

## **PALABORA MINING COMPANY**

### **“THE SUSTAINABLE DEVELOPMENT IMPLICATIONS OF CONVERTING FROM AN OPEN CAST MINE TO AN UNDERGROUND MINE”**

#### **1. THE SITUATION:**

Palabora Mining Company Limited (Palabora) operates an integrated open pit mine, concentrator, smelter and refinery complex located at Phalaborwa in the Northern Province of South Africa, approximately 560 km north east of Johannesburg and adjacent to the Kruger National Park.

Construction of the mine began in 1963 and the processing of ore began in 1966. Subsequent expansions due to technological improvements extended the life of the mine to nearly double the originally planned 20 years (1965 – 1985).

The present mining plan calls for open pit operations to cease in April 2002. Although proven reserves of ore continue for at least a further 1 000 metres below the bottom of the final open pit shell, the stripping ratio precludes further open pit mining. The company had a choice of closing down operations or looking into the viability of a much more costly, more capital intensive, smaller underground operation.

#### **2. THE CHALLENGE:**

If the decisions had been made to close the mine down at the end-of-life of the open pit, negative implications and other negative multiplier effects would have resulted, not only for the local socio-economic situation, but also for the regional and national economies. Some of these implications are detailed below.

##### **Economic Implications (negative)**

###### *(a) For the South African Economy*

Palabora supplies 100% of South African refined copper. Closure of the mine would mean that copper would have had to be imported, having a negative effect on the balance of payments. The closure would also have had multiplier effect on the national and regional tax bases, amounting to an estimated R300 million.

###### *(b) For the local Phalaborwa economy*

With a sprawling population of some 200 000 within a 50 km radius of Phalaborwa, the mine, together with several smaller interdependent organizations, produces approximately 80% of the area's GDP.

Palabora Mining is the area's largest employer. The closure of the Palabora mine would have had a disastrous effect on the economy, through a major reduction in employee spending power, leading to the closure of mining supply and contractor businesses, transport companies, estate agencies, legal firms, retail outlets and shopping centres to name some.

The company's expenditure on educational assistance, medical aid, services from Eskom and the Lepelle Water Board and the local municipality runs into millions of rands per month.

### **Social Implications (negative)**

(a) *Unemployment:* At the time of writing the labour complement on the mine is 2 500, including fixed term contractors. The complement in 1980 was just over 4 000 full time employees. The knock-on effect of the complement being nil would impact on all companies and organizations doing business with the mine and consequent reductions in labour levels would be inevitable. At the time of the final feasibility study the Phalaborwa area was not prepared for such unemployment levels, having depended on mining income for 80% of the GDP. Severe hardship would have resulted, particularly amongst the poorer local communities.

(b) *Social Initiatives:* All the social initiatives undertaken by the company would come to an end. The Palabora Foundations, funded by 3% of Palabora's after tax profits, is involved in multi-faceted local social projects, ranging from the building of clinics and libraries, to financing and running trade and entrepreneurial courses, to education and training, HIV/AIDS prevention and job creation for the tourist industry (arts & crafts).

The challenge, then, was to find a way to continue mining (underground) in a sustainable fashion, with due regard to economic, social and environmental viability for the company's shareholders, the Phalaborwa area, the region and the nation.

## **3. THE APPROACH**

Studies provide that the block caving method of mining could be profitably utilized to mine the 245 million tons of copper ore reserves situated below the final open pit shell. Block caving is a safe and cost effective method of underground mining as it utilizes natural stresses to break the rock. The cave is initiated by the removal of a thin horizontal slice of rock below the future cave. Removal of this slice, called the undercut, induces stresses which cause the rock mass overhead to fracture without costly drilling and blasting. The caved ore gravitates to drawpoints from where load haul dumpers (LHD's) remove the material and transport it to a tipping point in large tunnels. The ore is then fed into underground crushers, after which the crushed ore is conveyed to the production shaft from where it is hoisted to surface for further processing.

## **4. THE OUTCOMES**

Production levels will reach 30 000 tons of copper ore per day for at least 20 years, as opposed to the open pit's present 80 000 tons per day. The slightly higher grade of the underground ore will marginally reduce this substantial gap in production, as will the buying of copper concentrates to ensure sufficient plant throughflow.

### **Socio-Economic Implications (positive)**

- (a) Of the total amount of over R2 billion spent on the project, 90% (R1 800 million) has been spent within South Africa, of which in excess of R200 million has been spent in Phalaborwa.

- (b) Approximately 2000 contractors were employed on site during construction, with their consequent spending power in town.
- (c) A number of the existing workforce has been taught specialist skills in the fields of hoisting, refrigeration and ventilation.
- (d) South Africa will remain self-sufficient in copper. Exports of copper will be maintained provided supplementary concentrates are purchased.
- (e) The Palabora Foundation, with additional funding from other sources, will be able to continue its social commitment work, running programmes and projects with the neighbouring communities, covering education, business development, skills development and health issues.
- (f) The area will have a further 20 years to be transformed from a mining economy to a local industry and tourist economy. The company is committed to exploring avenues through which this transformation process can be assisted.
- (g) The downsizing of the operation has necessitated the reduction of the labour complement to about 1 800. An exercise is being carried out which involves identifying those positions which can be reduced and the offering of severance packages to incumbents, whether for early voluntary retirement or, if absolutely necessary, retrenchment. The company is preparing those employees affected through prior counseling and ample notice.

#### **Environmental Implications (positive)**

The company has in place extensive ongoing environmental programmes to minimize the effects of emissions, dust and water pollution, as well as an on-site wild life management programme. Were the mine to have closed down the Mine Closure Plan would have been implemented. With the mine life now extended to at least 20 years the environmental programmes will continue, but with much lesser plant emissions, dust and water pollution due to the substantially reduced operations. The Heavy Minerals Plant has already been closed down, as have the Zirconia plants. Parts of the Concentrator will also be mothballed or closed down.

#### Reference and acknowledgements:

1. MassMin 2000 papers presented by Messrs K. Calder, P. Townsend and F. Russell, supplied by Simon Hanrahan.
2. "Sustainable Development at Palabora" by Sarah Lutman.
3. Palabora Mining Company official brochure, notes on the underground mine.
4. Report on the socio-economic impact of the closure or downscaling of the Palabora Mine. August 1995.