TALBOT, B. Tailings scavenging—the complete story. *International Platinum Conference 'Platinum Adding Value',* The South African Institute of Mining and Metallurgy, 2004.

Tailings scavenging—the complete story

B. TALBOT
Impala Platinum Ltd

How this simple plant generates a large revenue stream.

The concept behind the Tailings Scavenging Plant (TSP) is simple: it is a non-complicated modular plant which is designed to be more stable than upstream plants. This, plus the use of 'high energy', enables the plant to recover any metal missed by the upstream operation.

Impala Platinum–Mineral process started pilot plant exercises in June 2003. The pilot plant ran for one year before the capital for the full-scale plant was approved. This year was used to motivate, design and cost a full-scale plant. The metal produced during the pilot and feasibility study enabled this part of the project to run at a small profit.

The scale-up to full-scale was relatively simple as the pilot plant had a capacity of 180 m^3/hr and the full-scale plant was designed for a capacity of 550 m^3/h.

The design for the full scale plant was completed in May 2003, with ground breaking taking place on 19 May 2003.

The construction phase of the project went well with the commissioning of the first two modules taking place on 22 October 2003. The remaining two modules were commissioned two weeks later. The plant was at full capacity by the 20 November 2003.

A review of the plants performance for the first 5 production months is as follows: the plant has required only a few minor modifications and additions, it has run well in excess of 95% availability with no major wear apparent. In addition to this, the plant has produced 3 times the metal forecast.

Introduction

For as long as there have been metallurgical operations, metallurgist and engineers have been trying to improve process efficiencies. This paper shows how a single new unit operation will improve process efficiencies of any existing flotation operation.

Impala Platinum realized that even though recoveries have been steadily improving, there is a significant amount of metal lost due to process instability. In other words, recovery on an operation can be highly variable even if the average for the month is good. At Impala this variability in the recovery of metal was calculated to contain as much as 150 kg/m of PGEs. See Figure 1.

Figure 1 shows Impala Platinum's normalized tailings grade over a period of 3 months. The three lines on Figure 1 are used to calculate the metal value contained between the line and the data points. The three lines are the average, the average less one STD, and the lowest value.

So, if the current metallurgical operations could not recover this metal, why would a new operation recover it?

First we need to define the reasons for the losses. We believed that metal losses were due mainly to the following reasons:

- Old metallurgical operations with many unit operations making them very difficult to run consistently
- Complicated metallurgical plants with many components which will fail from time to time, leading to losses
- Human error
- Changing ore types.

The above reasons are not all of the reasons for losses but some of the most significant.

Now that the reasons for metal losses have been defined, a solution could be identified. In the list above a new metallurgical operation would solve reason number one and have some impact on reason 2; however, reasons 3 and 4 would remain.

A new operation would provide an increase in recovery but this did not look like a very cost-effective solution for a few extra per cent improvements in recovery.

It was at this point that a company by the name of Tailing Technology suggested that Impala Platinum install a high-energy flotation plant. This plant would be a simple modular plant that by design would be more stable than our existing operations. The plant would also be equipped with the latest in high-energy flotation machines.

This new plant would provide both new technology and a plant that would be separated from Impala's existing operations. This separation would give the new plant the ability to avoid any upset condition and/or incidents that our existing operations might be having.

Pilot plant

In June of 2002 Impala Platinum, together with Tailing Technology, commissioned a pilot plant. This plant consisted of one 20 m^3 rougher, one 10 m^3 cleaner and one 5 m^3 re-cleaner. The pilot plant is capable of treating 180 m^3/h of tailings. During the course of the next year, the pilot plant was used to treat several different tailings streams. Information gathered from these tests was used to

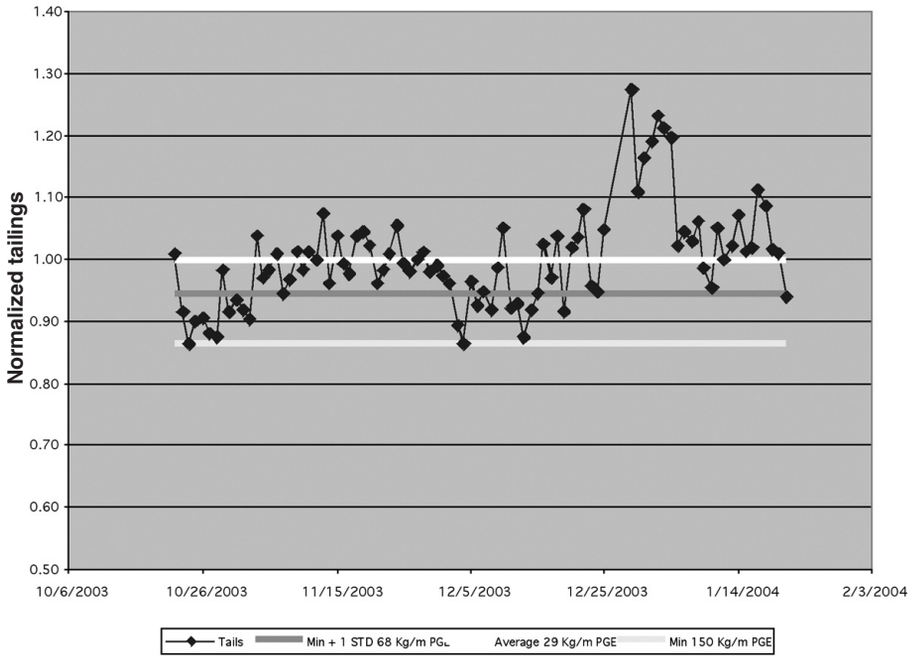

Figure 1. Normalized tailings grade vs. time

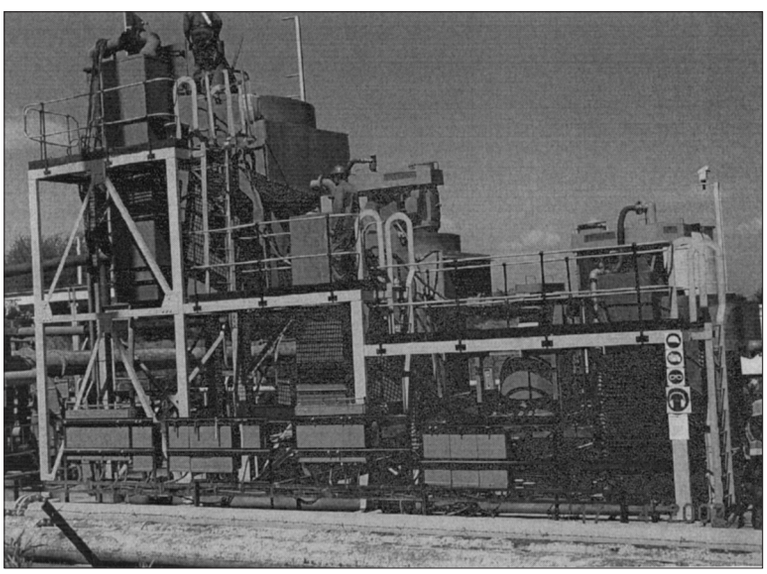

Figure 2. Picture of pilot plant

design and build a business case for the full-scale plant. The pilot plant was run like any other of Impala Platinum's metallurgical operation, 24 hours a day, 7 days a week.

Table I contains a summary of data collected during the pilot plant operation.

The pilot plant produced on average 1 kg/week for the entire test campaign, thus making this test exercise run at a small profit. The average grade of concentrate produced was 45 g/t with a chrome content of less than 2%. The pilot plant operated until the full-scale plant was just days away from being commissioned.

Full-scale plant design

The scale-up to full scale was relatively simple as the pilot plant had a capacity of 180 m^3/h and a full-scale plant would have a capacity of 550 m^3/hr. The full-scale plant would have four modules giving the plant an overall capacity of 2 200 m^3/h.

Table I

Average weekly production				
Plant	**Start date**	**End date**	**Days**	**PGE kg/week**
UG2	22-Jun-02	3-Sep-02	74.00	1.309
Mer/UG2	10-Sep-02	21-Nov-02	73.00	0.565
UG2	22-Nov-02	20-Dec-02	29.00	1.308

The plant was designed to be modular to:

- Reduce the risks associated with scale-up
- Provide a simple plant that would be easy to control and therefore more efficient than our existing plants.

Figure 3 shows a flow diagram of the full-scale plant. Each module comprises the following equipment:

- Two Roughers—30 m^3
- One cleaner—20 m^3
- One re-cleaner—10 m^3.

The project team had to deliver the above design within budget (R47 million), on time (full capacity by January 2004), with no accidents and produce in excess of 25 kg/m PGEs.

Construction and commissioning

Final capital approval was given in May 2003, and ground breaking took place on the 19 May 2003. The construction and commissioning went well with the plant being at full-scale production by the second week in November 2003.

There were no lost time accidents. There were four incidents during the project, two of which were dressing station cases.

Conclusion

The project was commissioned on time and was producing well in excess of 25 kg/month PGEs by January 2004. The project was also completed within budget, with no lost time accidents.

A review of the plant's performance for the first 5 full production months is as follows: the plant has required only a few minor modifications and additions, and it has run well in excess of 95% availability, with no major wear apparent. In addition to this, the plant has produced 3 times the metal forecasted.

The plant paid for itself in under 6 months.

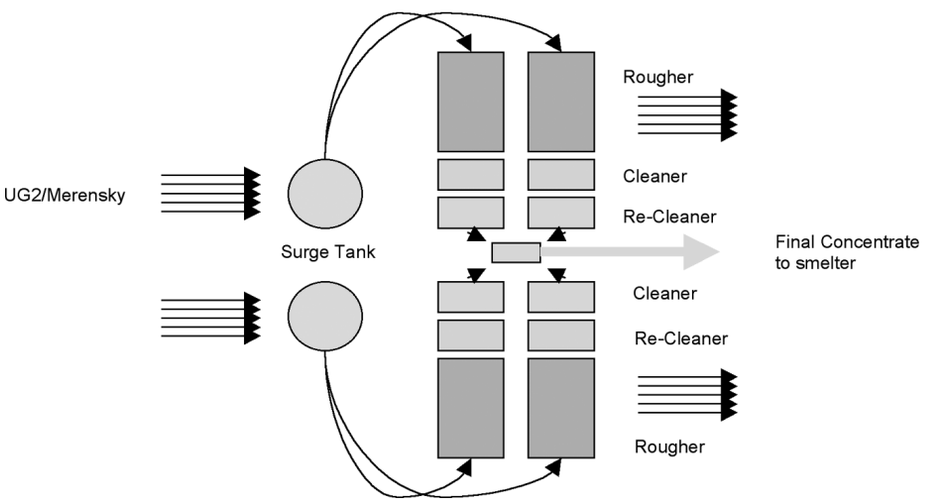

Figure 3

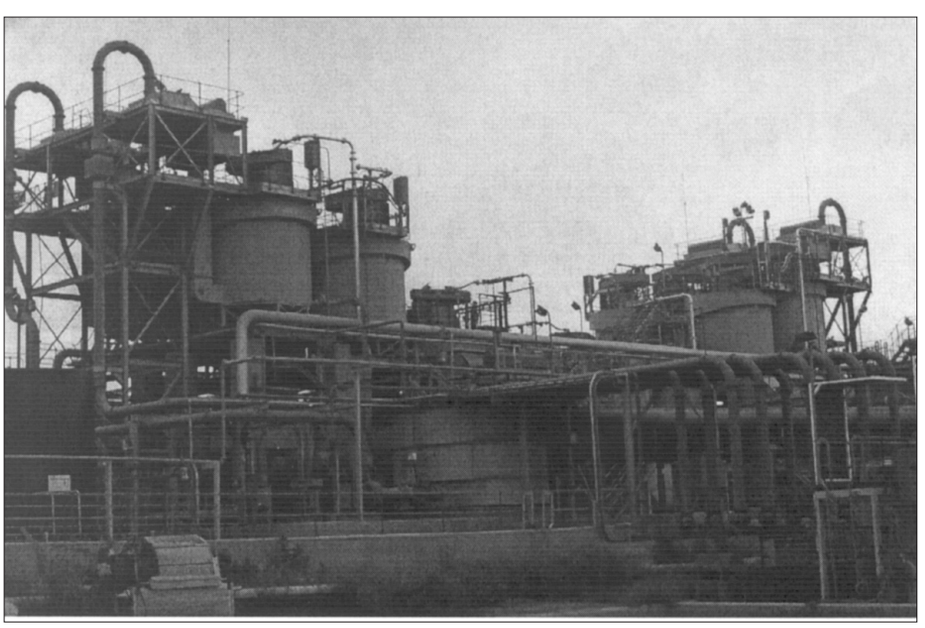

Figure 4. Tailings scavenging plant, November 2003