



Mining, Minerals & Metals

Background

Today's economic conditions dictate that to survive, mining, minerals and metals companies must optimise their operations and be highly cost effective. However, a retiring workforce and lack of qualified new professionals entering the industrial sector make this increasingly challenging. In fact, studies suggest that the gap between required workforce and available applicants will soon reach 30% in the mining industry (reference: Schneider Electric). This unbalance creates the need for intelligent but easy to use optimisation and process control tools.

Spiro MPC

Spiro MPC is a multivariable model predictive control application. The application comes embedded on a small footprint edge device, designed to connect to any control system easily. When embedded with Spiro MPC, the edge device is able to automate control of connected assets and can maintain processes at their optimal operating point.

Example: Spiro MPC applied to grinding circuits

Grinding circuits are a significant energy consumer and a critical unit operation in mining and minerals operations. Tighter regulations, increased energy costs and increased competition all combine to increase the need for better control of this unit.

Control of the grinding unit consists of manipulating water feed rate, ore feed rate and mill speed to impact mill load, torque, power draw and slurry density all while managing the impact of disturbances such as ore size and the amount of circulating load. Due to the complexity created by the number of possible combinations that must be analysed on a continuous basis and in real-time, when human operators make adjustments they tend to choose conservative parameters. This results in lost production opportunity as the amount of feed put into the process is not maximised which has a direct impact on production. For a site that has multiple mill operations, distribution of feed between these mills is also important. Using highly efficient state space control algorithms which achieve millisecond execution frequency, Spiro MPC can analyse multiple variable scenarios and make real-time adjustments to optimise control combinations on a continuous basis. As a result of this careful and constant fine tuning, much tighter control targets are achievable, and process performance across the plant can be maximised.

Estimated benefits per year to be achieved from process optimisation

Grinding circuit	\$0.7 million
Flotation circuit	\$1.6 million
Surge	\$0.2 million

*Source: GE, 2015

Spiro MPC & plant-wide optimisation

In continuous process industries, like the mining, minerals and metals industries, there is a need for a control strategy that addresses the challenge of optimising an entire integrated manufacturing facility as a complete holistic solution rather than optimising individual sub-systems. The Spiro MPC solution achieves plant-wide optimisation through cooperative distributed control. Each unit operation has a separate controller, preserving simplicity, but each controller is aware of subsystem interactions so that all controllers in the network cooperate to ensure that a plant-wide objective is achieved.

Estimated benefits from plant-wide optimisation

Platinum	5-6% increase in throughput / 1-3% energy reduction per ton of material feed
Alumina refining	2-4% increase in production
Smelting	2-4% loss reduction
Concentration	2-4% increase in production / 1-5% energy reduction / 1-4% recovery improvement

Spiro Analytics

Spiro Control offers a range of analytics applications that come ready installed on a small footprint edge device designed to connect to any control system easily and capture real-time plant data. Our data analytics applications can be used to analyse process performance, diagnose faults and to infer hidden properties without the need for expensive on-line analysers.

Massive amounts of data are generated at each step in mining, minerals and metals operations. This data has the potential to help companies optimise operations by improving safety, reducing energy consumption, optimising processes, and increasing production. However, all too often the data is not well analysed or made visible enough for useful decision support.

Part of the problem is that traditional approaches to analytics have built-in delays. For example, data may be stored in a data historian or data warehouse for days, weeks, or months before being analysed (if ever). In the case of mining where operations are often in remote locations, the problem is even more pertinent as information cannot be uploaded to centralised data centers for analysis and processing due to the sheer volume of data and because reliable networks and cloud connectivity are typically unavailable at these sites. Our solution is based on processing, analysing and responding to data right where it originates - at the edge of the network. Edge analytics allows data to be analysed in real time, immediately after the data are generated and without the need for connectivity to the cloud. Consequently, any issues in the production process can be quickly identified, alerts generated, and corrective action taken.

Because of the way our solution is configured it means that data applications can be easily used and customised by control and process engineers at site, not just data scientists and software specialists.

For more information, contact info@spirocontrol.com