

AVGOLD

TARGET DIVISION

LORAIN METALLURGICAL PLANT

POST AUDIT ON THE KNELSON CONCENTRATOR

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SYNOPSIS

The installation of the Knelson Concentrator (KC) proved to be successful with a resulted increase in overall plant recovery of 3%.

1. INTRODUCTION

During August 1999, the decision was taken to discontinue the operation of the Flotation Plant at the Loraine Metallurgical Plant. The decision was based purely on economics and the fact that the Flotation Section presented a source of lock-up gold.

This resulted in a decrease in overall plant recovery of 6%, from 95% to 89%.

In view of the new Target Metallurgical Processing Plant and the decrease in recovery on the old Loraine Plant, the option to install a Knelson Concentrator was investigated.

Experimental work conducted during the feasibility study of the new Metallurgical Plant indicated that the Target ore contains approximately 40% liberated, free gold.

The possible savings on cyanide and lime formed part of the project.

A capital Vote 0176 was prepared submitted and approved. Construction started during July 2000, which was completed during September 2000. The Knelson Concentrator was commissioned on the 12 September 2000.

The following parameters were set for the **Knelson Concentrator Project**:

	<u>Planned</u>	<u>Actual</u>
Total Capital Cost	R 742 073	R 702 113
Increase in Gold Recovery %	1.50%	3.0%
Commissioning	August 2000	September 2000
Pay Back Period	4 months	1 month

Final commissioning date was the 12 September 2000.

2. INSTALLATION

Refer to drawing below.

The installation of the KC was conducted on the secondary cyclone underflow stream. A T-piece was installed on the pipeline feeding the secondary cyclone underflow to a distribution box, which is then distributed, to 6 secondary mills.

An actuated pinch valve was installed after the T-piece, which acts as the feed point to the vibrating screen fitted with 305 x 305-mm polyurethane panels, at 2mm x 10mm-slotted aperture. The oversize is returned to the distribution box while the undersize gravity feeds into the Knelson Concentrator.

The KC is automated and operates as follows:

Feed material, screen underflow, enters the KC through the feed pipe, which enters the concentrating bowl. Concentrating takes place at a pre-set time i.e. 45 minutes, after concentrating the feed to the KC shuts down and the flushing mode is initiated, also at a set period, rinsing takes place for a few seconds and the KC is initiated to concentrate again. The feed valve is opened and the sequence is repeated.

The concentrates discharged are collected in a locked vessel, enclosed in an expanded metal cage. Once a day the vessel is removed, an empty vessel is replaced and the full vessel is transported to the smelthouse for further processing.

3. GEMINI TABLE (GT)

The concentrate from the vessel is removed, dried, weighed and sampled for gold and sulphur analysis. The concentrate is then upgraded by treatment on the Gemini Table. Four products are produced by the GT, namely Final Concentrate, Middling 1, Middling 2 and Tails.

Middling 1 is returned to the feed of the GT. The final concentrate is then cleaned by removing all magnetics with a magnet, acid treated with a 10% sulphuric acid solution for 12 hours and calcined at 600 °C for a further 12 hours before being smelted in a 30 Kilowatt induction furnace set at 1200°C.

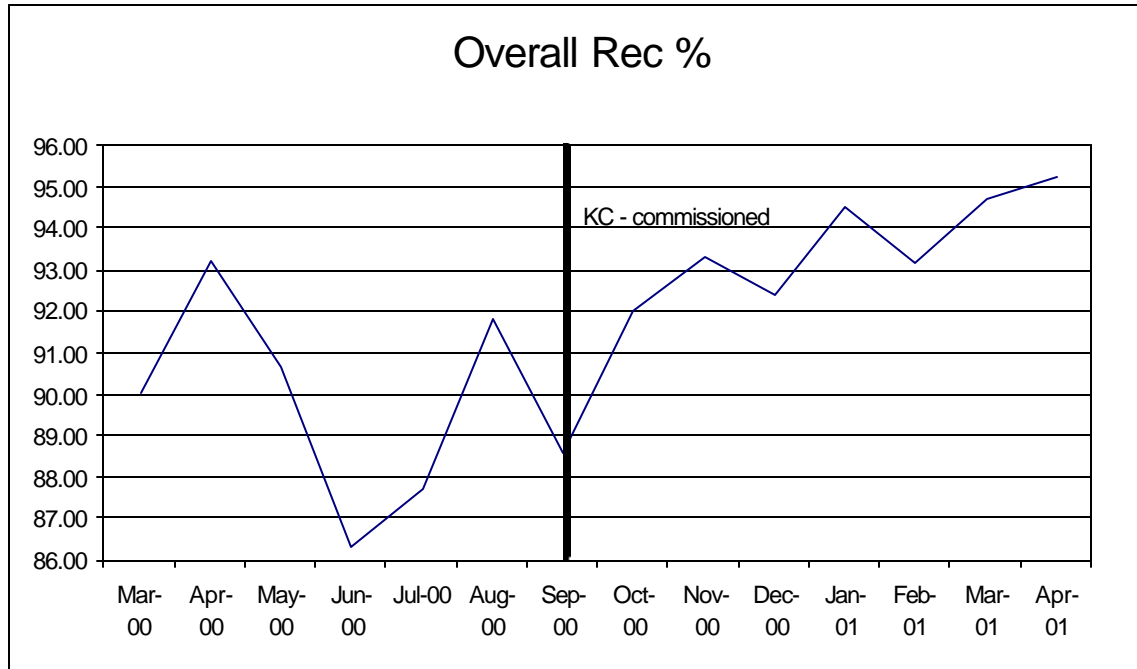
The slag produced by the smelt is accumulated and re-smelted in the arc furnace.

Middling 2 produced was initially accumulated until batches of 1 ton, which were dispatched to Rand Refinery (RR) for treatment. This proved not be successful as the content of gold declared by RR was up to 60% less than the calculated content done by the mine. This product in future will be re-treated at the Goldvac Plant.

The tailings from the GT are also re-treated at the Goldvac Plant. The Goldvac plant acts as a re-grind and upgrading facility. The concentrates generated from the Goldvac Plant are returned to the Gemini Table.

4. RESULTS

Figure 1, below is a summary of the recoveries achieved, to date, with the Knelson Concentrator installed on secondary cyclone u/flow.



Summary of results before and after installation :

Average recovery 6 months prior:	89.77 %
Average recovery 6 months after:	93.61 %
Difference	3.84 %
Average percentage Au recovered by KC:	34.07 %
Initial test work prediction:	32.00 %
Projected* average residue grade without KC:	0.30 g/t
Actual average residue grade with KC in circuit:	0.20 g/t
Difference	0.10 g/t
Over 6 months this translates to an additional	20.02 kg Au recovered

* Due to tonnage and grade fluctuations, residues for the last 6 months were projected by using average % recovery before the installation of the KC, including a 1% improvement in recovery (thus 90.77%) due to higher grades. This was done in order to project the residue grade, had the KC not been in the circuit.

5. RESULTS OF CHEMICAL ANALYSIS OF THE VARIOUS PRODUCTS

ICP analysis as well as microscopic analysis was conducted on the Gemini Products.

TABLE 2 – TYPICAL RESULTS OF THE ICP ANALYSIS

Sample Source	Au %	Ag %	Al ppm	As %	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu %	Mg ppm	Mn ppm	Ni ppm	P ppm	Pb ppm	Sb ppm	Ti ppm	U %	S %
KC Prod	0.27	280ppm	1566	0.70	546	30	0.11	552	0.10	890	3203	955	77	1615	<5	67	0.03	10.5
Gemini Conc	52	5.63	706	2.24	756	10	0.87	392	0.60	478	1818	4038	97	34802	276	77	0.39	3.80
Gemini Mid -1	3.2	0.46	688	4.6	356	41	1.27	1322	0.72	665	4855	7422	143	25775	170	87	0.41	21.1
Gemini Mid -2	2.21	0.24	523	5.2	215	46	0.88	1012	0.45	686	5314	4552	152	16532	106	61	4.0	26.6

The following elements were similar in all samples, namely:

Pt<0.1%
 Pd<0.1%
 Rh<0.1%
 B< 5 ppm
 Ba<5 ppm
 Be<5 ppm
 Bi<20 ppm
 Ga<10 ppm
 In<10 ppm
 Mo<5 ppm
 Nb<5 ppm
 Sn<5 ppm
 Sr<5 ppm
 Ta<10 ppm

6. CONCLUSION

The installation of the Knelson proved to be a profitable and valuable project in terms of improving the overall plant recovery and data gathering for the design of the gravity circuit on the new Target Metallurgical Processing Plant.

Although difficult to ascertain the exact influence of the Knelson Concentrator on the overall recovery of Loraine Plant, due to changing plant feed grades and tonnages, it is fair to assume an overall plant recovery increase of no less than 3%.

It must be noted that the Knelson Concentrator only treated a partial stream of the secondary cyclone underflow, being a test unit. Results would be far better if the total stream had to be passed through the Knelson Concentrator.

The effective performance of the unit was under estimated originally. Any gold processing plant, treating ore containing free gold, fine or coarse, should select a unit to treat the total stream.