



IPJ CASE STUDY

Recovering native copper at New Afton delivers recovery benefits



New Gold Inc: NGD: is a Canadian TSX listed gold explorer and producer.

The company has a portfolio of two core producing assets and a significant gold-silver development project. The New Afton Mine and the Rainy River mine both in Canada provide the company with its current production base.

New Gold's objective is to be a leading intermediate gold producer that is recognised for its achievements in environmental and social responsibility.

Background

The New Afton Mine is wholly owned by New Gold. The mine site is located in Kamloops, British Columbia. The mining method is block cave with the primary copper-bearing mineral in the original cave being primarily chalcopyrite. However, the New Afton Mine has more recently processed large quantities of metallic native copper from the upper oxide (supergene) and transition ores which do not recover as well in the conventional flotation circuit. According to Senior Metallurgist, Jennifer Katchen, this put at risk an average of 4.5% copper recovery in supergene ore and potentially more on individual days depending on the amount of native copper in the plant feed.

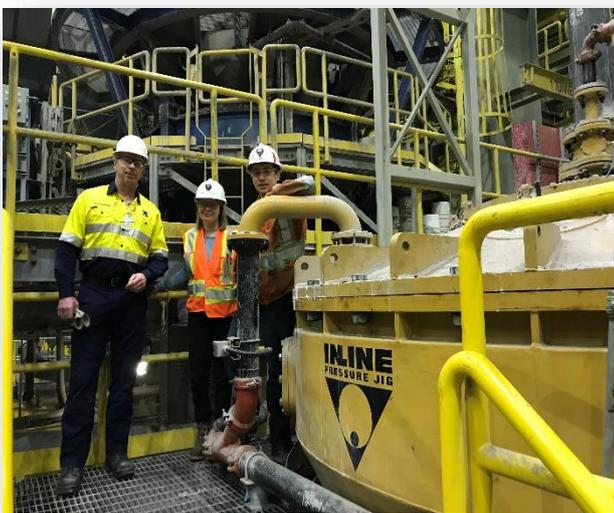
The project justification utilised an overall Cu recovery increase of 1.4% between October 2018-2021 with a payback period of 2 years. Because of the nature of the block cave, which draws ore down from the bottom and creates a cone of depression, it is difficult to control the feed blend to the mill. As



David Fenrich

As a result, there was no option to batch run this ore separately from the main hypogene ore type. Supergene ore samples taken for metallurgical test-work were highly variable in their proportion of copper as native copper, ranging from 11% to 95% based on QEMSCAN mineralogical analyses. Analysis of tailings from testing indicated that the majority of the losses were due to native copper in the coarser size fractions (>200 micron).

Supergene ore copper recovery was expected to be in the low 70% versus 82-84% for the hypogene and mesogene ore types. In order to de-risk the recovery, the New Afton team researched options for native copper recovery. While gold recovery benefit was considered, it was a lower priority due to relatively low gold head grades in the supergene ore.



Greg Rasmussen, Jennifer Katchen and Sam Carlberg

The concentrate from the IPJ3500 is combined with the concentrate from a centrifugal concentrator in the tertiary grinding circuit and reports to the cleaner IPJ2400 which carries out a significant upgrade to bring Cu grade up to an average of 46% and Au to an average of 48ppm. This additional gold recovery and grade was not expected and adds significantly to the concentrate values. A MagScreen 1000 MK2 magnetic separator removes magnetite from the IPJ2400 cleaner concentrate. See picture below on the left. The concentrate from the cleaner reports to a screen to remove very high grade 95% metallic copper from the product stream to reduce copper assay variability in the bulk flotation concentrate, and this concentrate stream is sold separately. See picture below on the right.



Cleaner concentrate – 46% grade



Screened cleaner concentrate – 95% grade

A world first IPJ3500 installation

The proposed flowsheet by New Afton required the installation of the world first high-volume InLine Pressure Jig IPJ3500. This unit treats nominal throughput put rates of 200 tph – 250 tph depending on the application and has been recently developed by Gekko Systems particularly for base metal and larger throughput operations. Due to potential demand an even larger sized unit is on the drawing board.

New Afton Team contributes to installation success

In order to optimise the circuit, the team at New Afton have worked with Gekko to control mass pull, manage water consumption and balance the circuit. Due to the coarse nature of the feed to the circuit the New Afton team have progressively addressed the issues of pipe and orifice wear with ceramic and tungsten inserts in the areas of low service life.

A novel approach to reducing mass pull was utilized by the New Afton team by reducing open screen area in the IPJ's which has helped stabilize the circuit. The outcome has been a gravity recovery circuit which operates with very little operator input and achieves consistently high-grade concentrate. The performance of the operating circuit is achieving better outcomes than the test work suggested. The circuit has been de-risked and has the capability of maintaining high recoveries even in high native copper environment.



IPJ3500 – 200-250 t/hr feed rate

Engineering and Installation Design Considerations

In order to properly commission and optimize the jigs for future applications it is important to consider the following key points for circuit design:

Pumping: For pumping the coarse concentrate from the IPJ 3500 a horizontal pump is recommended. Difficulties were encountered with an existing vertical pump which was initially installed. This pump system presented substantial operational challenges and impacted heavily on availability in the early stages of the installation.

Piping: The coarse nature of the jig feed, tails and concentrate will result in high wear rates on piping. The nature of the ore at New Afton has required ceramic lining for relevant pipework around the jigs as is standard in many sections of the plant including cyclone feed.

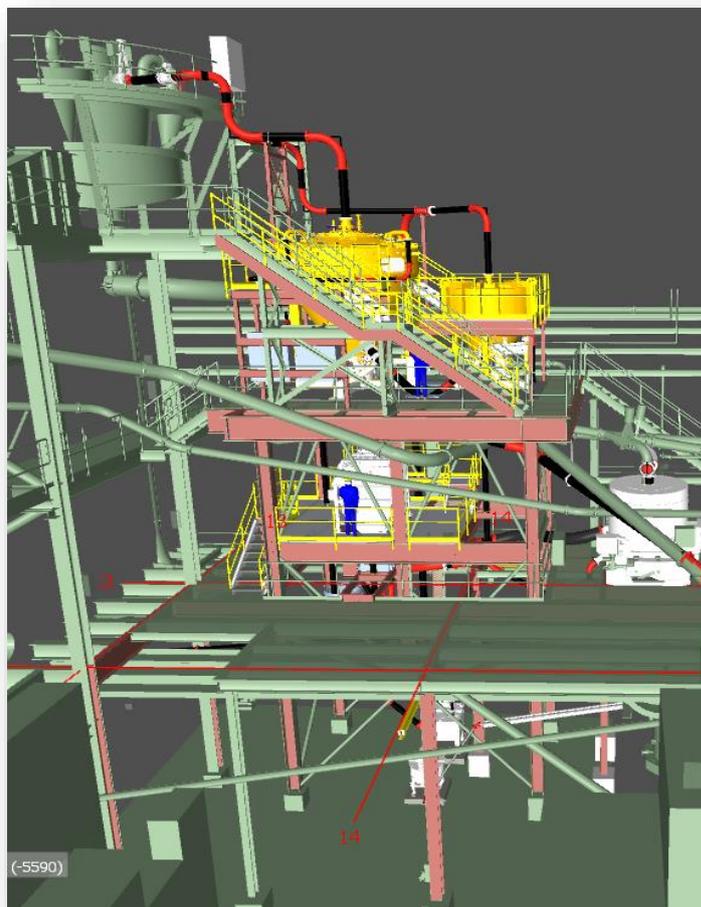
Ease of Commissioning - Orifice Plates & Isolation Valves It is recommended for efficient commissioning to have an assortment of wear-resistant orifice plates in different sizes on hand. Trying to optimize the circuit with mild steel orifice plates that wore quickly was inefficient. It is also beneficial to install isolation valves right before the orifice plates to allow for easy lock out when changing orifice plates or when a plug occurs in a discharge line.

The Benefits

The overall recovery benefit in the justification was estimated at 1.4% whilst the native copper ore is present in the feed, projected to end Q1 2021.

The IPJ's have made a significant contribution to copper recovery - approximately 9% of total copper - and have helped maintain the overall high copper recoveries in the New Afton plant. Overall native copper recovery from the gravity circuit is in the order of 50%. This reduces the mill circulating load and reduces coarse native copper (>200 micron) reporting to the tertiary circuit and subsequently the flotation circuit and potentially to the flotation tails. In addition, very high-grade concentrate is produced for both gold and copper which is sent directly to final concentrate.

Other benefits include financial returns from higher than expected gold recovery. Low water addition from the new circuit minimised any water balance issues and the IPJ's are a low cost per tonne technology.



Supergene GRC circuit general arrangement within the existing grinding circuit



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