

SUCCESS STORY

Automation and
optimization of a SAG Mill
circuit at an Eastern
Canadian company



AUTOMATION & DIGITALIZATION

IMPROVING PERFORMANCE

ADVANCED PROCESS CONTROL
FOR SAG MILL CIRCUITS

ANDRITZ

ENGINEERED SUCCESS

The challenge

Optimize SAG Mill circuit operation to improve performance

An Eastern Canadian mining company wanted to investigate new technologies that could improve the operation performance of their Nickel and Copper plant. Particularly, they wanted to increase production, improve recovery and reduce operating costs, a level of optimization that required an advanced process control system. ANDRITZ had previous experience in process optimization in copper and nickel operations and demonstrated this capability to the company after

performing a site visit and delivering an advanced process control and digitalization report with a process optimization road map. Based on this report and on ANDRITZ's record of successfully delivering advanced process control (APC) systems, ANDRITZ was awarded the contract to optimize the SAG Mill circuit.

Our solution

A new and advanced expert control and simulation platform

Drawing on prior copper and nickel industry experience and its focus on process optimization, ANDRITZ offered its APC technology solution, Advanced Control Expert (ACE), to stabilize the SAG Mill circuit operation as well as increase the plant's ore feed rate and performance.

The company's existing expert control system was replaced with ACE, which includes BrainWave (Multiple Input and Multiple Output (MIMO) Model-Predictive Controller (MPC)) and a data analytics supervisory system. Technology and knowledge were transferred between systems with ease and minimal disruption.

The BrainWave controller's unique self-learning and predictive capabilities enabled it to adapt to different operating scenarios and respond, with no disruption, to rapid ore changes. Using patented algorithms, BrainWave accurately controlled for process dead-time, non-linear responses, and multiple variable interaction controls present in every SAG Mill circuit. The supervisory system provided an optimization and management layer

that set prioritized controls for the process area, balancing compromises as the ore, equipment and operational constraints changed. The SAG Mill ACE system was connected to the plant's existing control system, enabling operators to interact with ACE through a familiar interface. This simplified both change management and operator training.

The SAG Mill ACE system for the customer's plant provided a powerful advanced process control strategy that simplified the SAG Mill circuit operation, reduced process variability, and increased ore feed rate throughput for a safer and more efficient operation that required minimal operator intervention. The APC system was commissioned, developed, and installed remotely, and still has room to grow. By connecting real-time operations data into the ANDRITZ platform, online digital twins and artificial intelligence solutions can be added in future. These would enable the plant to use the same platform to provide virtual instruments, condition monitoring and an even higher process optimization.

Results

Performance improvements for both people and processes

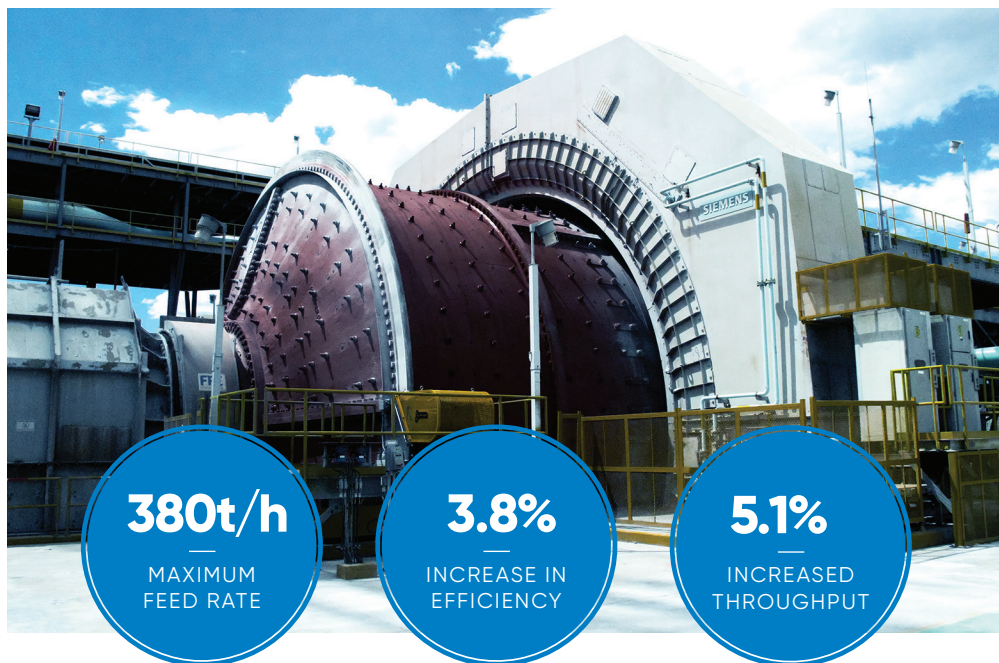
One month after start-up, the site increased plant throughput by 5.1% from 296t/h to over 311t/h. A 3.8% increase in grinding efficiency was also observed when running similar ore through the SAG Mill while operating the ANDRITZ system. The increase in efficiency was measured using site metallurgical model that correlates ore characteristics to an expected throughput.

After several more months using the new APC system, the safer, more reliable and predictable SAG Mill operation allowed operators to change the maximum feed rate from 360t/h to 380t/h, further increasing the plant's average.

The APC system's ability to automatically change scenarios and adapt controllers for rapid ore changes has enabled human operators to step back and supervise processes rather than interact directly with them. This has not only helped to improve the accuracy and efficiency of plant operations but has allowed operators to spend more time optimizing and adding value to operations rather than on performing repetitive tasks. ANDRITZ has been with the company every step of the way and will continue to support the operation to further optimize and improve operational performance.

BENEFITS

- Increased plant throughput
- Increased grinding efficiency
- A safer and more reliable SAG mill operation
- Minimal operator intervention
- Automatic control tuning for different ore characteristics





WHY WORK WITH ANDRITZ

International technology group ANDRITZ offers a broad portfolio of innovative plants, equipment, systems, services and digital solutions for a wide range of industries and end markets. Sustainability is an integral part of the company's business strategy and corporate culture. With its extensive portfolio of sustainable products and solutions, ANDRITZ aims to make the greatest possible contribution to a sustainable future and help its customers achieve their sustainability goals. ANDRITZ is a global market leader in all four of its business areas – Pulp & Paper, Metals, Hydro and Separation. Technological leadership and global presence are cornerstones of the group's strategy, which is focused on long-term profitable growth. The publicly listed group has around 29,100 employees and over 280 locations in more than 40 countries.

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