



Operations Performance Management

A Digital Mine solution from GE Digital and Wabtec's Digital Mine



External environments have significantly changed the way mines are operated, while data silos and a lack of standards are preventing plant operators from optimizing efficiency and margin.

Increase revenue and margin by optimizing the performance, yield and throughput of your plants, sites, and portfolio.

If you're like most mining companies, you're constantly looking for new ways to improve your processes, fleet efficiency, margin, and production output to optimize throughput, yield and recovery. You also want to minimize your energy costs, and do so in a sustainable, compliant manner. But how do you prioritize all these goals? How do you gain the operational insights to drive analysis and then make timely decisions to mitigate risks and achieve the operating improvements you need?

You've already invested in automation to increase productivity. Yet, problems still persist.

Those automation systems don't provide the insight you need to leverage the various types and sources of process and materials data to maximum yields and deliver predictable performance. You're not getting the right information, to the right people, at the right time. Processes are being operated sub-optimally, and you are not fully optimizing the assets within your plant. Throughput, recovery, and availability are suffering, constraining your operations and ultimately your financial performance.



Operations Performance Management

Maximize production while balancing costs

Increase revenue and productivity with a complete control-to-cloud optimization solution. Consolidate and track operational and business key performance indicators (KPIs) and optimize process performance in real time to increase throughput, recovery, and efficiency.

Understand your operations from pit to port

Operations Performance Management solutions from GE Digital and Wabtec's Digital Mine support operational decision making to rapidly discover and respond to changing mining conditions. They provide accurate, clear, and complete situational awareness to help mining professionals reduce process related downtime while maximizing outcomes.

Predix Operations Performance Management (OPM) provides real-time operational intelligence at the control, site, fleet, and enterprise levels. It's an all-in-one, real-time, 24/7 solution that closes your analysis gap by helping you optimize throughput and increase yields while making timely and accurate decisions that balance process performance with maintenance and profitability goals.

Differentiating features

- Instant access to operations, financial, and regulatory data
- Data-driven mapping to dramatically reduce implementation timeline and cost
- Adaptive cybersecurity solutions to protect data
- Broad and extensive advanced analytics catalog
- Single unified architecture from the sensor to the boardroom

Optimized outcomes

- Increased operations productivity, efficiency, and recovery
- Better decision making via instant access to your information
- Improved performance and reliability and safer mining practices

The solution provides:

Operational visibility and intelligence—monitor and respond to changing process and asset conditions enabling your team to get the most out of your available resources while meeting production targets within compliance standards.

Forecasting and What-If analysis—compare various production and process options to confidently deliver the best business outcomes.

Process performance optimization—quickly execute changes to process and asset parameters to improve operating results, asset utilization, and production planning and scheduling.

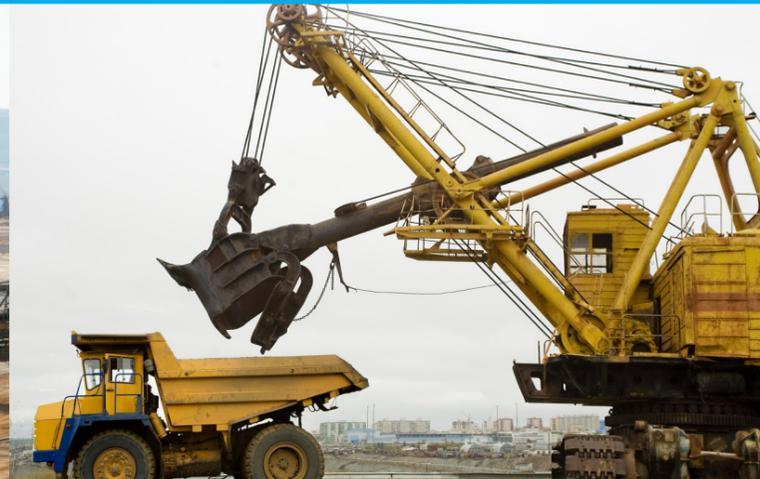
As an example, take a milling circuit within a Mining Operation. OPM calculates the optimal set points to stabilize and optimize the circuit. The solution monitors the pumps, electric motor, and gearbox, and maximizes the lining lifetime. The solution can improve throughput from 1 to 10%, within grind quality constraints, while also minimizing specific energy consumption (kWh/t).



Operations Performance Management offering

Core capabilities

Connectivity • Data management • Process workbench • Configurable dashboards • Process monitoring • Control loop monitoring • Quality tracking



Grinding and Flotation

(~\$0.7 – \$1.9M savings circuits/yr)

- Ore sorting
- Crushing
- Thickening
- Filtration

Leaching

(~\$0.9 – \$1.2M savings circuits/yr)

- Heap leaching
- Vessel leaching
- In-situ leaching

Control Loop

(~\$1.5 – \$2.0M savings circuits/yr)

- Proportional-Integral-Derivative (PID) tuning
- Control strategy
- Sensor maintenance
- Actuator maintenance

Other processes

(~\$0.7 – \$1.6M savings circuits/yr)

- Underground productivity
- Dryer
- Roaster
- Gas treatment plant



How does Operations Performance Management improve process performance?

OPM is a proven technology that reduces process variability and inefficiency, improves product consistency while increasing throughput, by allowing operations to push constraints to the limits, resulting in a higher return on investment (ROI).

By enabling Process Engineers to quickly identify and understand abnormal process variations, OPM's intuitive visualization dashboards uncover process variations in real time, while identifying and visualizing poorly performing control assets. Flexible dashboard and workbench tools can easily be configured to match the profile and configuration of each mining site, for optimal use. Application configurability includes real-time displays and the use of a unique combination of advanced analytical techniques to properly account for the complexity of any process.

To gain operational insights, OPM provides a single, secure way to gather disparate data from your assets and systems across the plant, creating a comprehensive and validated data repository. OPM applications provide you a unified, complete, and accurate view of your plant and process operations. Once your plant is connected, OPM applications go to work monitoring your operations and alerting you about behavioral anomalies. Using powerful 'process digital twins', digital models of continuous process steps, OPM is able to predict manufacturing process problems before they happen so you can focus resources where they are needed. And when issues do arise, OPM provides comprehensive case and knowledge management to ensure that your best practices are captured and available for future use. The ultimate goal of the OPM applications are to identify strategies to maximize production and optimize \$/ton. OPM takes optimization to an entirely new level, providing you with the quantitative foundation to implement a comprehensive, financially optimized operations strategy.



Benefits of Operations Performance Management

- Accelerate time to value through a KPI catalog, giving complex performance and financial KPI calculations including revenue, process efficiency, and process performance
- Enable analysis of a loss event (production loss or generation availability) and capture the impact, root cause, and remediation
- Provide financial projections for plant and fleet
- Leverage output projection and price curves to project cost, revenue, and margin
- Enable process engineers and plant managers to collaborate to ensure targets are met
- Allow management of all the activities and resources around process incidents and anomalies including workforce, inventory, etc.
- Provide monitoring, recording, reporting, and analysis of assets and workforce activities
- Monitor emissions constraints to ensure that recommended process optimizations do not violate emissions limits
- Incorporate financial goals and targets (revenue, profit) to drive the optimization calculations
- Ensure plant operations achieve financial goals

OPM process optimization software has been deployed at companies across a broad range of process manufacturing industries, including Mining. OPM is currently managing material and process variability to reduce waste and improve profitability at plants around the world. GE Digital's depth and breadth of technology, combined with Wabtec's Digital Mine domain expertise, ensure operational efficiency and success.



Operational outcomes

1.5% Increase in recovery at a concentrator plant

3.5% Production increase at a roaster

15% Increase in availability of mobile assets

30% Increase in processing capacity of crystallization

2% Decrease in specific energy consumption

\$2MM USD savings in maintenance costs

10% Decrease in power consumption per ton of material fed

50% Reduction in material overflow



DECREASE IN PROCESS VARIATION

Impala Platinum
40% improvement in pH stability



INCREASE IN THROUGHPUT

Mining company
Increase in average throughput by more than 5.5%



INCREASE IN THROUGHPUT

Lonmin
10% increase in smelter throughput



INCREASE IN ENERGY EFFICIENCY

Mining company
Decrease in specific power consumption by almost 2%

Check out our Digital Mine video

WATCH NOW



Customer corner

A mining customer decreases flow variability through flotation circuit by **50%**

Challenges

- Inconsistent flow
- Need for manual intervention
- Need to stabilize flow for downstream flotation levels

Results

- Decreased flow variability by 50%
- Increased throughput by 5%
- Increased recovery optimization calculations
- Ensured plant operations achieved financial goals

A mining customer increases throughput in milling circuit by **9.75%**

Challenges

- Sub-optimal throughput
- Circuit instability and poor grind quality
- Sub-optimal energy consumption

Results

- Increased throughput by 9.75%
- Stabilized circuit and consistent grind quality
- Decreased specific energy



Operations Performance Management solution includes Operational Intelligence, Forecasting and What-If Analysis, and Process & Performance Optimization

Operational Intelligence

Increase efficiency by proactively monitoring and responding to business KPIs while enabling centralized benchmarking

- Performance & financial KPIs
- System availability
- Benchmarking
- Event calendar
- Audit logs
- Situational awareness

Forecasting and What-If Analysis

Scenario analysis and planning to ensure confidence to execute best business outcome

- Financial projections
- Outage planning
- What-if analysis
- Forecasting
- Performance and process modeling
- Process troubleshooter

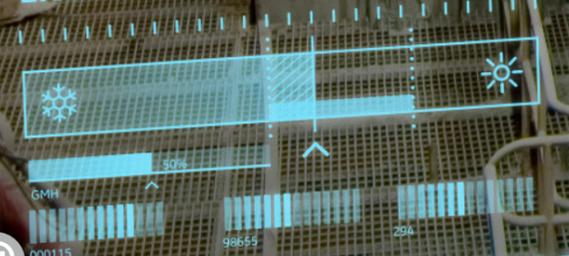
Process & Performance Optimization

Optimize processes and people balancing revenue, costs, and emissions for your sites and fleet

- Emissions optimization
- Financial optimization
- Schedule optimization
- Run-time execution
- Process optimization



ENGINE 22163



125

659731



Get started today

Operations Performance Management solutions from GE Digital and Wabtec's Digital Mine leverage cutting-edge data science and analytics technology, cloud scalability and accessibility, coupled with decades of experience to offer a full suite of solutions powered by Predix, the platform for the Industrial Internet.

Are you ready to increase revenue and margin by optimizing the performance and throughput of your mining plants, sites, and portfolio?





About our collaboration

The Wabtec and GE Digital collaboration brings together decades of mining vertical expertise with best-in-class OPM and APM software development practices, which is precisely the kind of collaboration needed for this incredibly dynamic space.

Wabtec is a re-seller for GE Digital Solutions. Please contract your Wabtec Seller if interested in learning more about our Digital Mine Solutions.

About GE

GE Digital is reimagining how industrials build, operate and maintain their assets, unlocking machine data to turn valuable insights into powerful business outcomes. GE Digital's Predix portfolio – including the leading Asset Performance Management, Automation and MES applications – helps customers manage the entire asset lifecycle. Underpinned by Predix, the leading application development platform for the IIoT, GE Digital enables industrial businesses to operate faster, smarter and more efficiently.

Contact Information

Americas: 1-855-YOUR1GE (1-855-968-7143)

gedigital@ge.com

www.ge.com/digital

©2017 General Electric. All rights reserved. *Trademark of General Electric. All other brands or names are property of their respective holders. Specifications are subject to change without notice. 06 2019

About Wabtec

Wabtec Corporation is a leading global provider of equipment, systems, digital solutions and value-added services for freight and transit rail. Drawing on nearly four centuries of collective experience across Wabtec, GE Transportation and Faiveley Transport, the company has unmatched digital expertise, technological innovation, and world-class manufacturing and services, enabling the digital-rail-and-transit ecosystems. Wabtec is focused on performance that drives progress, creating transportation solutions that move and improve the world. The freight portfolio features a comprehensive line of locomotives, software applications and a broad selection of mission-critical controls systems, including Positive Train Control (PTC). The transit portfolio provides highly-engineered systems and services to virtually every major rail transit system around the world, supplying an integrated series of components for buses and all train-related market segments that deliver safety, efficiency and passenger comfort. Along with its industry-leading portfolio of products and solutions for the rail and transit industries, Wabtec is a leader in mining, marine and industrial solutions. Wabtec has approximately 27,000 employees in facilities throughout the world.

Visit the company's new website at:

www.WabtecCorp.com

