EMERSON MINING SOLUTIONS

Unlocking Safer, Smarter & Sustainable Mining





The global energy transition is at an inflection point – driving a new era for mining.

A NEW ERA OF MINING **Energy Transition Driving Surge in Minerals Demand**





Global battery and minerals supply chains need to expand ten-fold to meet projected critical minerals needs by 2030.

Power Generation (kg/MW)

Source: International Energy Agency

A NEW ERA OF MINING

Core Challenge: Increasing Production – Sustainably

Operators have a new set of considerations that must be addressed to increase production, and do it sustainably. As a result, mining is more complex yet is filled with greater opportunity than ever before.

Decarbonization

72%

of mining and metals CEOs agree that sustainability issues—including decarbonization are "very important" or "important" to the future success of their businesses.

of mining CEOs say their companies will be

"highly" or "extremely" exposed to climate risks

Source: UNGC-Accenture (2022)

of global mining companies rank license to operate as the biggest risk to their businesses.

Source: Ernst & Young (2020)

Aging Workforce

License to Operate

44%

Climate Risks

35%



50%

skilled engineers are reaching retirement age in the next decade.







Source: PwC (2023)

in the next five years.

Higher Production Costs



in energy consumption to produce a ton of fine copper between 2001 and 2017.

Source: Ernst & Young (2022)

Staying Ahead of the Innovation Curve



\$425B

of value is on the table for the mining industry and its customers over the next decade due to digital transformations.

Source: World Economic Forum (2023)

A NEW ERA OF MINING Collaboration across Life of Mine has never been so important.

Ensure your projects are on-time and on-budget. As new mines are built, collaboration with the right technology partner will be key to design with sustainability in mind. The right automation infrastructure will be the precursor to achieving ROI from digital transformation.



ESG & Stakeholder Management

Innovative Design to Reduce Environmental

Impact and Improve Safety

Project Schedule

Accelerate Time to Market Flexibility in Design to Accommodate Evolving Technologies

A NEW ERA OF MINING

Unlock mining data to achieve enterprise excellence.





Manage, connect and deliver operational technology (OT) and information technology (IT) data easily across the enterprise, from the intelligent field devices to the edge and cloud.





With Emerson as your partner, mining can be safer, smarter and sustainable.

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Safety is your foremost priority.



SAFER

Automation and contextual data can make mining less dangerous.



SAFER

Safer tailings dam reduce the overall risk in mining operations.

The risks associated with tailings dams continue to rise due to:



Existing tailings infrastructure exceeding design constraints



Lack of proper monitoring





OUR SOLUTION

Emerson Dams Monitoring system is a complete autonomous system free of cables that measures underground water level and pressure at dam walls, providing real-time data direct to the control room to notify when conditions start to change and take timely actions.



A Comprehensive Suite of Monitoring

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Tailings Stability

Provides real-time data direct to the control room to alert operators when the water level in the ground rises to take timely actions.

Slurry Pipeline

Online monitoring for pipeline anomalies that could cause an accident that would harm the environment and the tailings dam.

Valve Position Monitoring

Ensures that valves in the slurry pipeline are in the correct position.

 \checkmark **Pump Barge** Monitoring

Keeps an eye on the pump system's health to ensure that it continues to function properly and recover water.

Solid Level Detection

Detects the level of different phases (slurries or solids) in the pond.

SOLUTION IN ACTION

Pump Barge Health Monitoring

MINING CUSTOMER IN PERU

CUSTOMER CHALLENGE

- The current monitoring system required personnel to conduct daily manual inspections, putting them at significant safety risk.
- The location of the floating pump station made it impossible to use cabling for a conventional monitoring system, and as a result, the barge experienced frequent failures.

SOLUTION

• An online wireless monitoring system – consisting of temperature, pressure and vibration sensors – was installed to detect abnormal conditions and reduce safety risks.

BENEFIT

• The solution provides a real-time view of the integrity of critical pumps on the barge, reducing instances of pump failure.



SOLUTION IN ACTION **Dam Wall Stability Monitoring**

MINING CUSTOMER IN BRAZIL

CUSTOMER CHALLENGE

- The lack of a modern online monitoring system had resulted in a dam wall collapsing, with catastrophic impact on the local community.
- The current manual inspection routine was time-consuming and put personnel at significant safety risk.

SOLUTION

• An online wireless monitoring system was installed to monitor the hydrostatic pressure underground. If the pressure rises, an alert is sent to the control room, indicating that the water level in the dam's wall is becoming saturated.

BENEFIT

• The solution provides a real-time view of dam wall stability and substantially reduces personnel risk.



SAFER

Continuous monitoring of hazardous gases is crucial to identifying harmful conditions that expose personnel to safety risks.

Detecting hazardous gases in underground mines can be challenging due to:

Harsh and remote environments





OUR SOLUTION

Emerson's wireless gas detectors enables you to take control over the ventilation conditions in underground mines. As a result operators can guarantee that the atmosphere is safe for workers.



SOLUTION IN ACTION **Hazardous Gas Monitoring in Underground Mining**

MINING CUSTOMER IN PERU

CUSTOMER CHALLENGE

The mine had several caverns where the limited line of sight presented challenges for instrumentation communication, putting personnel at safety risk.

SOLUTION

An online gas monitoring system consisting of wireless gas monitors and discrete transmitters was installed with local alarms to monitor gas concentration.

BENEFIT

The solution provided a real-time view of gas concentration, increasing the safety of the working conditions in the mine.





Smarter

Mining operators are balancing rising costs with production optimization, environmental impact and personnel risk mitigation.

SMARTER

Intelligent field devices, connected controls and analytics can future-proof greenfield and brownfield operations.



SMARTER MACHINES Mining is equipment-intensive – and uptime equals profit.

Miners must consider several factors to procure, operate and maintain their asset fleet. The choice of automation platform is critical for:



Interoperability and integration

Total cost of ownership

Asset utilization



OUR SOLUTION

With connectivity at its core, the PACSystems devices and architecture reach beyond conventional standards to anticipate trends and re-imagine the intersection of control, software, interfaces and devices to meet your future industrial automation and control needs.



RELIABLE MACHINES

Prescriptive maintenance improves uptime of asset fleet and reduce overall downtime.

Unanticipated mechanical failures present additional challenges:





OUR SOLUTION

Emerson and AspenTech work with your mining operations and maintenance teams to provide asset performance management solutions to enhance performance of your critical mining mobile assets.

Stay on Top of Developing Issues & Respond Quickly

Emerson's AMS 6500 provides online condition monitoring for mining assets.

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Take Vibration Data & Analysis to the Next Level

The AMS 2140 Machinery Health Analyzer takes vibration data and analysis measurements to the next level.

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Integrate Predictive Maintenance Techniques

The AMS Machinery Manager integrates multiple predictive maintenance techniques with comprehensive analysis tools.

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Deploy AI and Machine Learning Agents

Drive safe and reliable operations by getting early and accurate warnings on impending failure with Aspen Mtell[®].

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SOLUTION IN ACTION Crusher Edge Control Modernization

MINING CUSTOMER IN AUSTRALIA

CUSTOMER CHALLENGE

The site was experiencing extended downtime. Many of the issues were traced back to an obsolete control system on a cone crusher.

SOLUTION

The PACSystems Edge enabled PLC, which combines deterministic control and machine intelligence, helped modernize the cone crusher.

BENEFIT

Over \$250k in savings from reduced downtime and improved maintenance.



SOLUTION IN ACTION Improving Dragline Uptime

MINING CUSTOMER IN NORTH AMERICA

CUSTOMER CHALLENGE

Current maintenance practices were time-consuming and presented safety risks for personnel. The mine needed predictive maintenance capability.

SOLUTION

An online monitoring system utilizing the AMS 6500 machinery allowed the mine to overcome these challenges.

BENEFIT

Cost savings of \$5.8M/year.



SOLUTION IN ACTION Improving Reliability of Critical Assets GLOBAL MINING CUSTOMER

CUSTOMER CHALLENGE

The customer required a more robust predictive maintenance solution to handle reliability issues for critical equipment.

SOLUTION

Deploy Aspen Mtell[®] on key assets.

BENEFIT

With Aspen Mtell[®], the customer was able to proactively plan for maintenance and order spares without suffering higher downtime costs. Aspen Mtell[®] was scaled and now protects over 213 assets, static and rotating, including truck hauls across 11 sites.



MINERAL PROCESSING

Real-time insight into processes allows for superior control, resulting in improved production and performance — and more secure and sustainable operations.

Mineral recovery is increasingly challenging due to:



Complex metallurgical flowsheets and plant design

Increased ore variability

Challenges in maintaining process stability



OUR SOLUTION

DeltaV Automation Platform makes it easy to seamlessly and securely integrate a variety of systems and technologies. When data passes through the DeltaV[™] distributed control system, it is automatically contextualized, providing greater visibility into the process, reducing manual steps, and saving time and money. DeltaV Automation Platform helps teams analyze their system's health, fine-tune production for better water and energy use, and improve performance – building a bridge to greater operational sustainability.



ADVANCED PROCESS CONTROL

Process variability and disturbances can diminish recovery, operational profitability and predictability.

Process engineers need a solution that is more proactive, adaptive and intelligent than conventional process control systems



OUR SOLUTION

<u>AspenTech's DMC3[™] advanced process control</u> models automatically adapt online as plant conditions change, continually optimizing your processing operation. Embedded industrial AI provides a wealth of historical process data that enable quickly-built seed models and efficientlydeployed solutions. AspenTech's technology can be rapidly configured, deployed and scaled with typical ROIs measured in months.

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Up to

production increase

The Most Profit-Hungry Engine for DMC3™



energy reduction



yield improvement



SOLUTION IN ACTION **Flotation Advanced Process Control**

GLOBAL MINING CUSTOMER

CUSTOMER CHALLENGE

New flotation cells were introduced to an existing system with parallel Lead and Zinc recovery streams. Flotation variables (aeration rates, pulp levels and reagent dosing) required balancing in order to determine impact on downstream metals recovery.

SOLUTION

Implementation of Aspen DMC3[™] technology.

BENEFIT

1.35% increase in metal recovery leads, which translated to \$2M/year in savings.



HYDROMETALLURGY

A push toward global decarbonization will propel electrification, necessitating a surge in copper extraction via heap leaching.

Heap leaching faces several challenges:



Lower metal recovery due to irregular irrigation



Personnel safety risks associated with reagent exposure



Sustainability issues related to stability of leach pad and residue storage



OUR SOLUTION

Emerson's <u>wireless pressure and flow transmitters</u>, <u>valve solutions</u> and DeltaV Automation Platform delivers a smart heap leaching operation with complete diagnostics.



WORKFORCE

Digital solutions can help bridge the talent gap and empower the workforce.

Current workforce challenges include:



Upskilling an aging workforce that is less familiar with digital tools and technology



Attracting and retaining younger talent



Providing continuous training to match the pace of change



OUR SOLUTION

Emerson and AspenTech can help miners bridge the talent gap and empower the workforce with digital twin solutions that enable operator training and advanced testing of equipment and processes through dynamic simulation.

DeltaV[™] Mimic Train

Emerson's Mimic Train – a revolution in training simulation that gives plant operators dynamic, hands-on experience for unplanned events.

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DeltaV™ Mimic

DeltaV[™] Mimic provides accurate and real-time simulation of plant behaviors

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Aspen Fidelis™

Aspen Fidelis[™] simulates a range of scenarios to provide the first line of defense for unquantified risk to overall plant performance and revenue.







INTEGRATED AND REMOTE OPERATIONS

Visibility across the value chain will help improve business decision-making and enable mine operators to remain agile.

Factors influencing the transition to remote operations:





OUR SOLUTION

iOps Workspace Solution

Remote operations centers (ROCs) are centralized control rooms from which personnel can remotely monitor and control on-site operations.

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AspenTech Data Lake Solution

- The AspenTech Data Lake Solution provides a centralized system for your entire team to ingest, process, augment and store data.
- This distributed system can be managed from one centralized location and horizontally scaled across an enterprise.



Sustainable

Mining is water and energy intensive. The industry is actively working to reduce its environmental impact.





SUSTAINABLE

Automation and real-time intelligence can make mining sustainable.



SUSTAINABLE WATER MANAGEMENT

Managing water risk is complex and regulations are constantly evolving.



REPUTATIONAL RISK

As the mining industry strives to deliver on their ESG commitments, water-related incidents have a drastic impact on communities, production continuity and future investment.



PHYSICAL RISK

Climate change, flooding, declining water quality, scarcity and ecosystem degradation put communities, personnel and mine operations at risk.





REGULATORY RISK

Stringent discharge limits will require mining companies to invest in new treatment technologies and elevate operational costs.

SUSTAINABLE WATER MANAGEMENT

Complete visibility of water use will enable mines to improve efficiency and optimize recovery.

Several challenges stand in the way of integrated water management:



Emerson and AspenTech partner with you at every part of the water circuit to measure, automate and optimize.



The Emerson Approach: Enabling Integrated Smart Mine Water Management

Improve mine water circuit process control and stability

Programmable Automation Controllers

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DeltaV DCS

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Prediction Monitor LEARN MORE 7

Improve slurry flow control and handling

Clarkson Model KGA Plus Knife Gate Valve

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Clarkson KS1 Severe Service Knife Gate Valve

LEARN MORE 7

Improve reliability of critical water pumps

AMS 6500 Balance of Plant

AMS 2140 Machinery Health Analyzer

LEARN MORE 7

Reduce tailings volume with thickener advanced process control

DMC3[™] Advanced Process Control

AspenTech's DMC3[™] advanced process control models automatically adapt online with changing plant conditions continually optimizing you processing operation.

SUSTAINABLE ENERGY MANAGEMENT

Energy generation and demand are more dynamic than ever.

The right energy management infrastructure will be critical in optimizing energy consumption as the mining industry:

MOVES TO RENEWABLE SOURCES OF ENERGY

ELECTRIFIES MINING EQUIPMENT

SETS EMISSIONS TARGETS

RIGOROUSLY TRACKS EMISSIONS

The mining industry continues to explore options to decarbonize its operations and reduce consumption.

Progress is also met with new challenges:

While renewables are becoming more attractive to miners, more sophisticated grid management is needed to balance intermittent renewables with more continuous sources of power

Reporting on Scope 1 and Scope 2 emissions requires accurate measurements

OUR SOLUTION

Emerson and AspenTech partner with you to tackle energy management and track emissions.

Continuous Emissions Monitoring

The Rosemount XE10 CEMS provides reliable analysis of stationary source emissions.

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Microgrid Management

Leading solutions for real-time control and optimization of complex power networks. Reliably, securely and efficiently operate the grid while integrating new green energy sources for a reduced carbon footprint.

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Fuel Management Improve diesel consumption r

LEARN MORE 7

Improve diesel consumption measurement and mass balance control.

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