

CASE STUDY

Realising Benefits Through Optimised Cyanide Leaching

Peru, South America

Site Profile

An open cut gold mine in Peru, South America, has demonstrated how Orica's PRO Service enables consumption savings and increased gold recovery.

In recent years, mineralogy has been challenging for the sustainability of the site due to the depletion of oxidised mineral reserves and the onset of more complex minerals, such as transitional sectors and DEEP. The latter contains a higher concentration of copper, which contributes to higher consumption of cyanide and reduces the recovery of elements of interest.

The Situation

The Gold Mill Plant processes three types of minerals individually through alternate campaigns. It is essential to know the optimal operational variables to be able to control the appropriate levels for each mineral, thereby maximising recoveries and optimising costs.

Technical Solutions

Process Health Check methodology was used to analyse the site's historical data. Among the relevant variables that were closely scrutinised were cyanide measurement and its dosage; previously carried out through traditional methods and measured with a frequency of once every 3 to 4 hours.

The project determined that there were inconsistencies in the free cyanide measurements due to copper variations and sulphide levels in the ore. This variability initially generated an overestimation of free cyanide. It was determined that investing in an enhanced method and frequency of free cyanide measurement would significantly improve cyanide control and a more efficient leaching system.

Methodology



Figure 2 – Orica's PRO Service methodology

Orica proceeded to implement Cyantific™, a cyanide usage methodology which automates the measurement and dosage through the installation of its OCM 5500 equipment. The system was set up based on the classification of minerals, customer's cyanide consumption requirements along with the best control points and dosage ranges. The goal was to increase gold recoveries and reduce reagent consumption.

The OCM 5500 has helped to increase the accuracy and frequency of free cyanide measurement, together with the implementation of a control loop that was integrated with the Distributed Control System (DCS) of the plant and actuators. This automatic dosage system was developed with the flexibility to adjust the free cyanide set points that were optimised for each ore type.

The automated control system managed to significantly reduce free cyanide variability as compared to the manual dosage, which eliminated the periods of excessive and insufficient dosage. This resulted in a much more consistent free cyanide level, enabling a reduction of the consumption of reagents necessary for cyanide destruction, which is a critical requirement for tailings disposal.



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Once the free cyanide set point requirements for each ore type was defined, there was a need to have higher accuracy in the free cyanide measurement to implement a new process control methodology. An increased testing frequency was required to configure the process for different operating scenarios, which led to the integration of the OCM 5500 analyser with the control room and the establishment of a methodology to control the leaching process continuously.

The Outcome

Throughout the project, a baseline was established for each relevant variable, including free cyanide concentrations before and after the project.

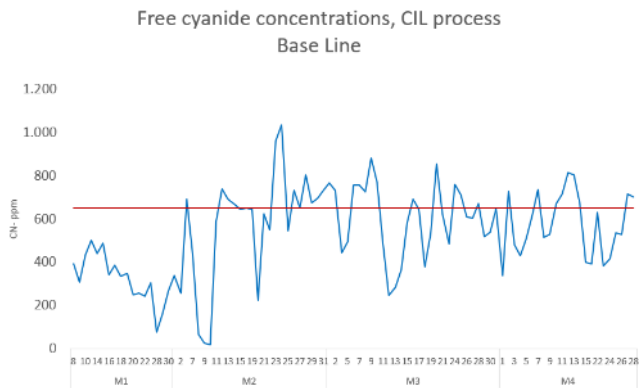


Figure 3 – Baseline for free cyanide concentrations (blue), where significant variability was identified in relation to the desired concentration (red)

The improved cyanide dosage control successfully reduced the variability of free cyanide in the process.

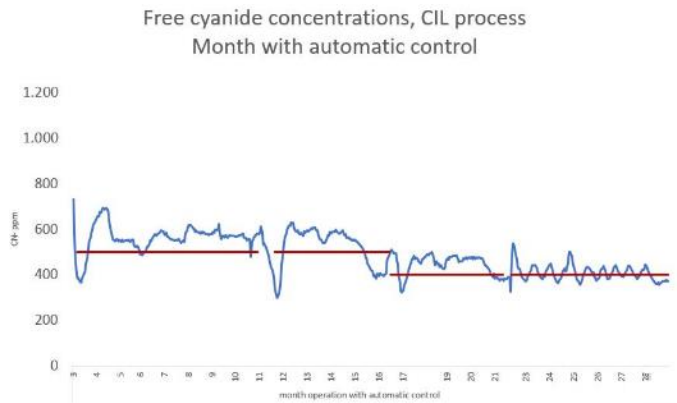
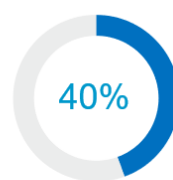
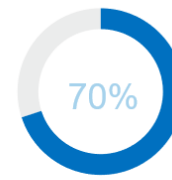


Figure 4 – Free cyanide concentrations with automatic dosage (blue), target set point (red)

By adopting the automated cyanide dosage system, the customer achieved a 40% reduction in cyanide consumption and more than 70% less hydrogen peroxide consumption. It was validated that gold recovery increased by an average of 2.5% from the baseline.



Cyanide savings in complex ore.



Savings by lower consumption of cyanide in neutralizing reagents, such as hydrogen peroxide.

Figure 5 – An optimised outcome

These significant gains can be further improved by using Orica's LeachIT™ to determine the optimum cyanide levels for various blends of ores with different levels of copper and sulphide minerals. Consistent levels of cyanide, as well as better accuracy of the results,



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produces a more accurate simulation of the leaching system and optimum leaching conditions resulting in further gains to customers.

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