



# OUTOTEC AUTOMATION SOLUTIONS FOR GRINDING OPTIMIZATION

Grinding circuit efficiency is critical for the performance of the whole ore beneficiation process. Outotec's ACT grinding optimization system – with the RockSense on-belt rock size analyzer, MillSense charge analyzer, and PSI particle size analyzer – gives you a complete solution for optimizing your entire grinding circuit. The system stabilizes the process, maximizes throughput, improves control of particle size, and provides accurate on-line analyses of the most critical variables.

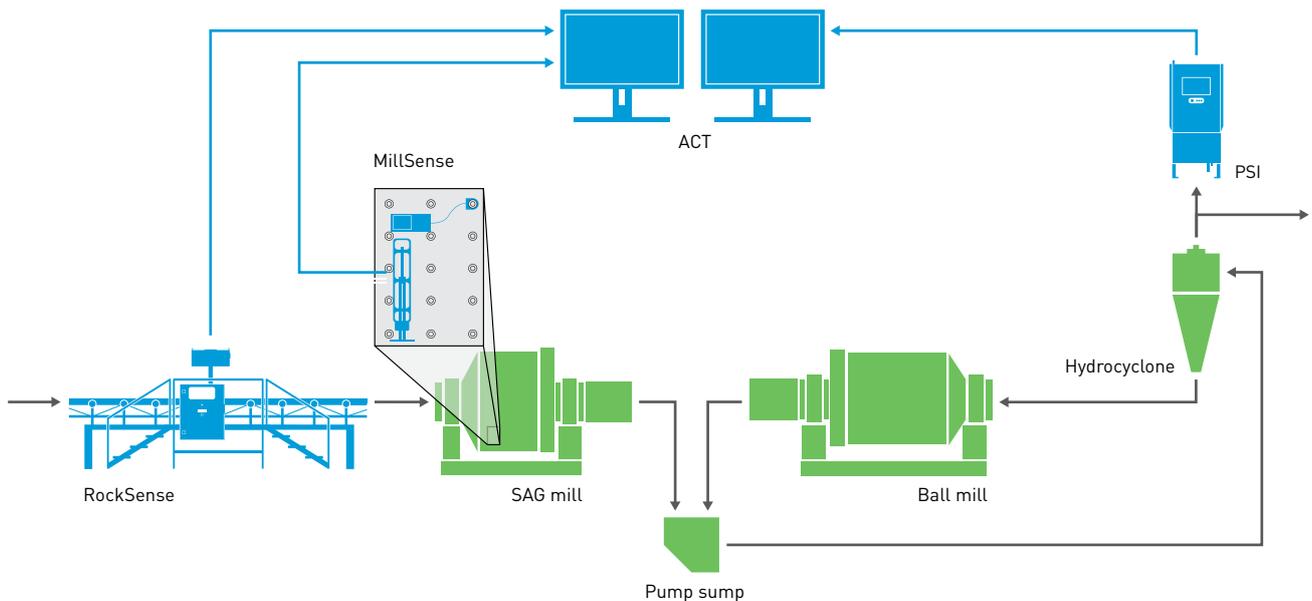
## BENEFITS

- Improved utilization of grinding capacity
- Maximized process throughput
- Reduced energy consumption
- Higher overall equipment efficiency
- A complete solution from one supplier

# GRINDING OPTIMIZATION IMPROVES PRODUCTIVITY

The grinding process is very energy intensive and often a bottleneck for concentrator plant capacity. Grinding is therefore considered a very beneficial target for optimization. It is critical to achieve a suitable ore feed size distribution in order to reach high grinding efficiency

and throughput, especially in grinding circuits involving autogenous (AG) or semi-autogenous (SAG) mills. The investment in grinding optimization pays for itself through reduced energy costs and improved productivity.



Outotec's ACT grinding optimization system with RockSense, MillSense, and PSI particle size analyzer gives you a complete solution for optimizing your entire grinding circuit.



## Outotec ACT – optimize and stabilize processes

Outotec ACT is an advanced process control platform for building customized control applications that enable you to stabilize and optimize everything from single-unit processes to plant-wide production. Outotec ACT can be connected to all existing plant control systems.

## Outotec ACT grinding optimization system

The Outotec ACT grinding optimization system is a customized control application for grinding circuits. It ensures stable conditions in the grinding circuit, optimal particle size for downstream processes, and increased throughput with minimized energy usage. The Outotec ACT grinding optimization system utilizes feed particle size data from RockSense, charge analysis from MillSense, and slurry particle size measurements from PSI, as well as other available on-line measurements.

# OUTOTEC SENSORS AND ANALYZERS FOR GRINDING CIRCUITS

## Outotec RockSense system

The Outotec RockSense system is an on-line particle size analyzer system for ores moving on a conveyor belt. The system uses high-performance 3D laser imaging technology that is resistant to changes in external lighting conditions. RockSense analyzes the rock particles during normal belt movement without affecting the capacity of the conveyor belt. The excellent resolution and realistic scale of the images is achieved by combining a high-resolution 3D laser scanner with a rotary encoder.

Outotec RockSense provides the following analyses:

- Particle size distribution with user-definable statistical measures
- Cumulative volume flow estimation

## Outotec MillSense® system

The Outotec MillSense system provides on-line analysis of the mill charge position and volume by directly measuring the charge's toe and shoulder angles. The volumetric charge measurement has proven to be an invaluable input for mill optimization and for decreasing disturbances caused by ore changes. The MillSense sensor is directly attached to a liner bolt and uses wireless technology for both power and data transfer.

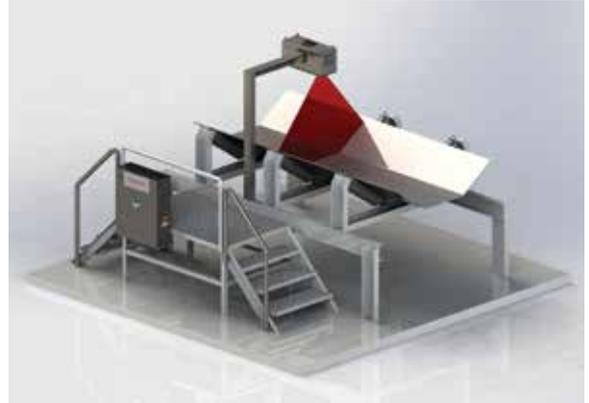
The benefits of Outotec MillSense include:

- Higher mill availability
- Fewer unexpected shutdowns
- Improved mill throughput from running the mill at the optimal charge volume
- Protection of liners
- Improved robustness for ore hardness changes

## Outotec PSI® particle size analyzers

The Outotec PSI particle size analyzer is a market-leading on-line sizing system for mineral slurries. Particle size monitoring and control improves throughput and helps to maintain the target grind in the grinding circuit. Additionally, it improves the downstream process by minimizing reagent consumption, increasing recoveries, and making thickening and filtration more effective.

Outotec offers two particle size analyzers. Outotec PSI 300i is the preferred instrument for most grinding control applications to measure P40 to P90 particle sizes ranging from 25 to 1,000  $\mu\text{m}$ . Outotec PSI 500i is recommended for applications with particle sizes ranging from 0.5 to 1,000  $\mu\text{m}$ .



The Outotec RockSense system analyzes rock particle size on a conveyor belt.



Outotec MillSense provides on-line analysis of the mill charge position and volume.



The Outotec PSI particle size analyzer is an on-line sizing system for mineral slurries.

# OPTIMIZE YOUR LIFE-CYCLE PRODUCTIVITY WITH OUTOTEC SERVICES

When you choose Outotec as a services partner, you are partnering with an organization that is firmly committed to understanding your business needs. We collaborate with you to develop a safe, sustainable, and reliable service solution based on our world-class technologies and process, operation, and maintenance expertise. We then design exactly the right bundle of services to help you achieve a step change in business performance – for your plant's entire life cycle.

## A comprehensive portfolio of services

The individual services that make up our portfolio can be combined into a customized solution to meet your precise requirements and asset needs.

## Outotec services portfolio

- Advisory Services
- Maintenance Services
- Operations Services
- Remote Services
- Spare and Wear Parts
- Training Services
- Upgrades

## Partnering with Outotec

Our service scope is always based on your business needs, with mutually agreed targets and shared responsibilities.

You benefit from receiving precisely the level of support you require, ranging from scheduled equipment health checks with recommendations to avoid unplanned downtime, to more comprehensive agreements where Outotec experts are based permanently at your site. With our experts fully integrated into your maintenance and operations processes, we can proactively optimize your plant's performance.

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## BENEFITS

- Improved health and safety
- Decreased operating costs
- Improved equipment and process efficiency
- Improved environmental efficiency
- Improved capital efficiency
- A comprehensive portfolio of services from one supplier



Outotec provides leading technologies and services for the sustainable use of Earth's natural resources. As the global leader in minerals and metals processing technology, we have developed many breakthrough technologies over the decades for our customers in the metals and mining industry. We also provide innovative solutions for industrial water treatment, the utilization of alternative energy sources and the chemical industry. Outotec shares are listed on NASDAQ OMX Helsinki. [www.outotec.com](http://www.outotec.com)