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Ore processing and tailings projects

*Metallurgical trouble-shooting, mill design and construction,
autoclave design and tailings facilities design*

Metallurgical trouble-shooting at Johnny Mountain gold mine

by A Bruce Cron, senior process engineer
Melis Engineering Ltd

Melis Engineering Ltd of Saskatoon Sask is an independently owned consulting and contracting firm offering mill engineering, construction, plant start-up, and plant operating and maintenance services for mineral processing, hydrometallurgy and waste management. Projects extend across North America for various clients, for both large and small scale mining.

One particular area of expertise that has been established is contract operating services including plant start-ups and retrofits as well as metallurgical trouble-shooting of existing plant operations.

Skyline Gold Corp's Johnny Mountain gold mine operation in northern British Columbia is an example of a successful production turnaround. Poor production performance on start-up resulted in a depleted cash flow situation, and quick improvements were required to generate a self-sustaining financial basis of operations.

The original mill process involved production of a copper concentrate. The flotation tailings were filtered, repulped in barren solution and fed to a 48-hour cyanide leach circuit. A second filter separated the pregnant solution filtrate to feed a Merrill-Crowe precipitation circuit. The filtered leach solids residue was repulped in excess barren solution and water before feeding a cyanide destruction tank for discharging

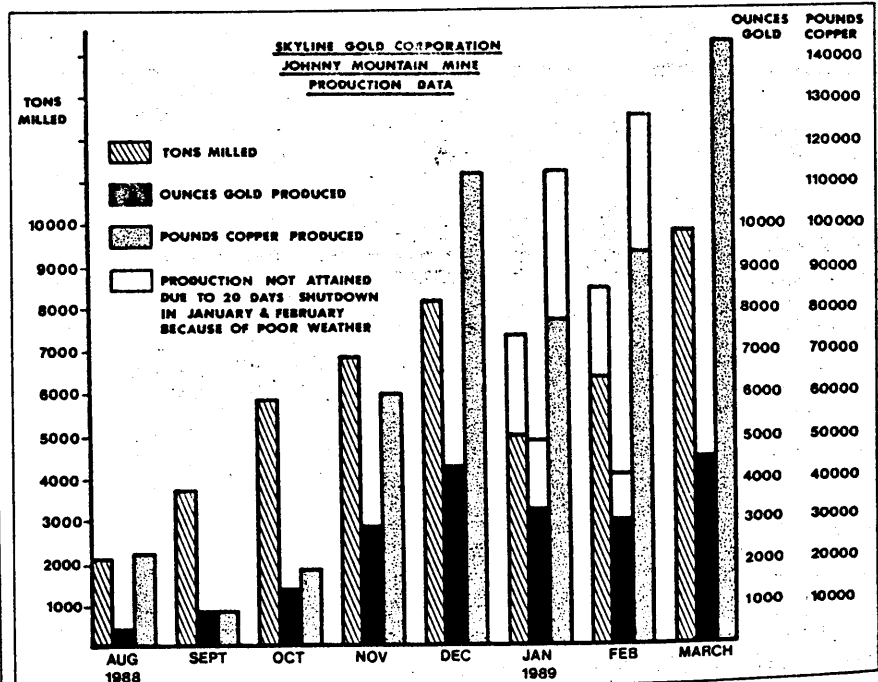
treated tailings. Cyanide destruction was carried out using a metabisulphate solution in an air-agitated tank.

A great deal of problems were being encountered with the filter operation resulting in considerable plant downtime and lost production. Low density slurry feed to the first filter would cause overflow of the filter boot, bypassing directly to leaching. Excess material feed to the leach circuit forced more slurry to discharge to the second filter which could not be

bypassed. Once the fifth leach tank, used as filter feed surge, was full, the plant had to be shut down.

As well, a fine clay fraction in the slurry led to blinding of the filter cloths reducing filtration capacity, which compounded the problem. A high cyanide consumption in the leach process restricted throughput in the cyanide destruction treatment circuit since acceptable residual cyanide concentration levels in treated tailings had to be reached.

Melis Engineering's first approach on this project (in October 1988) was to obtain samples of ore from the underground mining areas as well as samples of mill feed material for metallurgical testing. Test work at Coastech Research in Vancouver BC showed that acceptable gold and



The beneficial effect of Melis' input on the Johnny Mountain mill is shown by its production data over the past few months.

copper recoveries could be obtained using a simple gravity and flotation circuit.

The mode of operation for the mill was immediately modified to recover gold in a gravity concentrate followed by recovery of copper and remaining gold in a flotation concentrate. The cyanidation circuit, and associated cyanide destruction circuit, was shut down since any potential gold recovery from this circuit was determined to be uneconomical.

A duplex jig had been installed in the grinding circuit but it was not being operated at the time. In order to get immediate results, a lab-size shaking table and jig concentrate handling system was set up to permit the recovery of a gravity concentrate. A later modification was made to the tabling circuit to incorporate the use of a half-size shaking table feeding the smaller lab-size table. Table concentrate is upgraded to an acceptable feed grade for direct bullion production in the refinery.

The cyclone overflow reports to flotation where a copper/gold concentrate is produced. The original cleaner flotation equipment proved to be unmanageable, so a refurbished bank of four Denver No. 18 Special flotation cells was installed. This circuit now provides a copper recovery in excess of 93%, with the flotation concentrate assaying 20% Cu and typically 10-15 oz/ton Au.

Secondary gravity recovery was

added to the plant circuit by installing a Reichert spirals module on the cyclone overflow ahead of flotation. This has raised the gravity gold recovery to above 30%, with overall gold recoveries approaching 90% at a nominal throughput of 300 tons/day.

M Engineering has worked closely with Skyline's own operating personnel on site which provided the opportunity for hands-on operator training. Melis' involvement on this project was still on-going in May 1989 although Skyline's own personnel are now operating the plant.

Dona Lake — Placer Dome's latest

by John C MacDonell, project engineer
Bechtel Canada Inc

In January 1989, within days of receiving its first ore, Placer Dome Inc (PDI)'s Dona Lake concentrator in Pickle Lake Ont was consistently processing gold ore at design tonnage. The swift start-up by PDI marked the completion of another successful mine project with which Bechtel Canada Inc has been associated. For Bechtel, the official opening of the Dona Lake mine and milling facility in mid-June also marks the 40th anniversary of Bechtel's continuous operations in Canada.

In July 1987, Placer Dome awarded Bechtel an engineering and procurement contract for the complete processing and service facilities for the 500-tonnes/day underground gold development. The level of engineering was tailored to reflect the client's requirement for a low cost facility.

Also in accordance with the client's

requirement that engineering be substantially complete by the start of construction, a relatively small and versatile team reached better than 80% complete by May 1, 1988. A team effort by Bechtel, Lyall Chapman (mine manager), Ken Wright (chief metallurgist) and George Laszlo (construction manager) resulted in a design that is compact, functional, low cost, but of a high quality.

Following a review of the feasibility study documents and incorporation of final modifications to the concept, PDI approved the commencement of detailed engineering and procurement in August 1987. Before Christmas, all major equipment, including refurbished second-hand units, had been purchased and a contract for the buildings had been let.

In early May 1988, initial stripping of overburden indicated that "Murphy" had guided the sub-surface investigation performed the year before. Many of the probes had hit pinnacles and ridges of bedrock incorrectly suggesting a fairly flat bedrock surface. Swift action by PDI's construction management team and foundation design revisions by Bechtel in the field minimized the schedule impact.

Consequently, by September 1988, PDI moved into the service building and the mill was closed in, thus providing cover for the completion of the processing facilities. Before Christmas, pre-operational tests were complete and the plant was ready to accept feed in January. First ore was fed to the mill in mid-January and was closely followed by the first gold pour on Feb 14 1989.

The Dona Lake complex houses the headframe, shops, offices, utilities, laboratory, change facilities, ware-

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