Control Performance Optimizer Provides Offline Simulation, Reducing Downtime for Australian Lead and Silver Mine

Challenge

A large Australian lead and silver mine discovered that autogenous mill overload was their leading cause of downtime. This downtime was occurring during the most energy-intensive stage in iron ore processing, impacting further stages of separation (float circuit recoveries).

Solution

In conjunction with mine personnel, engineers used Control Performance Optimizer to develop a non-linear grinding circuit simulator and soft sensors to understand the overload conditions and to continuously monitor the AG mill.

Control Performance Optimizer is Powered by Matrikon, which represents vendor neutrality. This product works with third-party control systems and applications.

Advantage

- Improved process understanding
- Consistent estimation of mill state
- Advanced Control platform development

The Road to Better Control: Understanding

A large Australian lead and silver mine produces over 34 million ounces of silver and 240 000 tons of lead annually.

Comminution is the first stage in ore processing. It is energy-intensive, and the performance of this stage impacts further stages of separation (float circuit recoveries).

The mine found that autogenous (AG) mill overload was their leading cause of downtime. In conjunction with mine personnel, engineers used Control Performance Optimizer to develop a non-linear grinding circuit simulator and soft sensors to understand the overload conditions and to continuously monitor the AG mill.

The objective was to provide a tool that assisted the operators and engineers in understanding their grinding circuit and reduce the frequency of AG mill overload.

Grinding circuits are highly nonlinear and have extensive coupling between variables. The problem is, therefore, to successfully model both the system and control dynamics across the full process operating range.

A Simple Interface for Dynamic Simulation

Control Performance Optimizer was used to develop a flexible, non-linear dynamic simulator and soft-sensors for the grinding circuit to further enhance process understanding and reduce downtime.

The grinding circuit simulator was designed to simulate the system dynamics starting from the stockpile reclaim system and finishing at the feed for the flotation process. The simulation includes:

- feeders and conveyors
- the autogenous (AG) mill
- water addition
- discharge hopper
- cyclones
- recycle and pebble crushers
- soft-sensors monitoring the mill charge/volume, shoulder/toe angles and cyclone overflows

The simulator and soft-sensors were developed using a combination of first principles modeling, along with input-output dynamic responses. The models included:

- Morrell 'C' model for power and charge shoulder/toe angle prediction
- Whiten's mixing model for breakage and hold-up
- Nageswararao cyclone model for predicting cut size
- slurry recovery and water recovery

POWERED BY
MATRIKON

Benefits: Understanding and Monitoring

The grinding circuit simulator has enabled further process understanding, controller design and prototyping, as well as investigation of various optimization strategies. Using a simulator is advantageous because it can be used to:

- test and clarify ideas before committing to final implementation
- explore situations that could be potentially hazardous or difficult

The model-based approach results in enhanced process understanding and a physical insight into the process. Furthermore, first principle model-based development also allows the logical incorporation of process and circuit changes, giving a more maintainable solution. The grinding circuit simulator and soft-sensors were accessible via two additional screens in the HMI.
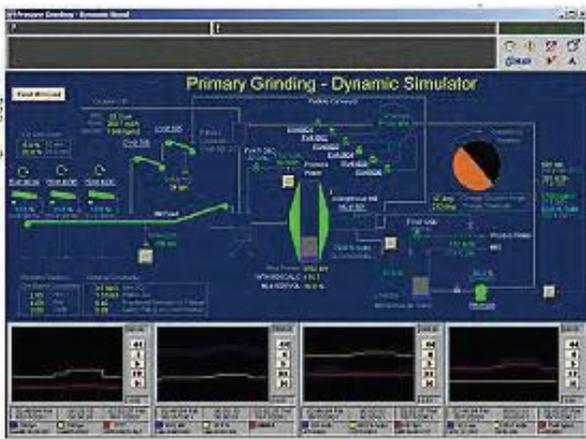

Figure 1 – Dynamic simulation provides a better understanding of grinding circuit operation and in conjunction with mill soft sensors can reduce downtime events, such as mill overload..

'Powered by Matrikon' symbolizes that this product/solution is system and application independent.

For more information:

For more information about Control Performance Monitor, visit our website www.honeywell.com/ps or contact your Honeywell account manager.
www.matrikon.com
cpm@matrikon.com

Honeywell Process Solutions

1250 West Sam Houston Parkway South

Houston, TX 77042

Lovelace Road, Southern Industrial Estate

Bracknell, Berkshire, England RG12 8WD

Shanghai City Centre, 100 Junyi Road

Shanghai, China 20051

www.honeywell.com/ps

Honeywell