga and was developed as an opencast coal mine in the early 1970s. The mining method was mostly open cast and three draglines were utilised for exposing coal.

Rietspruit was the first large opencast coal mine in South Africa to shut down its operations completely towards the end of 2001 – after more than 30 years. During the life of the mine, 1 760 ha of open veld was disturbed. Opencast mining activities took place to a depth of 80 m and approximately 2 112 million tons of material was moved.

Owing to the size of the operation, proper planning for closure and rehabilitation was of utmost importance in order to reduce the huge impact on both humans and the environment.

The total mine closure cost amounted to some R302 million, which was to be spent over a period of five years.

APPROACH

An integrated planning approach dealt with all issues of mine closure and not only the environ-

mental rehabilitation. Planning for closure started in 1998 when a comprehensive closure cost assessment was carried out. Coal-mining operations ended in 2001. A five-year period was earmarked for rehabilitation and closure.

Specialist studies were commissioned to investigate the impacts of different scenarios of surface water and groundwater management on mine closure. Predictive modelling was done which eventually resulted in an inter-mine flow groundwater assessment where typical 'time to decant' and water qualities could be predicted.

Extensive use was made of computer software specifically developed by African EPA for the optimisation of rehabilitation designs.

Close contact was maintained during the whole closure planning process with interested and affected parties, which included mine-workers, farmers, adjacent mines and service delivery personnel operating in the mine-owned Reedstream Park village. Local and district municipalities that needed to take over the mine infrastructure and service delivery aspects, previously operated by the mine, were also involved.

SOME OUTSTANDING FEATURES Dragline rehabilitation – a first

Rehabilitation of opencast mining is normally done with bulldozers, trucks and shovels. With the realisation that the largest component of the mine closure costs involves the huge volumes of material to be moved, the decision was taken to investigate different methods for rehabilitation construction.

Three options were evaluated:

- The conventional method with bulldozers, trucks and shovels
- Using draglines for rehabilitation purposes
- A combination between the conventional and dragline options

To our knowledge the option to use draglines had never been tested or done in the past and no information of past experience was available when we started the investigations. Dragline operation is extremely expensive and is therefore normally only used in the production process to expose coal. A combination of dragline work (bulk movement) and conventional construction equipment proved to be the most cost-effective way in the case of Rietspruit Mine rehabilitation.

SOCIAL PLAN

Rietspruit Mine Services is committed to the sustainability of the Rietspruit community after mine closure. An integrated social plan was developed addressing personnel downscaling, housing and sustainable development of the community. In compliance with labour regulations, collective agreements were reached with the unions and associations with regard to downscaling activities at the mine.

Strategies to replace contractor services with mine employees, alternative employment and placement of affected employees at other Ingwe operations were followed. Retrenchment of mine personnel was linked to the provision of housing and the creation of jobs for the affected employees.

The mine committed itself to transform the town (Reedstream Park) into an independent, economically and socially stable entity after mine closure. It is envisaged to sell mine houses below market value to employees and to donate all income obtained from the sale of the houses to a Section 21 company who would utilise this money for job creation opportunities. A R2 500 education grant was offered to all retrenched employees as part of their severance packages.

MINE CLOSURE PLAN

The mine and the consulting team had to develop a closure plan which could be used as a manage-



RIETSPRUIT MINE CLOSURE

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KEY PLAYERS

Client Rietspruit Mine Services (Pty) Ltd

(comprising Ingwe Coal Corporation – which is owned by BHP Billiton – and Xstrata Coal)

Professional team African EPA (Pty) Ltd

► Top to bottom: Before, during and after rehabilitation

Mine

ment tool during the decommissioning phase of the mine.

A substantial list of items had to be addressed during the mine closure process. Some of the more important ones are listed here:

■ Residential areas and property subdivisions

Properties belonging to the Rietspruit Mine included a complete village with residential houses, recreational facilities, a shopping complex, water purification works, wastewater treatment works, low-cost housing and associated infrastructure. The entire infrastructure needed to be sold off and the services transferred to the local municipal council. Vacant land belonging to Rietspruit Mine needed to be sold off or subdivided and the town needed to be proclaimed

■ **Rietspruit Dam** When the mine was initially developed a dam was constructed to supply fresh-water to the mine and village. Decisions had to be taken on how to transfer the operations and liabilities to new owners. The fate of the recreational club and water rights negotiated with neighbouring farmers all needed to be resolved during the closure process

■ **Administration and workshop infrastructure** The mine infrastructure consists of various buildings, workshops, wash bays, offices, etc. Part of this infrastructure needed to be demolished while infrastructure that could be used for other purposes needed to be sold off, subdivided and transferred to new owners

■ **Plant infrastructure** The mine operated a complete coal-washing plant consisting of stacker reclaimer infrastructure, railway lines, silos, water dams, water pipelines, conveyor belts, etc. A decision on the future fate of the plant involved a thorough technical and financial evaluation

■ **Slimes dam** Rietspruit Mine operated a coal slimes dam as part of its beneficiation operations. The slimes dam needed to be rehabilitated after decommissioning as part of the closure process

■ **Underground workings** Decommissioning of the underground workings needed to be carefully planned with rehabilitation of the opencast spoils. Once the underground workings were decommissioned, salvaging of equipment from the underground workings needed to take place within a short space of time before closure of the underground workings could be done

■ **Opencast infrastructure** All fixed assets belonging to the mine needed to be salvaged and sold off or demolished. This included items such as the explosive magazine, ring feed power supply to the draglines, and seed stores

■ **Water management structures** The mine oper-



ated numerous dams and water management infrastructure during its operations. These dams contained either clean or polluted water and needed to be dealt with in a responsible manner. Polluted water cannot be discharged into the environment and careful planning was required to ensure that this water would be dealt with properly during the decommissioning phase

■ **Highwall shaping** The total length of highwall at the mine amounted to some 8 km. Risk assessments were done on various alternatives to the highwalls in a way that would be cost beneficial as well as acceptable from an environmental and safety point of view

■ **Authorities and interested and affected parties**

Involving stakeholders in the closure process proved to be a valuable investment. During the development of the Rietspruit mine closure plan, authorities and other IAPs were kept up to date with the latest planning. In this way all parties were able to make their contributions during the development of the closure plan.

CLOSING REMARKS

The project entailed the closure of the mining operations of Rietspruit Mine and the rehabilitation of the environment back to its natural state. The pioneering use of draglines for rehabilitation, in combination with conventional construction equipment, resulted in significant cost savings. □

Source:

[http://www.saice.org.za/downloads/monthly_publications/2007/
CivilEngFeb07web/#/0](http://www.saice.org.za/downloads/monthly_publications/2007/CivilEngFeb07web/#/0)