



# The Operations Playbook

Expert Insights on Driving Productivity  
and Efficiency in Mining Operations



2024 edition



## Message from the Managing Director

As we close the chapter on 2024, it's an opportune moment to reflect on the evolving challenges and opportunities in mining and mineral processing. This year has been defined by the relentless global demand for base metals like copper, nickel, and lithium, alongside the growing complexity of mining operations. Declining ore grades, rising energy costs, and skilled labour shortages have added layers of difficulty for operators striving to maintain productivity and efficiency.

Yet, these challenges also present a window of opportunity. With the right tools and expertise, the industry can embrace digitalisation and industrial automation to transform operations and improve outcomes. At Mipac, we've been privileged to partner with clients to address these challenges head-on, delivering innovative solutions that drive efficiency and unlock hidden potential.

The articles in this year's Operations Playbook are a testament to the strides made across our industry in digital transformation. They highlight practical insights into leveraging data analytics, upgrading control systems, and

adopting advanced asset management strategies to tackle real-world challenges. These learnings are not just theoretical—they are the tools mining professionals can use to ensure better results in 2025 and beyond.

As you explore this collection, I encourage you to consider how these insights could shape the future of your operations. Whether it's adopting predictive maintenance, integrating smarter control systems, or simply finding new ways to do more with less, the path forward is clear: those who invest in technology and innovation will lead the way in productivity, sustainability, and competitiveness.

Mipac remains committed to supporting your journey. We are here to help you navigate the complexities of modern mining, providing the expertise and solutions you need to succeed.

Here's to driving efficiency and innovation together in 2025.

Eddie de Rivera  
Managing Director, Mipac

## Special Feature

2024 marked an important milestone for Mipac as we extended our capabilities into Asset Performance Management (APM). Our partnership with AspenTech enabled us to deploy the Aspen Mtell® solution, which leverages predictive analytics to optimise equipment reliability and reduce unplanned downtime. This new capability was first commissioned at the Ok Tedi processing plant in Papua New Guinea—a project that exemplifies how data-driven decision-making can transform operations in even the most challenging environments.

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# Introducing the Mipac Digital Maturity Model

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## Why Digital Maturity Matters in Mining

The mining industry is at a pivotal moment as it grapples with increasing pressure to improve productivity, reduce costs, and minimise environmental impact—all while navigating the challenges of remote operations and fluctuating commodity markets.

Digital technologies have emerged as powerful tools for addressing these demands. From real-time monitoring and advanced automation to data-driven decision-making and predictive maintenance, these technologies promise transformative gains. However, the sheer scale and complexity of mining operations mean that digital transformation is not a one-size-fits-all solution.

This is where a digital maturity model becomes invaluable. Providing a structured framework allows organisations to assess their current capabilities, identify gaps, and map out a clear, phased path toward advanced digital capabilities.

A maturity model ensures that foundational elements like robust infrastructure and data integration are in place before introducing more sophisticated technologies like machine learning or autonomous systems. Without such a roadmap, companies risk investing in solutions that fail to deliver sustainable value due to missing critical building blocks

Moreover, following a maturity model aligns stakeholders across functions, prioritises investments where they matter most, and helps overcome cultural resistance by demonstrating incremental successes. In the mining sector, where digital adoption often lags behind other industries, a maturity model offers a practical guide to achieving meaningful and lasting transformation.

## The Mipac Digital Maturity Model

To address these challenges, Mipac has worked with MMM (Mining, Minerals, and Metals) operations worldwide to develop our Mipac Digital Maturity Model, tailored to the unique needs of the mining sector. This model mirrors other maturity frameworks, like safety maturity models, but it is explicitly designed for the digital landscape.

Drawing on decades of experience, we've built this model to guide clients at every stage of their transformation, from manual operations to predictive, autonomous systems.

### Why a Digital Maturity Model?

A structured maturity model provides several critical advantages:

**Assessment of Current State:** It helps mining companies identify where they are on the journey, uncovering gaps in infrastructure, processes, and technology.

**Phased Progression:** It maps out an achievable path forward, ensuring that foundational elements—such as connectivity, control systems, and data integration—are in place before layering on advanced capabilities.

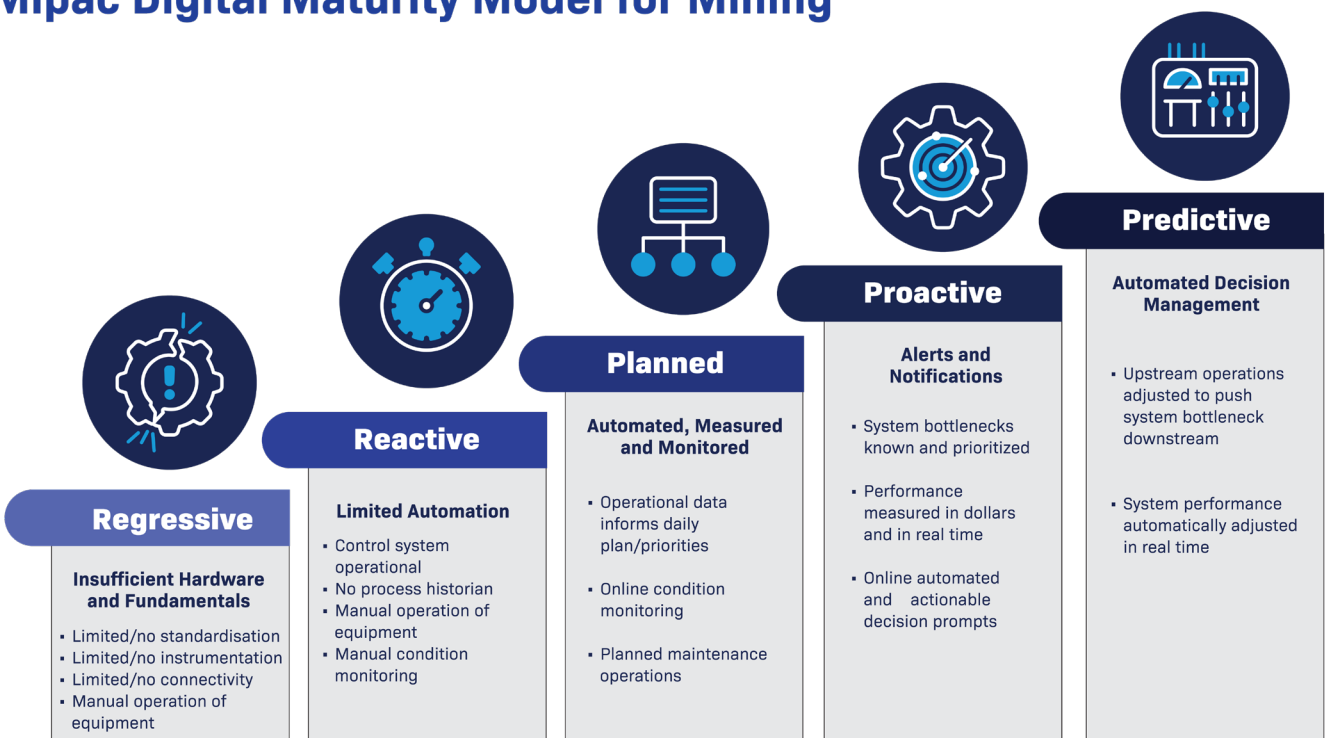
Alignment and Focus: It aligns cross-functional teams on priorities, ensures smarter resource allocation, and prevents wasted investments.

Tailored Solutions for Legacy Systems: The model addresses the complexity of effectively integrating old and new systems by working with operations ranging from modern facilities to those running on decades-old infrastructure.

Our global experience informs Mipac’s approach. We’ve collaborated with operations worldwide, helping organisations modernise and optimise their facilities while recognising the constraints of legacy systems and workforce readiness. Mining operations that have existed for decades often rely on manual workflows, limited instrumentation, and outdated automation. Our digital maturity journey helps these operations transition gradually, avoiding the pitfalls of trying to leapfrog directly to advanced solutions without laying the groundwork.

Let’s take a look at the model

## Mipac Digital Maturity Model for Mining





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# Key Stages of Digital Maturity

The digital maturity journey consists of five major stages:

## Stage 1: Regressive

The regressive state reflects a baseline where operations lack the foundational tools to leverage digital technology effectively. Organisations in this stage often experience high operational variability and inefficiency, leading to inconsistent performance and limited potential for scalability.

Key characteristics include:

- Limited or no standardisation
- Minimal instrumentation and connectivity
- Predominantly manual plant operation

## Stage 2: Reactive

In the reactive state, operations often respond to problems as they arise, relying heavily on manual interventions to maintain stability. This stage is marked by focusing on short-term fixes rather than long-term planning, which can lead to operational bottlenecks and higher costs.

Key characteristics include:

- Control systems may exist but are not up-to-date
- No process historian
- Equipment monitoring and operation are still manual
- Instrumentation is not routinely maintained or calibrated

## Stage 3: Planned

The planned state represents a transition toward greater control and predictability as companies begin to standardise processes and integrate automation into their workflows. This stage allows organisations to set clearer performance targets, but there is still untapped potential for optimisation and innovation.

Key characteristics include:

- A reasonable amount of automation
- Online measurement and monitoring
- Operational data informs daily plans and priorities
- Examples of monitored systems: Pump condition monitoring, SAG mill, flotation circuit, and smelting performance
- Maintenance is planned based on runtime hours
- Base level instrumentation is correctly installed and regularly maintained and calibrated

## Stage 4: Proactive

In the proactive state, organisations shift from reacting to issues to anticipating them, using data insights to prioritise efforts and prevent problems. This stage of decision-making becomes more dynamic and financially driven, laying the groundwork for advanced, system-wide integration.

Key characteristics include:

- Automated alerts and notifications to developing issues
- Clear identification of system bottlenecks
- Real-time performance monitoring in financial terms
- Planned maintenance based on performance indicators such as vibration and throughput

## Stage 5: Predictive

The predictive state is the pinnacle of digital maturity and is defined by a high degree of automation and self-regulation. In this stage, systems adjust in real-time to optimise outcomes without human intervention. This stage enhances operational resilience and drives sustainability through smarter resource use and reduced environmental impact. Breakdowns are predicted before they happen, and repairs are planned and scheduled with sufficient time to prepare all necessary resources.

Key characteristics include:

- Always on technology, enabling people to be more effective in their roles
- Automated, real-time performance adjustments with minimal human intervention
- Feedforward control based on upstream or downstream inputs
- Maintenance shutdowns predicted by algorithms analysing online instrumentation (e.g., temperature, pressure, vibration)



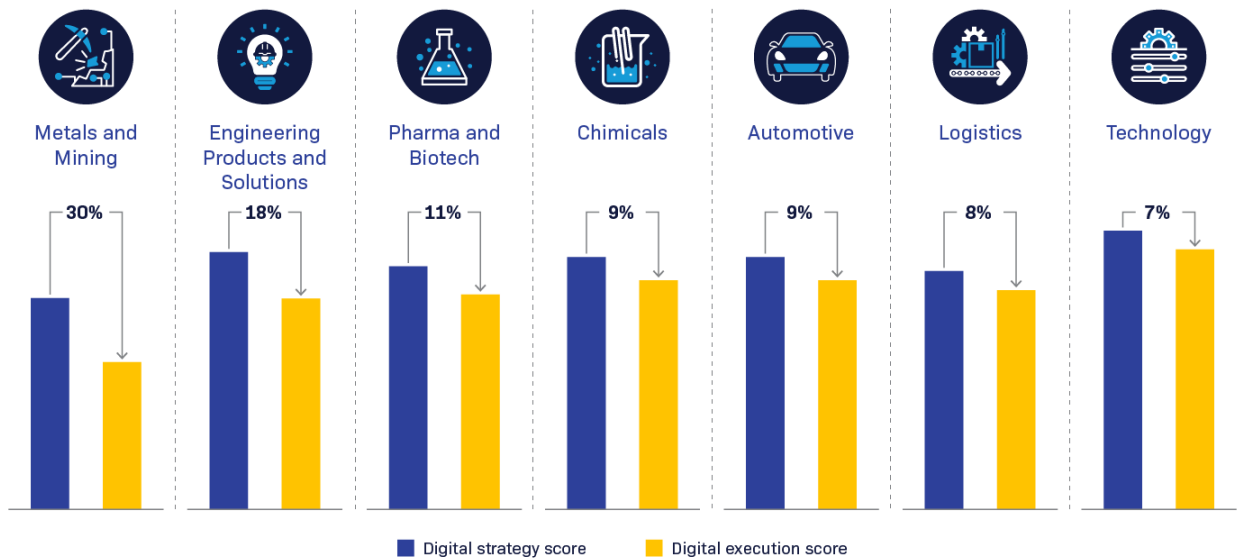
## Where is the MMM sector?

Today, most operations in the (MMM) sector, including Tier 1 sites, are still in the reactive or planned stages of digital maturity.

Digital transformation across industry sectors is well documented by the world's leading consulting groups.

According to the 2021 Boston Consulting Group report on the Digital Acceleration Index, the metals and mining industry lags 30% to 40% behind sectors like automotive and chemicals in digital advancement.

### EXHIBIT 2 | The Strategy-Execution Gap in Metals and Mining



Source: BCG.

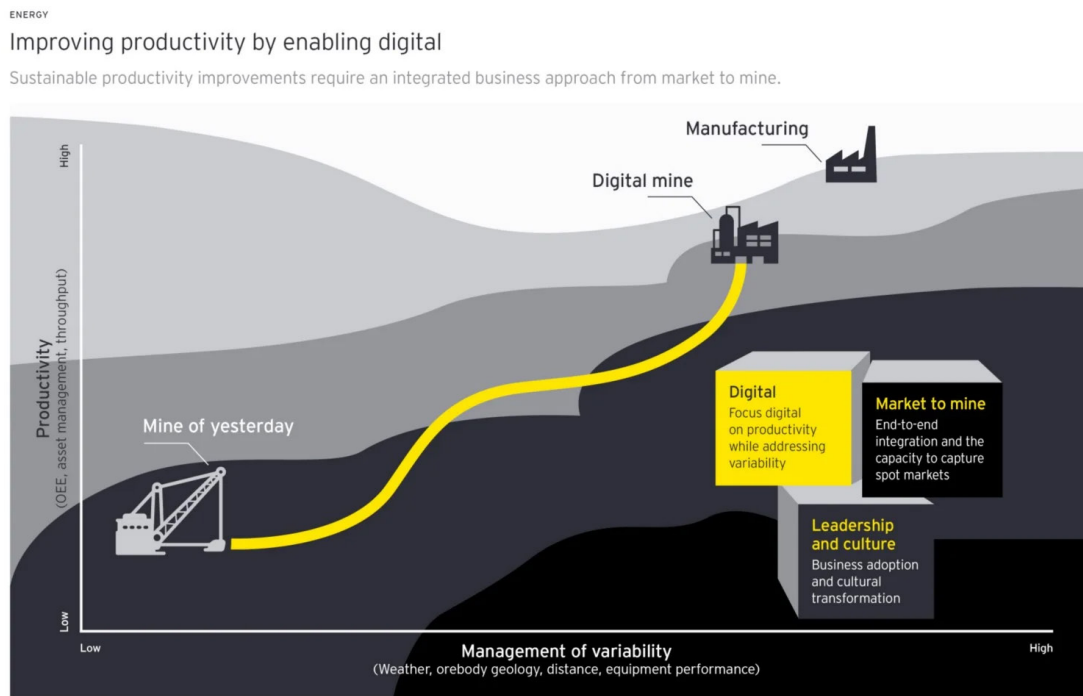
Note: All represented values are rounded.

This research was also supported by EY's Paul Mitchell back in 2020 who stated:

“A digital disconnect in the mining and metals sector, however, has created a gap between the potential from digital transformation and the poor track record of successful implementations. Addressing this disconnect will be critical for mining companies to succeed in the rapidly changing digital world.

The digital disconnect exists, not because of a lack of engagement from

the sector, but because of a range of practical issues that continue to challenge the industry.”



Back at our Maturity Model, many mining operations aspire to rapidly leap to the predictive stage without addressing foundational elements. This ambition highlights the sector’s challenges and opportunities in digital transformation.

The reality is that transitioning to advanced digital stages requires a structured approach. MMM operations frequently need help with barriers such as prioritising where to start, workforce unfamiliarity with digital solutions, cultural resistance to change, and operational constraints due to remote or rugged environments.

## Addressing the Gap Between Strategy and Execution

One of the primary challenges in the MMM sector is bridging the gap between ambitious digital strategies and their execution. While digital technologies promise increased throughput, lower costs, and simplified processes, effective implementation requires customised solutions, agile methodologies, and a focus on long-term sustainability. Leaders in the sector often succeed by aligning their technology investments with operator needs and the specific characteristics of their facilities, such as focusing on the bottleneck.

## Leveraging Phased Implementation for Success

A phased approach to digital maturity—addressing bottlenecks one step at a time—remains the most practical and impactful way forward. For instance, companies that invest first in understanding their limitations (e.g., control systems and instrumentation) and then target improvements on appropriate unit operations often see quicker returns. Scaling up proven solutions across the operation in waves allows for managing complexity while delivering consistent results.

## The Role of Data as an Asset

Another critical insight is the undervaluation of data within the sector. Despite the potential of real-time data to transform operations, many companies treat data collection as an added cost rather than a strategic asset. On the other end of the spectrum, some operations are swimming in too much data causing analysis-paralysis. Emphasising data integration and analysis of meaningful data, coupled with tools such as predictive analytics, can unlock significant operational efficiencies.

## Overcoming Workforce and Cultural Challenges

Workforce readiness and cultural acceptance are central to sustaining digital transformation. Clearly articulating an inspiring why, upskilling employees, fostering a digital culture, and involving operators in the design

and implementation of solutions help ensure long-term success. Establishing digital centres of excellence and leveraging tools like eLearning and simulators can accelerate the adoption.

By addressing these challenges through incremental investments and strategic planning, MMM organisations can achieve sustainable digital maturity while maximising value and operational resilience.

## The Mipac Approach to Digital Maturity

With pressure on the bottom line and constant operational demands, we find our clients are spread across the different stages of the digital maturity journey. One thing they have in common is a desire to transition towards predictive. A common pitfall is wanting to transition all the way through to predictive in one leap without changing or implementing the fundamentals.

There are many METS and technology suppliers out there who promote the machine learning silver bullet. However, our clients are realising that they can't do that. You can't run before you can walk or, in some cases, crawl. You have to put in the hard work, put the foundations in place, and transition through those steps.

The good news is that you don't have to do it all at once. You don't have to do this for your entire minerals processing plant. You can do it in phases, in small slithers of investment.

A good place to start is understanding your limitations across your operational technology systems: your control system, your network architecture, your historian, etc. You might need to upgrade your control system to the latest version. You may find that your operation will benefit from an automated start sequence, for example.

Then, you shift to your unit operations to identify the bottleneck. Perhaps that's your flotation circuit, and you will start to look at what small slithers of investment are required there.

- Do you have instrumentation installed?
- Do you have the right instrumentation installed?
- Do you have it installed in the correct locations?
- Is your instrumentation maintained, calibrated, and scaled correctly?

Then, what are the control philosophies around the flotation circuit? Do you have appropriate feed-forward mass pull control in place? So, you're taking a thin slice at your unit operation. You're investing a bit of capital to generate a return. That return is either distributed to your stakeholders, reinvested in that unit operation, or you move to your next bottleneck and invest it there.

Once you've invested and optimised, say, three or four unit operations, you're starting to see interactions between those unit operations. Now, you need to start improving and optimising the system that makes up your unit operations. Now, you are at a stage where an advanced process control (APC) solution, with or without machine learning, could be implemented. Importantly, applying an APC solution too soon will waste time, energy and money for no return.

## The Digital Transformation Flywheel

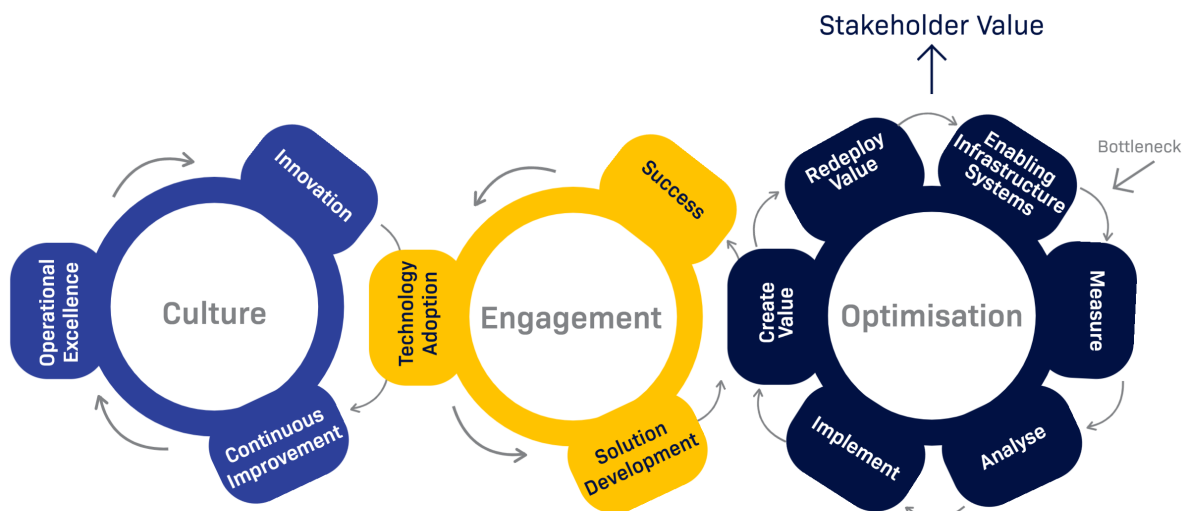
When you get the approach and engagement right you will see the digital transformation fly-wheel turn towards a culture of continuous improvement, innovation and operational excellence:

- Enabling infrastructure allows you to measure and analyse
- Engaging staff and leveraging their expertise allows you to implement solutions and create value
- Creating value breeds success and buy-in to technology as an enabler to solve additional problems via continuous improvement



A continuous improvement mindset inspires a pursuit for operational excellence and further innovation

Now, the flywheel can't be stopped and gains momentum, creating increasing levels of value that can either be redeployed to stakeholders or reinvested for further value creation



## Supporting Mining's Digital Transformation

At Mipac, we pride ourselves on meeting our clients wherever they are on the maturity spectrum. By tailoring solutions to each operation's specific needs, we ensure that progress is sustainable and delivers real value. Our maturity model is not just a tool for assessing readiness—it's a proven roadmap for transformation, built on years of hands-on experience with mining clients who face the complex challenges of modernising aging infrastructure while staying competitive.

With this model, mining companies gain the clarity and direction needed to embrace digital transformation confidently, improving operational efficiency, safety, and environmental performance while ensuring long-term viability in a rapidly evolving industry.

# Declining Ore Grades: How to Boost Efficiency at Ageing Copper Plants

## Snapshot: Ageing Copper Plants Under Pressure

Copper producers face a double whammy: declining ore grades and an ageing workforce. This article explores how to boost efficiency at these plants through:

- **Digital Transformation:** Leverage automation, advanced process control, and predictive maintenance to optimise operations.
- **Infrastructure Upgrades:** Modernise control systems, integrate sensors, and unify data platforms for better visibility and control.
- **Workforce Strategies:** Upskill existing staff, embrace remote expertise, and prioritise knowledge capture.
- **Technology Adoption:** Utilise digital twins for simulation, implement smart sensors for data-driven insights, and explore automation solutions.

By embracing these strategies, copper plants can become more efficient, minimise costs, and extract maximum value even as ore grades decline.

## How to boost efficiency at ageing copper plants

Copper producers face a double whammy: declining ore grades and an ageing workforce. This article explores how to boost efficiency at these plants through:

- Automating processes and implementing digital technologies can drive major optimisation improvements.
- Focus on reducing operating costs, improving extraction rates and leveraging data.
- Get more from less through predictive maintenance, process simulation and optimisation software.
- Upskill and retain staff by making their roles more exciting and purposeful.
- Sweat your assets through operational excellence programs.

There's no magic bullet, but many opportunities exist to sustain margins at tired operations.

## Copper ore production winners and losers

Copper, a vital metal for our modern world, faces a complex challenge: declining ore grades in many major producing countries. This situation is putting pressure on global copper production, even as demand is expected to rise.

Let's delve deeper into the specific trends seen in some of the top copper-producing countries in 2023:

Increasing production recorded

- **Chile:** Despite being the world's largest copper producer, Chile's output fell in 2023 due to challenging mining conditions, lower ore grades, water shortages, and project delays. However, a rebound is expected by 2025.

- **China:** China's copper output declined in 2023 as its domestic mines matured and faced environmental restrictions.
- **United States:** US copper production also dropped in 2023, primarily due to declining ore grades and heavy rainfall events.
- **Russia:** Russia's copper mine production saw a slight decline in 2023. However, a new mine is expected to significantly increase output in the coming years.
- **Indonesia:** While Indonesia's copper production initially boomed in 2022, it dipped in 2023 due to operational issues at a major mine. An increase is expected in 2024.
- **Australia:** Copper mine production in Australia remained relatively stable in 2023.
- **Zambia:** Zambia's copper output has been declining for the past few years, with a further decrease in 2023.
- **Mexico:** Mexico's copper production remained flat in 2023.

## The challenges of declining ore grades for copper processing

### Lower Yields, Higher Costs

We've been reading this for a while now – ore grades have been declining for years at copper processing plants around the world. Those rich, high-grade deposits are becoming increasingly rare. Instead, you must process larger volumes of lower-quality ore to maintain production levels.

This means higher mining and processing costs per tonne of copper produced. Every extra tonne of ore mined, crushed and processed eats into margins. It's a vicious cycle that makes sustaining profitable operations an uphill battle.



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## Complex Processing Demands

As if that wasn't enough, declining ore grades also create new processing hurdles. Lower-grade ores often contain higher concentrations of impurities and minerals that are difficult to separate. This increases the complexity of the extraction and concentration processes.

To recover the copper efficiently, you may need to invest in additional grinding, flotation, or leaching capacity. Retrofitting plants or building new processing lines is hugely capital-intensive. Yet failing to adapt could mean leaving valuable copper untapped in the tailings.

## Rising Energy & Input Costs

In addition, you're battling rising energy, water, and reagent costs. As ore grades decline, more of these inputs are required per tonne of copper produced, making energy-intensive processes like grinding, flotation, and smelting a much bigger expense.

With narrow margins, managing these escalating costs is critical. Even small efficiency gains in comminution, concentration or hydrometallurgy can translate to major savings. It's a constant push to boost process efficiency and recovery rates.

## Experienced Workforce Shortage

And let's not forget the human element. An ageing workforce means experienced operators and maintenance staff are retiring in droves. Attracting and retaining the next generation of skilled plant workers is an industry-wide challenge.

Without enough knowledgeable people running your operations, it's nearly impossible to optimise processes and extract maximum value from declining ore grades. Investing in training is essential – but it takes time your plant may not have.

## The Digital Transformation opportunity

So what's a copper producer to do? For many, the answer lies in digital transformation:

- Advanced process control and automation
- Digital twin simulations to optimise operations
- Predictive maintenance to improve equipment reliability
- Remote monitoring and analytics for expert insights

By leveraging industrial AI, big data and IoT connectivity, you can drive down processing costs while boosting recovery rates. It's about doing more with less in an increasingly challenging environment.

## How ageing infrastructure impacts processing plant efficiency

As your copper processing plant ages, the infrastructure slowly deteriorates – impacting efficiency and productivity. You've likely noticed some key signs like:

### Frequent Equipment Breakdowns

Worn-out parts, corroded pipes, and outdated technology lead to more mechanical failures. Unplanned downtime skyrockets as you scramble to get replacement parts or call in technicians for repairs.

Seemingly minor issues can quickly escalate into major disasters. A tiny crack in a pipeline could rapidly worsen – contaminating your product, causing leaks, or even triggering an explosion.

### Increased Energy Consumption

Ageing equipment operates less efficiently, consuming more power to achieve the same output. Poorly insulated buildings and outdated HVAC systems further drive up energy costs.

Every percentage point of wasted energy cuts into your profit margins. As utility rates rise, the financial impact of inefficient infrastructure grows exponentially.

## Higher Maintenance Costs

With ageing assets constantly needing repairs, maintenance becomes a real headache. You end up allocating more labour hours, rushing to order spare parts, and hiring specialised contractors.

Maintenance costs skyrocket, often unpredictably, due to the fragility of older equipment. Replacements and renovations require careful budgeting years in advance.

## Process Inefficiencies

Outdated technology and ageing infrastructure make optimising processes for maximum efficiency difficult. Manual operations, lack of automation, and disconnected systems create productivity bottlenecks.

Human error risks increase with older equipment that lacks modern safety features. Rigid legacy systems can't easily adapt to changing ore grades or evolving best practices.

The good news? Proactive steps can mitigate the impacts and optimise your ageing plant:

- Conduct comprehensive audits to identify risks and prioritise upgrades
- Implement condition monitoring to predict failures before they happen
- Invest in automation for consistent, efficient, 24/7 production
- Transition to modern digital platforms for flexibility and optimisation
- Partner with specialists like Mipac for turnkey solutions

Strategic investments allow you to breathe new life into your ageing copper operations. Improving efficiency ultimately boosts profitability and sustainability.



# Dealing with workforce shortages and loss of specialist skills

## Nurture Your Talent Pipeline

As experienced operators and technicians retire, their hard-won knowledge walks out the door. Don't let those critical skills disappear. Groom your next generation through mentorship programs, on-the-job training, and knowledge capture.

## Leverage the Technology Toolbox

Automation and digital tools are your allies in the battle against workforce gaps. Advanced process controls can optimise operations with less human intervention. Digital twins provide a virtual test-bed for troubleshooting issues. AI-powered decision support streamlines complex analysis. With the right solutions, you can do more with less while upskilling the remaining staff.

## Bring in Specialised Support

You can't find or retain all the expertise you need in-house. Augment your workforce with specialised consultants and service providers. Their deep domain knowledge and cross-industry experience pay dividends. They troubleshoot stubborn issues, optimise workflows, and transfer skills. With the flexibility to scale support up or down, outside experts ease your staffing crunch.

## Foster a Culture of Learning

In a rapidly evolving industry, continuous learning is survival. Promote professional development to attract and keep top talent engaged. Invest in training on new technologies, from advanced process controls to IIoT platforms. Encourage sharing new ideas through webinars, conferences, and knowledge exchanges. Nurture an environment of innovation and growth.

## Prioritise Knowledge Management

Document everything from operating procedures to maintenance logs. Use digital tools to capture notes, photos, and tribal knowledge in a centralised system. Tag content with rich metadata for findability. Build a comprehensive



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knowledge base to preserve institutional wisdom for the long haul. Make it easy for new hires to tap into decades of insight.

## Boosting extraction rates through advanced automation

### Smart Sensors & Predictive Maintenance

You already know that maintenance is key to keeping your ageing copper plant running smoothly. But have you considered how smart sensors and predictive maintenance could take things to the next level?

With advanced automation, you can say goodbye to unplanned downtime and costly repairs. Smart sensors monitor every component 24/7, giving you real-time data on performance and upcoming maintenance needs. This allows you to plan maintenance perfectly, fixing issues before they cause expensive breakdowns.

And it gets better. Predictive analytics can crunch that sensor data to forecast when parts will likely fail. You can then order replacements ahead of time and schedule maintenance for minimum production impact. Genius, right?

### Optimise Processes with Digital Twins

You're always looking for ways to boost that all-important extraction rate. Digital twins could be the answer, recreating your entire plant operation virtually to test out new processes risk-free.

A digital twin simulates how process tweaks would play out in reality using real-time data from your operations. You can experiment endlessly to find the sweet spot for higher yields – all without disrupting your actual production line.

And the insights keep coming. Digital twins highlight bottlenecks, waste and areas ripe for automation. They take the guesswork out of optimisation, helping you cut costs and improve efficiency with data-driven decisions. ripe for automation. They take the guesswork out of optimisation, helping you cut costs and improve efficiency with data-driven decisions.

## Upskill Staff Through Mixed Reality

With an ageing workforce, finding new ways to capture know-how is crucial. Have you considered using mixed reality (MR) technology to upskill staff and transfer tribal knowledge?

MR training blends the real and virtual worlds using headsets or tablets. Experienced operators can record procedures step-by-step, letting others learn through immersive 3D visuals and hands-on guidance.

No more shadowing in the plant or dry training manuals. Learners get a realistic, repeatable experience from any location. And it works both ways – experts can virtually observe floor staff to provide instant remote support.

All this helps new starters get up to speed faster while capturing invaluable insights before your veteran team retires. Talk about a knowledge force multiplier!

So, if you're serious about boosting extraction rates and future-proofing operations, it's time to invest in advanced automation. Those production gains (and bottom-line boosts) are just waiting to be unlocked.

## Digital optimisation tools to reduce operating costs

As copper ore grades decline, leveraging digital optimisation tools is becoming increasingly crucial. These advanced solutions can streamline operations, driving down costs while boosting extraction rates. Let's explore some top tools that savvy plant managers are utilising.

### Predictive Maintenance

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Unplanned downtime is a profitability killer. Predictive maintenance uses sensor data and machine learning to forecast equipment failures before they occur. This allows for preemptive repairs during scheduled outages – minimising costly disruptions.

Additionally, condition monitoring provides insights into machine health. Combined with asset management software, you can optimise maintenance schedules and spare parts inventory. Less unplanned downtime translates to higher throughput and lower costs.

## Process Optimisation

Mineral processing plants are incredibly complex, with myriad variables impacting recovery rates. Digital twins create a virtual replica, enabling simulation and scenario testing. You can identify bottlenecks, test operational adjustments, and fine-tune processes – all without risk to the physical plant.

Advanced process control takes this further, using multi-variable models and complex algorithms. By responding to real-time data, it automatically optimises parameters like reagent dosing for peak efficiency.

## Remote Monitoring & Analytics

Maintaining expertise is challenging with experienced operators retiring. Remote monitoring centres provide 24/7 oversight from process experts. They analyse live data, identify issues early, and make proactive adjustments.

Cloud-based historian databases consolidate all your operating data. This structured big data enables powerful analytics, from energy consumption to predictive quality modelling. Actionable insights help drive continuous improvement.

Mineral processing is undergoing a digital transformation. Leveraging the latest optimisation tools will be critical for ageing copper plants to control costs and remain competitive as grades decline.

# Top 5 technologies to modernise and extend brownfield sites

As declining ore grades squeeze margins at your ageing copper processing plant, it's time to think smart. Automated systems and digital technologies are the key to boosting efficiency, reducing costs, and increasing extraction rates. Here are the top 5 tech solutions to modernise and extend the life of your brownfield site:

## 1. Advanced Process Control (APC)

Optimising complex processes with advanced algorithms is a game-changer. APC systems crunch massive data sets to make real-time adjustments, ensuring operations run at peak performance. By stabilising processes, variability is reduced, and constraints are actively managed for maximum throughput. No more flying blind—APC gives you X-ray vision into your plant.

## 2. Digital Twin & Simulation

A virtual replica of your physical assets opens a world of possibilities. Digital twins allow you to simulate scenarios, test “what-if” conditions, and troubleshoot issues risk-free. It's like having a crystal ball to predict performance and uncover optimisation opportunities. Don't just react to problems; get ahead of them with powerful digital twins.

## 3. Remote Operations & Monitoring

With a skilled workforce shortage looming, remote capabilities keep your plant running optimally. Leverage experts anywhere to monitor operations, analyse data, and provide guidance. No more flying specialists across the country for site visits. Empower your team with always-on support and expertise when you need it most.

## 4. Predictive Maintenance

Those ageing assets are ticking time bombs waiting to disrupt production. Predictive maintenance uses sensor data and machine learning to forecast failures before they happen. Prioritise repairs, reduce downtime and extend asset life. Why wait for breakdowns when you can prevent them?

## 5. Mobility & Visualisation

Put critical information at your team's fingertips with mobile dashboards and visualisations. No more running back to the control room or sifting through reports. Interactive visuals deliver vital KPIs and alerts in real-time on any device. Respond faster with data-driven insights when seconds count.

The future is here for copper processing plants willing to modernise. With Mipac's deep experience and skilled teams, we guide you every step of the way in selecting and integrating the right technologies to transform operations. Declining grades don't stand a chance against a digitally optimised plant.

# Critical control system upgrades to maximise plant productivity

At your copper processing plant, you're facing declining ore grades, ageing infrastructure, and a skilled workforce shortage. To drive optimisation improvements, reduce operating costs, and boost extraction rates, it's time to prioritise critical control system upgrades.

## Modernise Obsolete Controls

Those legacy control systems are holding you back. Creaking automation relics can't keep pace with the latest process optimisation techniques. By modernising obsolete controls, you gain powerful new capabilities to maximise productivity and efficiency.

- Advanced process control algorithms
- Integrated asset monitoring and predictive maintenance
- Real-time optimisation and dynamic scheduling

Don't settle for sluggish, rigid systems. Upgrade for the agility and insights to run leaner operations.

## Leverage Smart Sensors & IoT

Smarter plants start with smarter sensing. Bolting on the latest smart instrumentation and Industrial IoT unleashes a torrent of rich data. You can finally gain complete visibility into every nook of your processes.

Ubiquitous sensing enables advanced analytics for:

- Predictive asset performance monitoring
- AI-powered process optimisation
- Digital twins and simulation modelling

With the right data at your fingertips, you can respond faster and make better decisions to maximise uptime and throughput.

## Unify Systems on a Connected Platform

Disjointed systems and information silos are productivity killers. Rip out those isolated islands by unifying operations on a secure, connected platform. A centralised data and control backbone integrates your automation, information and analytics layers.

You gain a unified view of operations with:

- Consistent KPIs and data models across systems
- Automated workflows spanning plant and business systems
- Enterprise visualisation and mobile access to insights

By eliminating disjointed systems, you empower faster, more informed decision-making and collaboration.

With our team of control system experts, Mipac can guide you through these critical upgrades. We have the cross-disciplinary skills and deep industry experience to drive real productivity gains – boosting your bottom line.

## Conclusion

With ageing infrastructure, declining ore grades and skills shortages, the key to running a profitable copper plant today is all about efficiency. Focus on digitising and automating processes wherever you can. Get clever with predictive maintenance programs to limit downtime. And invest in upskilling your workforce for the digital age. Do all that and you'll keep the red metal flowing for years to come.



# 3 Control System Solutions for Brownfield Challenges

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## Navigating the complexities of mineral processing plant revamps

In this article we explore Mipacs control system solutions for brownfield challenges – giving new life to existing mineral processing facilities. This practice known as brownfield redevelopment, offers numerous advantages, from extending resource lifespans to revitalising neglected industrial areas.

However, these projects face unique challenges. Aging infrastructure, outdated technology, and evolving environmental regulations can turn brownfield processing plant revamps into intricate endeavours.

Fortunately, modern control systems have emerged as a powerful weapon in navigating these complexities and ensuring the success of brownfield mineral processing operations.



## Brownfield challenges: the control system conundrum

One of the biggest hurdles in brownfield mineral processing plant revamps is **managing legacy infrastructure**. Existing equipment, electrical grids, and process control systems might be outdated, inefficient, and incompatible with modern technologies. Integrating new control systems with this infrastructure requires careful planning, compatibility assessments, and, potentially, system upgrades to ensure smooth operation and efficient resource utilisation.

Another significant challenge lies in **environmental compliance**. Brownfield sites often have a history of industrial activity, potentially leaving behind environmental concerns like dust emissions, water runoff, and waste management issues. Outdated or inadequate control systems can exacerbate these issues, making it challenging to adhere to ever-evolving environmental regulations.

Furthermore, brownfield projects must navigate a complex web of **regulatory requirements**. Environmental agencies impose strict regulations on emissions control, water discharge, and waste management. Demonstrating compliance can be a significant hurdle, requiring extensive paperwork and manual monitoring.

## Control system solutions: refining efficiency in brownfields

Modern control systems offer a potent remedy for these challenges, equipping brownfield mineral processing plants with the tools to operate safely, efficiently, and sustainably.

- **Modernisation and Integration are crucial.** Advanced control systems boasting features like remote monitoring, data analysis, and automated responses can significantly improve process control and situational awareness. These systems can be seamlessly integrated with existing infrastructure, leveraging existing wiring and sensors while adding new functionalities.
- **Environmental Safeguards take center stage.** Control systems allow for continuous monitoring of air quality, water composition, and waste management systems. They can trigger automated dust suppression systems, manage water discharge rates, and send alerts in case of potential environmental incidents. This proactive approach minimises the risk of pollution and ensures responsible resource processing.

- **Data-driven decision-making** empowered by control systems provides valuable insights to optimise plant operations. By collecting and analysing data on factors like equipment performance, feedstock quality, and process parameters, control systems can identify areas for improvement, predict potential equipment failures, and optimise energy usage. This translates to increased efficiency, reduced operating costs, and a smaller environmental footprint.

## A brighter future for brownfield processing plants

By harnessing the power of modern control systems, brownfield mineral processing plant revamps can overcome complex challenges and unlock their full potential.

As control technology evolves, we can expect even more sophisticated systems that further enhance safety, efficiency, and environmental responsibility in brownfield projects.

This paves the way for a future where brownfield redevelopment becomes a cornerstone of sustainable resource utilisation and responsible industrial development.

## Looking for control system solutions for brownfield challenges?

We've helped numerous clients achieve remarkable results in brownfield mineral processing plant revamps. Whether you're facing integration challenges, environmental concerns, or simply seeking to optimise operations, we have the expertise and solutions to guide you.

Contact us to discuss your specific needs and learn how our control system solutions can transform your brownfield project.

# Building a Sustainable Process Optimisation Program for Mineral Processing Excellence

We know that process optimisation is a long game. As metallurgists and engineers, we're in this for the long haul. We aim to build excellence into our mineral processing operations through incremental improvements. But how do we create a process optimisation program that's both strategic and sustainable, one that outlives individual team members and leadership changes?

This article explores what it takes to build a process optimisation program that drives continuous improvement. We'll look at how to lay the foundations, engage the workforce, leverage technology and data, and embed optimisation into the culture.

There are no quick fixes or magic bullets. But with a coordinated effort across operations, maintenance and technical teams, we can play the long game to unlock our plant's full potential.

# The necessity for sustainable process optimisation in mineral processing plants

The global mining industry is dynamic, demanding adaptability and long-term vision. Large-scale mineral processing plants require efficient and effective processes to ensure continued viability. Precise measurement and control over process variables are crucial for optimising performance and establishing a sustainable operational foundation.

## Sustainable process optimisation for long-term operational effectiveness

Sustainable process optimisation offers mineral processors a powerful tool to ensure the long-term health and effectiveness of their operations. Plants can establish a foundation for sustained success by focusing on process stability and efficiency. This includes optimising resource utilisation, minimising waste generation, and implementing preventative maintenance practices to maximise equipment lifespan. A sustainable process optimisation program fosters a culture of continuous improvement, ensuring that processes remain adaptable and responsive to changing conditions over time.

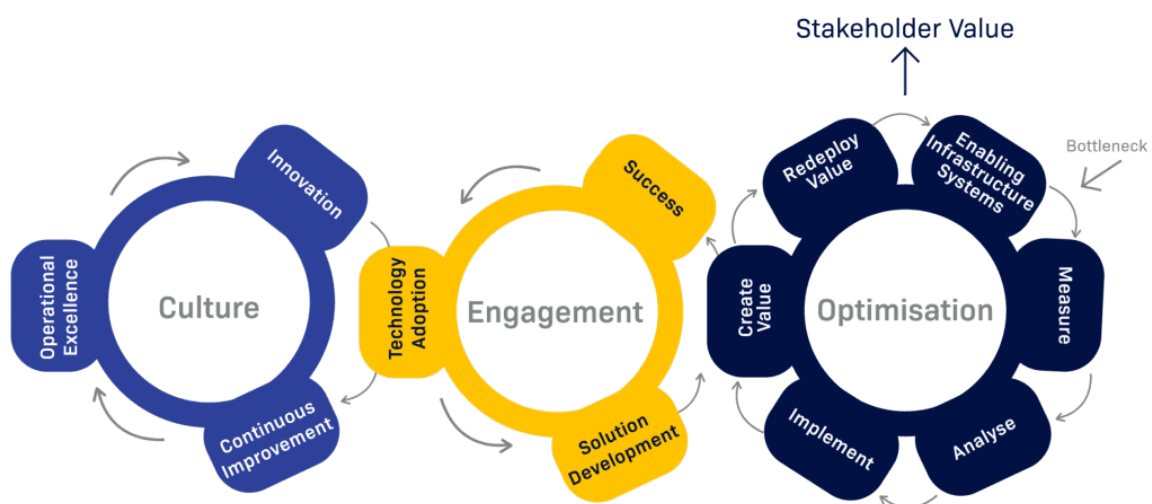


Fig 1: Digitalisation Flywheels

## Driving continuous improvement and operational excellence

Optimised processes lead to continuous improvement across the entire operation, which increases productivity, efficiency, and reliability and, in the long term, creates greater value for the mineral processing plant.

## Building a sustainable operational legacy

Mineral processors can achieve these goals through collaboration with experienced partners who can assist in overcoming unique challenges and implementing tailored solutions. Experts can design, configure, and advise on optimising assets to deliver sustained performance enhancements and a robust operational framework.

Mineral processors can build a sustainable operational legacy by investing in sustainable process optimisation. This approach ensures a manageable and effective long-term strategy for continued success and fosters the adaptability required to navigate the industry's evolving demands. Optimising processes today secures a more robust and enduring future for the plant.

## Challenges in process optimisation in mineral processing plant



*Challenges in Process Optimisation in a Mineral Processing Plant*

## **Complexities of the process**

Mineral processing plants are intricate systems with multiple interconnected unit operations. Each process step impacts the next, creating a complex web of dependencies. Minor fluctuations can ripple through and significantly impact overall plant performance.

## **Variability in feed characteristics**

The characteristics of the mine ore feed, such as grade, mineralogy, and particle size distribution, are inherently variable. This variability poses a constant challenge in maintaining consistent process performance and product quality.

## **Ageing assets and equipment constraints**

Many mineral processing plants operate with ageing assets and equipment constraints. Optimising processes within these limitations while minimising unplanned downtime requires a delicate balance. And with plants designed for the first five years of mine production and oxide zones being repurposed for differing ore mineralogy.

## **Diverse data streams**

Process data is generated from various sources, including online analysers, laboratory assays, and control system historians. Integrating and reconciling these diverse data streams to derive actionable insights is a significant challenge.

## **Evolving market demands**

Market demands for product specifications and recovery rates are continually evolving. An ongoing optimisation challenge is adapting processes to meet these changing requirements while maintaining efficiency and profitability.

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Market demands for product specifications and recovery rates are continually evolving. An ongoing optimisation challenge is adapting processes to meet

these changing requirements while maintaining efficiency and profitability.

## Resourced constraints

Mineral processing plants often face resource constraints like water scarcity, energy costs, and environmental regulations. Optimising processes while minimising resource consumption and environmental impact is a complex balancing act.

At Mipac, we understand these challenges intimately. Our experienced team can design, configure, and advise you on optimising assets while considering your specific constraints. We are your partner in driving operational performance, ensuring sustainable production improvements and increased value generation

# Developing a process optimisation roadmap

## Step One: Establishing a clear vision and goals

The first step is to establish a clear vision for process optimisation. This vision should be ambitious yet achievable and align with the mineral processing plant's overall goals. For instance, the vision could be: "To become a leader in sustainable mineral processing by achieving a 10% improvement in overall recovery rates while reducing water consumption by 5% within the next two years."

Once the vision is defined, specific and measurable objectives (SMART goals) should be developed for key performance indicators (KPIs). These KPIs are the metrics used to track progress towards achieving your process optimisation goals.



## Factors to consider when choosing KPIs

- **Relevance to overall goals:** The KPIs should directly link to the program's vision and objectives. For example, if the vision is to improve recovery rates, a relevant KPI would be "P80 target" or "metal recovery percentage."
- **Measurable:** A clear and consistent method should be used to measure each KPI. Ensure the chosen metrics are readily obtainable through existing data collection systems or easily implemented measurement procedures.
- **Actionable:** The data obtained from the KPIs should provide insights that can be used to make process adjustments. For instance, monitoring "specific energy consumption" (kWh/t) in a grinding circuit can help identify opportunities for reducing energy usage.
- **Timely:** KPIs should be monitored frequently enough to identify trends and opportunities for improvement. Depending on the process and KPI, monitoring could be done hourly, daily, weekly, or monthly.

### Step Two: Data collection and analysis

Data is the lifeblood of any process optimisation program. Here are some critical considerations for data collection and analysis:

- **Implementing a data management system:** A centralised system for storing and organising process data is essential for efficient analysis. Many plant information systems (SCADA) already have built-in data logging capabilities. However, if a dedicated system is needed, consider onsite historians that offer scalability and remote access.
- **Using data visualisation tools:** Visualising data through charts, graphs, and other visual representations can help identify trends, outliers, and areas for improvement. Modern data analysis software offers visualisation tools tailored to specific KPIs and process parameters.
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- **Focus on high-quality data:** Ensure the accuracy and consistency of data collection procedures to avoid basing decisions on faulty information.
  - o Regular calibration of sensors and instruments is crucial for ensuring data accuracy.
  - o Standardise data collection procedures across the plant to eliminate inconsistencies.
  - o Implement data validation and error correction protocols to identify and address any anomalies in the data set.

### Practical tips for data collection

- Leverage existing data sources from plant information systems (SCADA) and laboratory analysis. Most modern mineral processing plants generate a wealth of data that can be readily utilised for process optimisation.
- Standardise data collection procedures across the plant to ensure consistency. Develop clear protocols for how and when data is collected for each KPI.
- Implement protocols for data validation and error correction. Train personnel on how to identify and address potential errors in data collection.

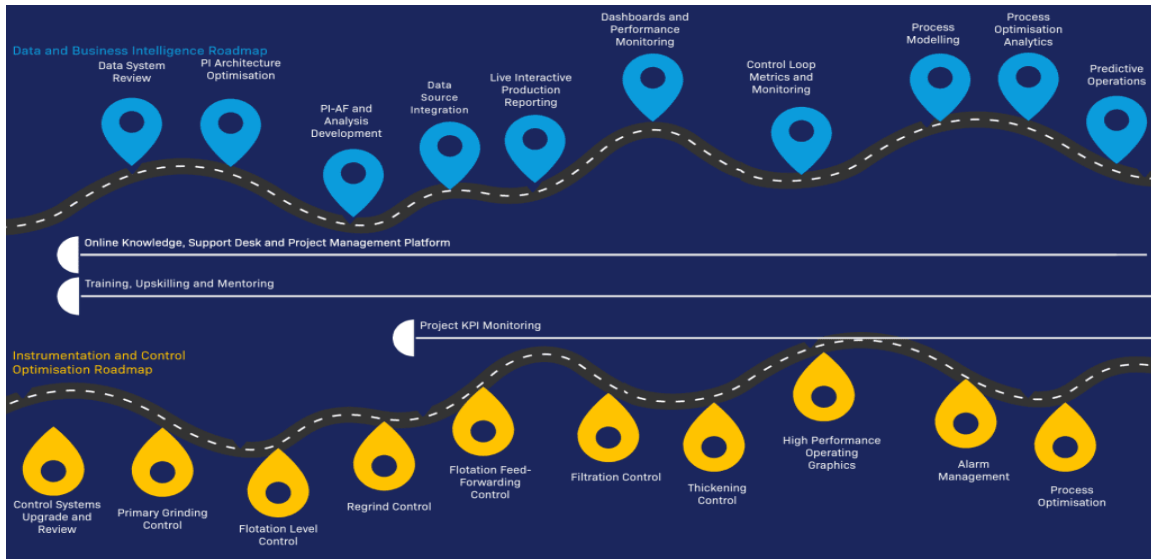
## Step Three: Optimise opportunities

Once you understand your plant's performance through KPI analysis, it's time to identify and prioritise optimisation opportunities.

- **Start with low-hanging fruit:** Focus on implementing simple operational changes or adjustments that yield quick wins. For example, optimising grinding mill discharge size or automating reagent dosages in a flotation circuit can often lead to significant improvements without major capital expenditure. These initial successes can help build momentum and buy-in for the program.

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- **Prioritise based on impact and feasibility:** Evaluate potential improvements based on their expected impact on KPIs and the resources required for implementation. High-impact, low-cost opportunities should be prioritised to maximise the return on investment.
- **Simulation:** Test automation changes on simulation tools to improve implementation success



*Fig 2: Mipac's Digitalisation Journey featuring roadmaps for Data and business Intelligence, and Instrumentation and Control*

## Building a culture of continuous improvement for sustainable process optimisation

### Embracing a culture of continuous improvement

Achieving process excellence in mineral processing is not a singular accomplishment but an ongoing pursuit. It necessitates a cultural shift that permeates every facet of operations. Successful programs cultivate an environment where team members feel empowered to identify and champion optimisation opportunities. From frontline operators to senior engineers, a mindset of continuous learning, experimentation, and adaptation is fostered.

## Leveraging data-driven decision-making

At the core of a sustainable process optimisation program lies data-driven decision-making. By harnessing the power of advanced analytics, mineral processors can gain deeper insights into their operations. Continuous monitoring of key performance indicators (KPIs) allows for identifying bottlenecks, inefficiencies, and areas ripe for improvement. This data-centric approach empowers informed choices, streamlines workflows, and eliminates non-value-adding activities, ultimately driving increased productivity and profitability.

## Fostering cross-functional collaboration

Process excellence flourishes in an environment that fosters collaboration. To achieve this, breaking down organisational silos and promoting seamless communication and knowledge sharing across functions is crucial. Working in unison, cross-functional teams leverage diverse perspectives to develop holistic solutions. This collaborative approach ensures that improvements in one area do not have unintended consequences elsewhere. By fostering an integrated mindset, processes can be optimised end-to-end, delivering sustainable improvements.

## Investing in continuous learning

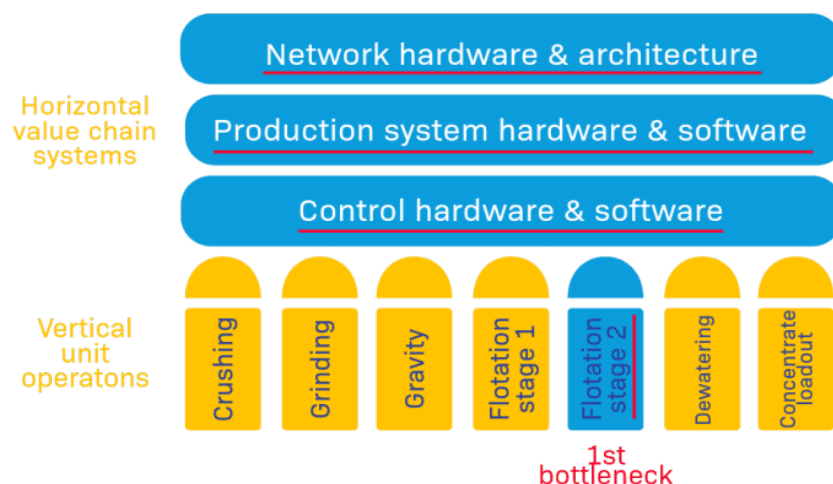
Cultivating a culture of process excellence requires a steadfast commitment to continuous learning and skill development. By investing in comprehensive training programs, mineral processing plants can equip their teams with the latest tools, methodologies, and best practices. This ensures that employees stay ahead of the curve, empowered to drive innovation, challenge the status quo, and implement cutting-edge solutions that propel them to the forefront of mineral processing excellence.



# Practical optimisation strategies

Data is the lifeblood of any process optimisation program. Here are some critical considerations for data collection and analysis:

- **Comminution:** Optimising grinding mill parameters (e.g., feed size, mill speed, liner configuration) can improve mineral liberation and reduce energy consumption. Regular mill performance monitoring and adjustments based on KPI data (e.g., specific energy consumption) can lead to significant efficiency gains.
- **Flotation:** Fine-tuning reagent dosages, air flow rates, and impeller speeds based on mineralogy and ore characteristics can enhance recovery and concentrate grade. Utilising online sensors for froth height, conductivity, and particle size distribution can provide real-time data for optimising flotation performance.
- **Classification:** Ensuring proper classifier efficiency to optimise particle size distribution in downstream processes like grinding or flotation is crucial. Regular monitoring of KPI data (e.g., cyclone overflow size distribution) and adjustments to classifier settings can significantly improve overall plant performance.
- **Maintenance:** Implementing preventative maintenance strategies (e.g., routine equipment inspections and oil analysis) can reduce equipment downtime and improve overall plant reliability. By scheduling maintenance based on equipment conditions rather than a fixed schedule, unplanned breakdowns and associated production losses can be minimised.



## Conclusion

Building a sustainable process optimisation program requires a commitment from management, metallurgists, and operational personnel. By focusing on clear goals, effective data utilisation, practical optimisation strategies, and continuous improvement, mineral processing plants can significantly improve recovery rates, reduce environmental impact, and enhance overall profitability.

The key lies in moving beyond simply collecting data to leveraging data for actionable insights that drive real-world improvements in plant performance. Remember, a successful program is not just about implementing the latest technology but about building a culture of continuous improvement that empowers everyone involved to contribute to a more efficient and sustainable operation.



# 5 Benefits of Digitising your Mine

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Today's mining operations often struggle with a range of interconnected issues.

Rising operational costs decrease profit margins, while manual data collection and analysis create inefficiencies and negatively impact decision-making.

Additionally, compliance demands grow increasingly stringent, requiring meticulous record-keeping and accurate reporting, which manual processes often fail to provide.

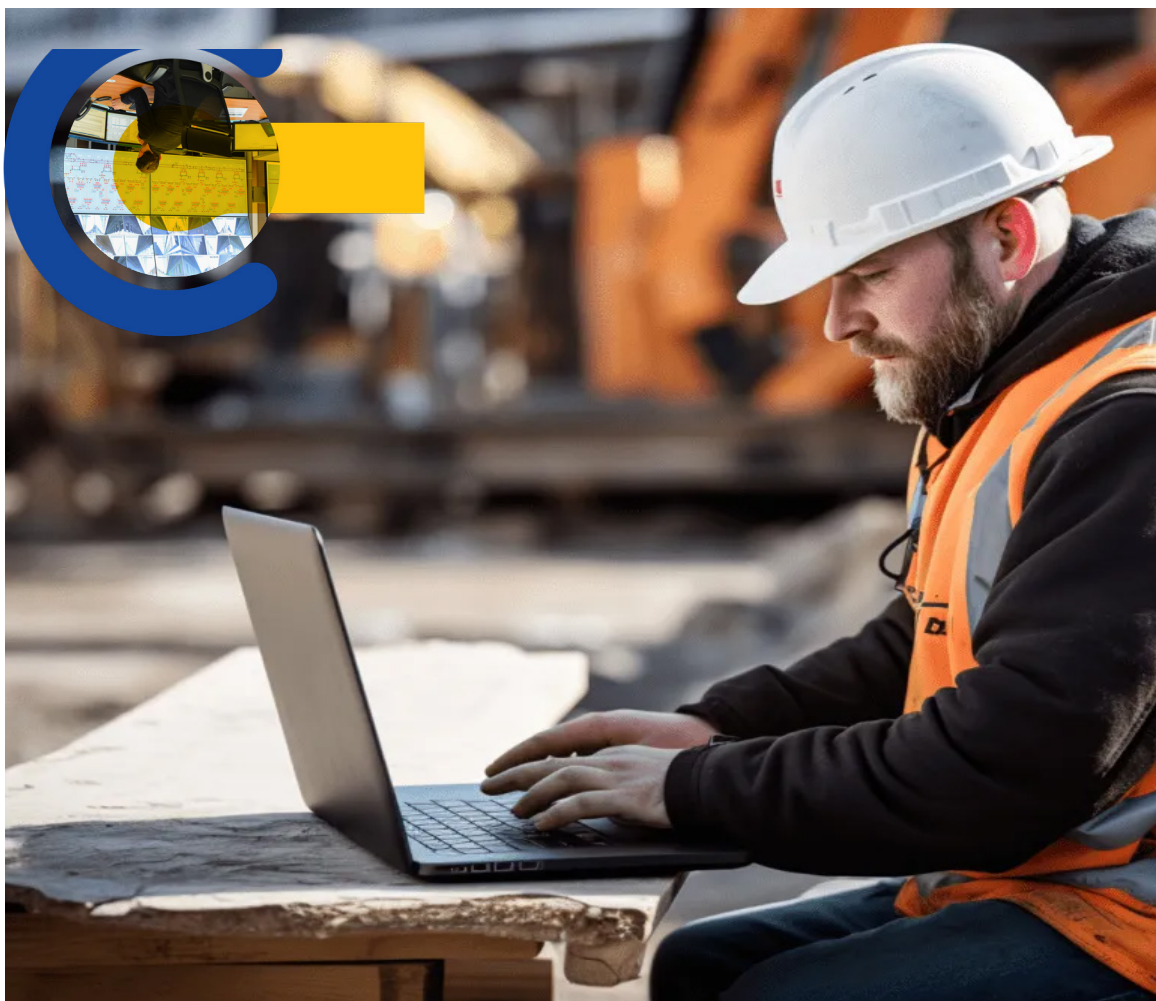
Furthermore, mines face uncertain resource distributions and fluctuating market conditions. Optimising resource recovery and maximising profitability requires a level of precision and agility beyond the capabilities of outdated, paper-based systems.

## The case for digitisation

These pressing challenges create a strong impetus for mine operators to embrace digitalisation, seeking solutions that unlock efficiency gains, enhance safety protocols and empower data-driven decision-making for a more sustainable and profitable future.

In the mining industry, adaptation is key to staying relevant and competitive. By incorporating innovative software solutions into a mine's framework, mining operations can unlock a range of benefits that streamline processes, enhance productivity, and drive sustainable growth.

Digitalisation is rapidly becoming the driving force behind improved efficiency, safety and sustainability. But exactly what tangible benefits can you expect from digitising your mine?



# The benefits of digitising your mine

## 1. Improved safety

Safety is one of the most important factors in the mining industry and fortunately, digitisation can enhance safety measures for mining operations.

Using advanced monitoring and automated technologies, risks can be identified in real-time, minimising the likelihood of accidents or injuries occurring. For example, digital solutions allow for the detection of abnormalities in equipment performance, enabling rapid responses and helping to prevent safety incidents.

## 2. Increased efficiency

Another benefit of digitisation is that it streamlines processes across the entire mining operation. Automation software can work to speed up tasks and reduce downtime, resulting in increased productivity and cost savings.

Digital solutions also allow for real-time monitoring of key performance indicators, allowing you to identify areas of improvement and quickly implement corrective actions.

## 3. Asset performance

Maximising the performance and longevity of assets is crucial for sustainable mining operations.

Digitisation allows you to assess your asset performance by providing real-time visibility. Operations can detect anomalies earlier, allowing for quicker and more robust interventions. As a result of this, downtime is minimised and the asset lifespan is increased, driving down maintenance costs.

## 4. Up-to-date data

Instead of relying on paper-based reports, multiple versions of spreadsheets and out-of-date data, workers can access automatic reports, giving workers the ability to collect, analyse and act on data quickly.

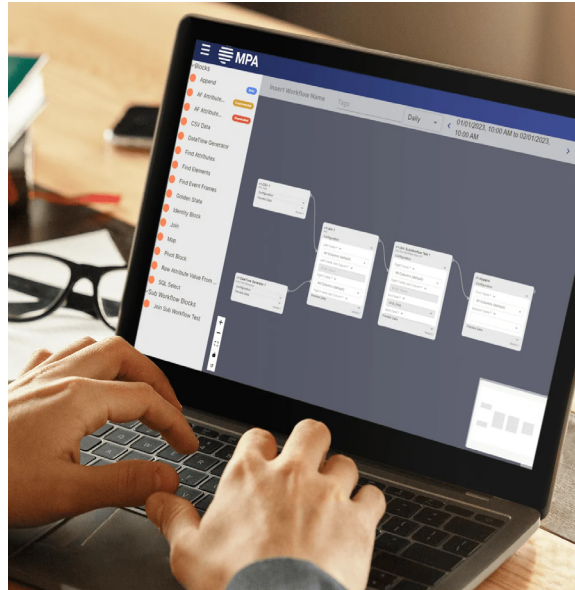


Software solutions centralise and automate data collection and analysis, allowing stakeholders to gain a comprehensive view of their operation at any given moment. This real-time data access works to drive operational excellence and innovation.

## 5. Compliance and reporting

Ensuring your organisation can meet compliance and regulatory requirements is essential in the mining industry. By automating data collection and reporting, compliance is simplified.

Digital documentation eliminates the risk of errors which often occur with manual record-keeping. As a result of this automation, the likelihood of regulatory penalties and fines is reduced.



# How Predictive Analytics in Mining is a Game-Changer

The Mining, Metals and Minerals (MMM) industry operates in a relentless pursuit of efficiency and safety. From vast open-cut and underground mines to intricate comminution and refinery processes, companies strive to extract valuable minerals while prioritising worker well-being and minimising environmental impact. In this dynamic landscape, a powerful tool is emerging: predictive analytics.

## What is Predictive Analytics in mining?

Predictive analytics is the art of using historical data to forecast future events. It leverages statistical techniques, machine learning algorithms, and data mining to uncover hidden patterns and trends within data sets.

Imagine a system that analyses sensor data from mining equipment and predicts potential failures before they occur. Or a tool that scours geological

data, pinpointing areas with a high probability of harboring valuable mineral deposits.

These are just a glimpse into the transformative potential of predictive analytics for the mining industry.

## Use case for Predictive Analytics in mining

We've established that predictive analytics in mining empowers informed decision-making. Now, let's delve deeper into how it unlocks a wide range of opportunities for the mining sector. By analysing vast troves of data, organisations can unlock a multitude of benefits, including:

### Optimising Equipment Maintenance

One of the most significant challenges in mining is the upkeep of heavy machinery. Routine maintenance is essential, but traditional methods can be wasteful. Predictive analytics shines in this regard.

#### How it Works:

By analysing historical and real-time sensor data, predictive analytics can forecast equipment maintenance needs with remarkable accuracy. Imagine identifying signs of wear and tear or potential malfunctions well before they escalate into significant breakdowns.

#### The Benefits:

This proactive approach allows mining companies to schedule maintenance during planned downtime, avoiding costly work stoppages and catastrophic equipment failure. This translates to:

- Extended equipment lifespan
- Reduced maintenance costs
- Improved safety

By addressing issues before they become critical, predictive maintenance minimises the risk of accidents

## Enhancing Production Schedules

Efficient production scheduling is the lifeblood of any mining operation. Predictive analytics goes beyond equipment health, leveraging data analysis to optimise production schedules and effectively allocate resources.

### How it Works:

Whether managing workforce shifts or optimising supply chain logistics, predictive analytics provides insights that enable smooth and efficient operations. Imagine anticipating potential delays in material arrival or identifying inefficiencies in workforce deployment.

### The Benefits:

By proactively addressing potential roadblocks, mining companies can:

- Streamline production processes
- Meet demand more effectively
- Maximise profitability

## Missing Downtime

Downtime is the enemy of productivity. Predictive analytics plays a vital role in minimising downtime by identifying potential issues before they escalate.



### How it Works:

Real-time data evaluation allows mining companies to react proactively. Imagine monitoring equipment health or supply chain status in real time.

### The Benefits:

By anticipating potential disruptions, mining companies can ensure:

- High material-movement efficiency
- Reduced production delays
- Improved overall operational efficiency

These are just a few examples of how predictive analytics in mining empowers to operate more strategically and efficiently. As technology continues to evolve, we can expect even greater opportunities to unlock the mining sector's full potential.

## The power of prediction

The power of prediction in mining translates into a multitude of benefits:

### Enhanced Safety

By analysing sensor data from equipment, predictive analytics can anticipate breakdowns and malfunctions. This allows for proactive maintenance, preventing costly downtime and, more importantly, safeguarding worker safety.

Example: Predictive analytics can identify a critical failure risk in a haul truck, enabling preventative maintenance and avoiding potential accidents.

### Improved Efficiency

Predictive analytics can optimise production schedules by analysing historical equipment performance and resource availability data. This leads to smoother operations, increased output, and, ultimately, a boost to the bottom line.

### Cost Reduction

Predictive analytics in mining can identify areas where maintenance efforts can be streamlined, optimising resource allocation and minimising unnecessary spending. Additionally, companies can save on operational costs by pinpointing inefficiencies in the production process.

According to Deloitte, moving from a reactive, condition-based maintenance strategy to a more data-driven approach can offer big savings.

It has estimated that predictive maintenance can reduce mining and metal operations' maintenance planning time by 20-50% and overall maintenance costs by 5-10%.

### Environmental Responsibility

The ecological impact of mining is a growing concern. Predictive analytics can play a crucial role in ensuring environmental compliance:

Analysing data on emissions, water usage, and waste disposal helps companies optimise operations and minimise their ecological footprint.

### Exploration & Discovery

Predictive analytics can disrupt traditional exploration methods by analysing vast geological data sets. These tools can identify areas with a high probability of harboring valuable minerals, streamlining exploration efforts and reducing environmental impact.

## Choosing the right predictive analytics software: key considerations

Implementing the right predictive analytics solution is crucial to reap the maximum benefits. While a plethora of software options exist, several vital factors should guide your selection process:

- **Cost:** Data analytics tools can range in price from a few hundred dollars to tens of thousands annually. Balance the features offered by the software with your budgetary constraints.
- **Ease of Use:** If your team lacks in-house data science expertise, prioritise user-friendly software with intuitive interfaces and readily available training resources.
- **Scalability:** As your mining operations grow, your chosen software solution should be able to handle increasing data volumes and evolving needs.
- **Security:** Ensure the software incorporates robust security measures to safeguard sensitive data, including production information, geological data, and financial records.
- **Integration:** Assess how well the software integrates with your existing mining management systems. Seamless integration ensures a smooth workflow and maximises the value derived from your data.

## The road ahead

The future of predictive analytics in mining is bright. Artificial intelligence and machine learning advancements promise even more sophisticated models capable of gleaning more profound insights from data.

Predictive analytic tools empower maintenance planners, systems engineers, controllers, and other mine personnel to make real-time decisions that improve performance, reliability, and the bottom line.

As adoption rates grow across different mining segments, we can expect to see a transformative shift in how mining operations are conducted.

### Key takeaways

- Predictive analytics in mining, metals and mineral processing operations empowers informed decision-making.
- By leveraging historical data to forecast future events, this technology offers many benefits, including enhanced safety, improved efficiency, cost reductions, and greater environmental responsibility.
- As the mining industry embraces this powerful tool, we expect a more sustainable and profitable future.



# Is Software the Secret to Running a Better Process Plant?

Chances are, your process plant relies heavily on manual processes and outdated systems. While there is a wide range of software tools available now, many plants still haven't moved much beyond the Excel stage.

Paper log sheets, Excel macros, and physical inspections are still common ways to measure plant data and manage operations. This is partly because old habits die hard. But there are also good reasons why your plant might still be stuck in manual mode.

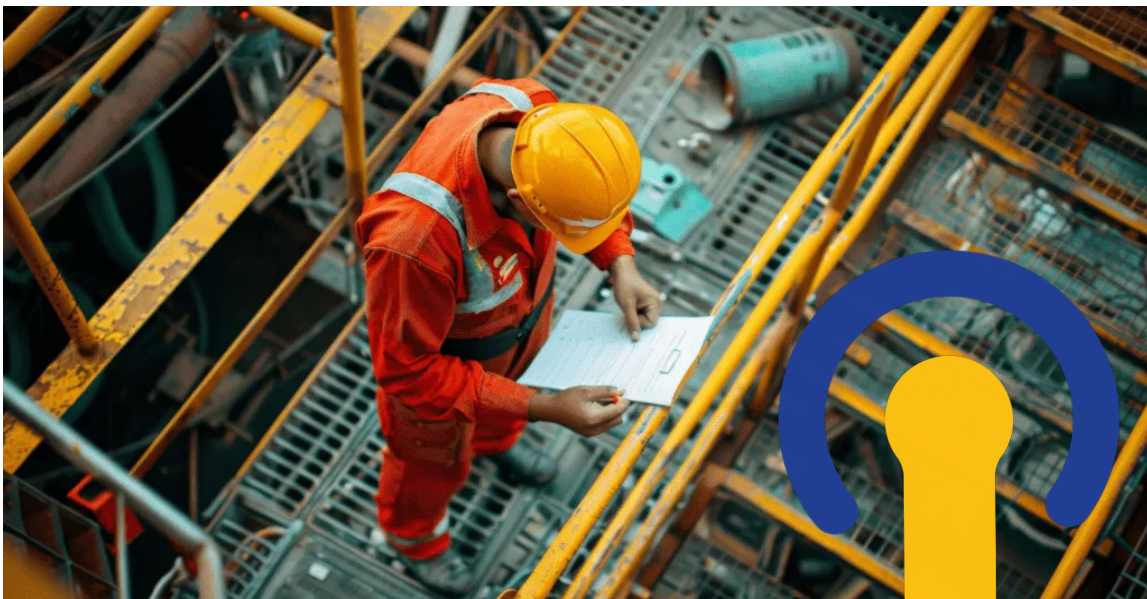
Drew Clements, Optimisation Team Lead at Mipac, says he understands why metallurgists and operations managers in process plants haven't rushed to jump on board the digital bandwagon.

"I really do see a mix of different reasons why people are at different levels of digital adoption," Drew says.



“There’s a sense that, if everything’s running smoothly, you shouldn’t change it, but then you miss out on a lot of innovation and improvement.”

Some might not realise how much technology has changed, with a range of software now tools designed specifically for mineral process plants. These tools are built for operational teams and can provide new data insights, real-time monitoring, and early problem detection, so metallurgists can coordinate quick responses to deviations. Meanwhile, they’re still simple enough that you won’t need months of training to get them working well for you.



## Working like it's 1999

One reason people are reluctant to adopt software is the idea that operators pay more attention when processes aren't automated. When you write something down, you have to look at the page or screen. This means you're more likely to pay attention and notice when something's wrong. If that process is automated, it could mean less time spent looking at the data so things might get missed.

“The act of making someone look at the page trains their eye to that page and to that Human-Machine Interface (HMI),” Drew says. “If you automate everything, but nobody looks at the screens anymore, you're going to have more mistakes being made.”

That's why not every process should necessarily be automated, especially if there's no real value in doing so. And there are some effective but old-

fashioned ways of making sure an operator stays engaged with what's happening on screen—but that doesn't mean it's the best way. Drew recalls one mine site that found a very simple fix to remind operators to check in.

“The team had these little stopwatches set for the things they had to record. They may have been engaged in a conversation with you, but when the watch went off, they had to switch back and have a look at the page.”

Of course, manual entry and paper record keeping have numerous issues. Sheets can get covered in mill grease and coffee stains or get the corners torn off. Entering data into a computer is tricky if you can't read what's on the paper – let alone if someone forgets to hand them in or they get lost in someone's bag. These old-school problems can create inaccurate, unreliable data and limit your team's effectiveness.

Then there's the fact that highly paid metallurgists and engineers spend hours each day manually entering data. Time that could be better spent using their skills to improve the plant.

It just doesn't make sense to have an experienced professional spending a big chunk of their day on basic admin tasks. Drew says he knows of at least one site where a metallurgist spent most of his time each day doing all the data entry. After implementing software tools to do that work, he had an extra 5-6 hours per day available to tackle more important projects that could have a real impact on the plant.

“What happens is you've given more time back to someone who's got all these skills, but who doesn't get enough time to get out on the plant.”

That's why it's time for more operations to look more closely at software options.

## **Moving towards a predictive plant**

While systems like SCADA and AVEVA PI are commonly used alongside Excel in mineral process plants, they are largely used to provide historical reporting. For example, daily production reports are created to report on the events of the previous day. This means that problems often aren't detected until some

time after they occur, and it's hard to sift through the data to track down the source of your issues.



Some newer software tools give you near-live visualisation of plant performance. They also allow you to track and resolve issues as they occur. Trigger Action Response Plan (TARP) software will kick in when something is out of range and start a process to flag and escalate it for a response. Control loop monitoring can recognise when a plant is beyond certain sigmas and will recommend which parameters you should adjust to fix it.

“If you can get these control loops working well, you can stop the downstream effects of other events happening,” Drew says.

Software also offers far more detailed analytics, so issues become visible that you simply couldn't see with more manual data handling and reporting. Once they are visible, you can fix them as you find new optimisation opportunities throughout the plant.

## Implementation time seen as an obstacle

The fear of lost time can deter sites from embracing new software tools. Drew says there used to be a saying that introducing anything new to the mining

industry would take at least 20 years – and many plants worry they don't have the time or resources to implement a big shift to digital, even when cost isn't an issue.

"I've seen companies where, even though the price was low, the point of view was they just didn't have time to take on a new app and learn how to use it."

But while software tools were once complex beasts that required extensive training – and often a cultural shift – the new generation of apps tends to be simpler, more affordable and easier to implement, with benefits outweighing any imagined teething troubles.

"These new apps are quite intuitive," Drew says. "Once you put one in, it doesn't take long to notice that it works really well."

## Where to start?

If you want to start digitalising some of the processes in your plant, it's worth thinking about what problems you want to tackle. Do you want information transfer automated to be as fast as possible? What about reducing the amount of time highly skilled – and highly paid – staff are spending on data entry and generating production reports?

Starting with a digital TARP is a no-brainer, Drew says. Many sites have an escalation procedure and every site should know what their top 10 problems are. Put these into a TARP to get started and you'll see the benefits straightaway.

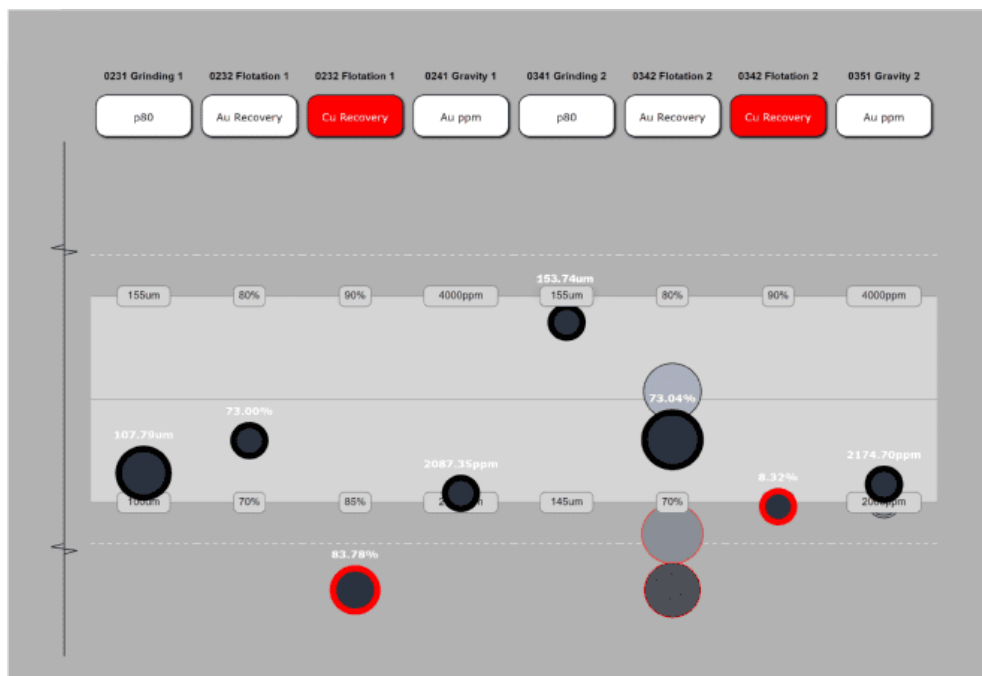
"The TARP only is flagged when, say, the mill bearing is outside of the temp that it's supposed to be running in, and it's something that needs addressing urgently so the escalation procedure kicks in. For the first 15 minutes, it's with the operations team to fix it. If they can't bring it under control, it gets escalated to the maintenance team."

That way, more urgent problems get more visibility, with less risk of being overlooked and eventually causing downtime.

If you're not sure what your top 10 problems are, you might need more historical data. Start by setting up historian software (AVEVA PI comes recommended), before moving on to downtime monitoring and log sheets (Mipac's Logsheets). After TARP and production accounting, Drew suggests live visualisation software Golden State.

"Golden State is a good visual snapshot of your plant so that you can understand at any moment where your plant is at," Drew says.

While he understands the hesitation around introducing new software, it's something you can't put off forever.



*Golden State in use*

Digitalisation is more than just a corporate buzzword—it's something that can have real, practical benefits for operations managers and metallurgists. It's also a way to give your operation a competitive edge.

"There's a change of guard coming through and we're going to see more adoption of this kind of software," Drew says.

"The rest of the industry is moving fast, so you've got to match it, otherwise you'll get left behind."

# 3 Reasons to Stop using Excel Macros for Everything in your Process Plant

**Most metallurgists are wizards in Excel. And rightly so, it can be a powerful tool to keep mineral process plants running smoothly. With Excel VBA macros you can automate all kinds of repetitive tasks like data logging, production reports, and metal accounting.**

VBA is versatile and powerful, but it does have significant limitations when it comes to data visibility, data reliability, and data accuracy. These three are essential if you want to make informed decisions about your plant based on up-to-date data. That's also why Excel is non-compliant with the AMIRA P754 Code of Practice for metal accounting.

In 2024, there are better ways to handle data so you can free up valuable time for your team and find new ways to optimise your plant.

So what are the three reasons why leaning too heavily on Excel macros could be holding you back?

# 1. Data visibility

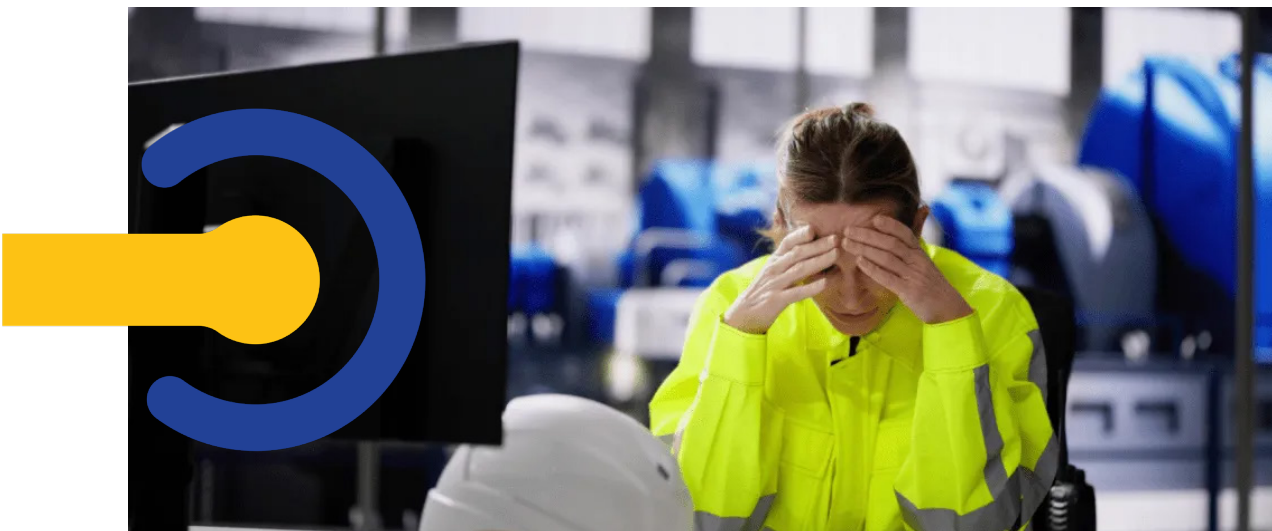
Why does data visibility matter? In a word, trust.

If you can see and trace how the data is being manipulated, you can trust it. And that's where many metallurgy and operations teams run into problems with Excel.

If you don't trust the numbers in a report created with a macro, tracing the calculations to check your numbers is difficult or impossible. Complex VBA macros have multiple subroutines, so data can be buried many pages deep.

Macro creators can hide certain actions from users, or lock out some of the sheets so it can't be modified. This makes users completely blind to the calculations and workflow, making troubleshooting impossible.

Excel macros are notoriously difficult to audit, especially when multiple team members have access and can modify the code without leaving a clear audit trail. It's hard to track who made changes, and when, or why. If a formula is accidentally changed, identifying the root cause can be extremely difficult.



If you use specialised software instead of Excel, your plant operation team can maintain clear audit trails, with changes and annotations tracked in one place. This fosters better communication and creates more collaboration and faster issue resolution.

"If you have the right software, it's pretty easy just to click through, follow the workflow and find it," explains Drew.

“It will tell you what instruments are being used in this calculation and what that tag name is. Whereas, to find those tag names in the VBA code in Excel, you’ve either got to hope that it’s in the cell formula, or if it’s buried in the VBA code, good luck.”

### **The risk of “cute data”**

There’s another big reason you need data visibility: to find deliberate mistakes, or ‘cute data’. Sometimes, people feel incentivised to make the numbers balance and look correct rather than submit a report with errors.

“If you can’t see the actions being performed, then you’re assuming your VBA code is doing what you’ve been told it does, or shown it does. But, in some cases we’ve seen examples where the macros have been coded to hide actions and make the numbers balance,” he says.

“When it comes to the visibility of your plant and making good decisions, the key here is trust. If I can see and trace how my data is being manipulated in an easy-to-read format, then I’ll trust it.”

Without clear visibility of who changed what, accuracy and accountability suffer. Errors can go unnoticed for months or years.

## **2. Data accuracy**

Accuracy is non-negotiable in plant operations. Without accurate data you can’t make good decisions to fix faults and make improvements.

For accuracy, Excel macros are an excellent tool. They will accurately repeat the same actions and print the report the same way every day.

Problems develop when the data put into the macro isn’t accurate. The people inputting the data can, and do, make mistakes. It’s common to miss a decimal place, accidentally insert a new column, or even receive erroneous lab data.

When this happens, your macro will probably still run and generate the report, but there are no checks in place to flag numbers that are out of range. So



your reports could be completely inaccurate, and you wouldn't even know. Excel doesn't have debugging capabilities, or a way to tell you if an error has occurred.

Which takes us back to the visibility problem. Once you realise there's a mistake, finding it can be an immense task.

"If you start moving a row or a location where data is actually retrieved from, that macro breaks down. Or, worse still — it still works — but now it's got the wrong data in the process," explains Drew.

This is the key challenge with an Excel-based met accounting system. It isn't adaptive. It can't tell when you've added a column, taken a column away or included a new row.

Small mistakes can propagate through the entire system and distort the reliability of the data you're using to make decisions.

Accuracy can be much higher using software tools designed for process plant operations. When set up correctly, users get an error notification when they enter a number outside of the normal range. And the same checks are run on the final numbers in reports, flagging the likely sources of the errors.



## 3. Data reliability

To make good use of your data, the numbers must be reliable. When set up correctly, an Excel macro will reliably give you accurate results.

But, they start falling apart when you encounter unplanned ‘what if’ statements.

For example:

- What if I turn this circuit off?
- What if I change and recycle this stream back around?
- What if we’re only running one scalping screen instead of two?

That’s when you need more complex VBA code.

“As it becomes more complex, it becomes less robust,” says Drew.

Plants change all the time. There will nearly always be something offline, or getting replaced, or not operating within normal ranges.

Spreadsheets are built based on the current state of the plant. When something changes or gets added, it can quickly break. “It can execute code to the letter, but it has no flexibility or resilience to changing conditions,” he explains.

How do you accommodate that? You need to write code with logic branches. I.e., ‘if this is turned off, then this needs to have a trigger, then that sets off this next reaction’.

“You’ll need some pretty fancy logic pathways for it with triggers. But that’s not a common Excel coding skill for most metallurgists,” shares Drew.

In comparison, well-designed process plant management software is set up with complex what-if statements and logic pathways so it can automatically adapt to changes as they happen.

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## The legacy tool problem

Metallurgists often create and maintain these macros, which are then used for years or even decades. Then, at some point, they leave the business, leaving behind complicated, poorly documented code that someone else will need to modify as the plant changes.

All too often, employees forget a password for a protected sheet or leave the business for a new role and take the document passwords with them. Some operations don't take data security seriously enough, not realising that a simple lost password could interrupt essential day-to-day activities.

## So, what's the alternative?

If Excel and VBA aren't reliable for running a modern process plant, what should replace them?

Firstly, there are plenty of situations where Excel is the simplest, most straightforward option. But, if you are repeatedly running into data problems caused by complex macros, it may be time to start looking for better ways to do things.

If you have an existing spreadsheet using VBA you could take the process to the next level and automate it with software. This will give you more transparency and integration into your production reporting, analytics and visualisation tools.

A good starting point is to use software to automate and standardise the things you are already doing. If you aren't using one already, setting up a data historian such as AVEVA Historian will give you a database of all process, alarm, and event history data.

Next, add downtime tracking software to track downtime events and production losses.

With these set up, you will be able to produce better daily production reports and also be ready to look at introducing a reconciliation engine for met accounting.

There are a range of software tools on the market that pull data directly from sensors, PLCs and control systems to give you real-time visibility without human intervention. Some are more flexible than others.

“You want to look for one that’s adaptable to different sources. And make sure it’s able to import the data from a wide variety of places,” says Drew.

### **Better analytics can uncover new optimisation opportunities**

With modern process plant software, you eliminate many of the visibility, accuracy and reliability challenges created by relying on Excel macros.

You also gain new, actionable insights from detailed analytics software.

One tool specifically built for process plants is Mipac’s MPA software suite.

“If you run the data into MPA, you can access highly insightful analytics. You get new insights into your business that start unlocking more value because you can start seeing things that you couldn’t see before,” says Drew.

“These tools allow the optimisation team to come in, use the analytics, and help your plant. If it’s reliability data, they can ask valuable questions like ‘What is the mean time between failures on these pumps and what is the strategy around managing it?’” he explains.

It offers up new opportunities for improvements when reliability teams can ask things like:

- What is the meantime between failures on these pumps?
- What Trigger Action Response Plan are we going to put in to manage that?
- Is there a metallurgical solution for this that we haven’t thought of?
- Is there a digital way to manage that by changing the control loop or control strategy?

Don’t underestimate the value of being able to visualise your data in new ways. The software tools available now provide more powerful visual graphics than a spreadsheet can produce.

## Is it time to address data visibility, accuracy, and reliability in your plant?

Excel macros may have served your process plant well for years, but as the complexity of mineral processing operations increases, their limitations become more apparent.

They are susceptible to human error, which can create inaccurate, unreliable data that is hard to audit and analyse.

When you adopt specialised software tools, you can boost efficiency and production in your plant while simplifying your reporting. And free up time for your team to work on more important things.



# 6 Reasons to Embrace the AVEVA PI System

The landscape of control systems and automation engineering is dynamic. As an engineer in this space, it's critical to stay ahead of the curve when it comes to technology, innovation and tools to make your life easier.

Enter the AVEVA PI System: an industry-leading data historian solution specifically built for industrial environments.

Among the myriad of tools available to you as an engineer, the AVEVA PI System is one tool that will help you optimise your work and improve your performance.

So why should you embrace the AVEVA PI System?

## 1. Integrated data

At the heart of every successful historian lies data. The AVEVA PI System excels in its ability to seamlessly integrate diverse data sources. Whether it's process

data, equipment performance metrics or environmental variables, the AVEVA PI System aggregates and contextualises data from disparate sources, providing you with a holistic view of your operation in real-time. This comprehensive data integration empowers you to make informed decisions, identify patterns and proactively address potential issues, thereby optimising processes and maximising efficiency.

## 2. Advanced analytics

As an engineer, you rely on actionable insights derived from data analytics. The AVEVA PI System goes beyond conventional analytics by leveraging advanced algorithms and machine learning techniques to uncover hidden patterns, trends and correlations within data sets.



## 3. Scalable and flexible

In an era characterised by rapid technological advancements and evolving industry needs and expectations, the AVEVA PI System's modular architecture and scalable infrastructure enable you to expand and accommodate growing data volumes and evolving business needs as needed. Whether deployed on-premises, in the cloud or hybrid environments, the AVEVA PI System gives you flexibility, ensuring compatibility with existing systems and future-proofing investments.

#### 4. Enables enhanced collaboration and knowledge-sharing

Collaboration is at the heart of innovation. The AVEVA PI System enables seamless collaboration with multidisciplinary teams and provides a centralised platform for data storage, visualisation and analysis. In this way, the AVEVA PI System fosters collaboration across departments, enabling you to share insights, best practices and lessons learned with other engineers. This collaborative approach not only accelerates problem-solving but also cultivates a culture of continuous improvement, driving innovation and fostering organisational resilience.

#### 5. Cybersecurity and data integrity

In an increasingly digitised world, safeguarding critical infrastructure and data assets against cyber threats is vital. The AVEVA PI System prioritises cybersecurity and data integrity through robust authentication, encryption and access control mechanisms. By adhering to industry best practices and regulatory standards, such as NIST guidelines and ISA/IEC 62443, the AVEVA PI System ensures the confidentiality, integrity and availability of your data, giving both you and your stakeholders confidence that this data is safe from cyber threats.

#### 6. Data visualisation

With the AVEVA PI System, you can quickly spot trends and spot anomalies



thanks to the operations data visualisation. Team members will be able to enjoy near real-time visibility and gain a data-driven perspective.

The AVEVA PI System can empower you and your operation to be more efficient, innovative and resilient. From comprehensive data integration to advanced analytics, scalability, collaboration and cybersecurity, the AVEVA PI System is a holistic solution tailored to the evolving needs of



modern industries. By embracing the AVEVA PI System, you'll be able to navigate the complexities of your control systems with confidence, helping to drive sustainable growth and develop a competitive advantage for your operation in an ever-changing landscape.

Mipac offers a range of software products that integrate with the AVEVA PI System, including:

- MPA
- Digital TARP
- Logsheets
- Loop Performance
- Production Reporting



# 5 Ways to Improve your Shift Handover Process

Mining operations are complex, high-stakes environments where every shift counts. With operations running around the clock, the transition between shifts — otherwise referred to as the shift handover — becomes a critical juncture that can determine the success or failure of the entire operation.

However, the shift handover process is often plagued by inefficiencies, miscommunications and oversights, leading to costly delays, safety risks and operational disruptions.

So what are some problems that occur during shift handovers and what practical strategies can you use to overcome these challenges to ensure your operation runs smoothly and safely around the clock?



# The impact of inefficient shift handovers

There is no margin for error in the mining industry. A missed task or a miscommunication during a shift handover can quickly escalate into significant operational issues. Common problems include:

**1. Incomplete task handover:** When tasks are not fully communicated or transferred between shifts, it can lead to incomplete work, duplicated efforts, or critical tasks being missed entirely. This is particularly dangerous in safety-critical environments like mining, where the consequences of a missed task can be severe.

**2. Loss of operational continuity:** The handover process is intended to ensure continuity between shifts, but when information is not accurately or thoroughly passed on, it can lead to disruptions in workflow. This can slow down production, increase downtime, and reduce overall efficiency.

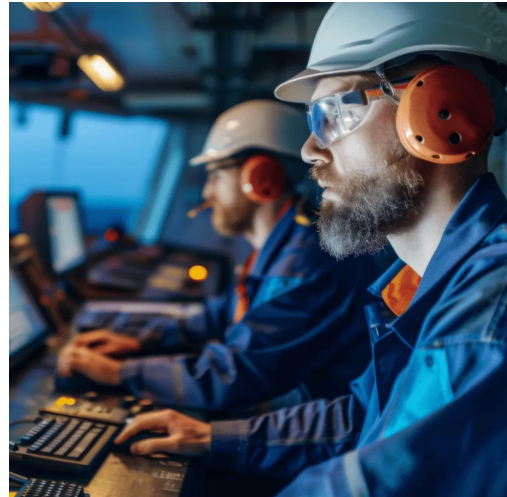
**3. Communication breakdowns:** Verbal handovers, reliance on memory, and inconsistent documentation practices often result in miscommunications. Important details can be lost or misunderstood, leading to errors that could have been easily avoided with clearer communication.

**4. Accountability issues:** Without a clear and auditable record of tasks and responsibilities, it's challenging to hold team members accountable for their work. This can lead to a culture of passing the buck, where issues are not addressed promptly, and tasks are left incomplete.

**5. Safety risks:** In an industry where safety is paramount, any lapse in communication or missed tasks can lead to hazardous situations. Ensuring that safety protocols are consistently followed during shift handovers is critical to protecting workers and maintaining compliance with regulations.

## What causes shift handover problems?

Understanding the root causes of these issues is the first step toward solving them. Some of the most common factors contributing to shift handover challenges include:



**1. Lack of standardisation:** In many mining operations, shift handovers are left to the discretion of individual teams or managers, resulting in a lack of standardisation. Without a consistent process, handovers are prone to variability, increasing the likelihood of errors.

**2. Over-reliance on manual processes:** Many mining sites still rely heavily on paper-based logs, verbal communication and manual tracking of tasks. These methods are not only time-consuming and repetitive but also prone to human error.

**3. Inadequate training:** Operators and supervisors may not receive adequate training on how to conduct effective shift handovers. This can lead to misunderstandings about what information needs to be communicated and how it should be documented.

**4. Accountability issues:** Without a clear and auditable record of tasks and responsibilities, it's challenging to hold team members accountable for their work. This can lead to a culture of passing the buck, where issues are not addressed promptly, and tasks are left incomplete.

**5. Limited use of technology:** While some sites have adopted digital tools to assist with shift handovers, many still rely on outdated systems that do not provide real-time visibility into task status or allow for effective communication across shifts.

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# How to improve shift handover processes

To overcome these challenges, mining operations need to adopt a more structured and technology-driven approach to shift handovers. Here are some strategies that can help:

## **1. Implement standardised procedures**

Establishing a standardised shift handover process is critical for ensuring consistency and reducing the risk of errors. This includes creating a checklist of essential tasks and information that must be communicated during each handover. By standardising the process, you can ensure that nothing is overlooked and that each shift is fully informed and prepared.

## **2. Leverage technology for real-time communication**

Digital tools can play a crucial role in improving the shift handover process. By using software that allows for real-time tracking of tasks and communication between team members, you can ensure that all relevant information is captured and shared. This not only improves transparency but also provides an auditable record of all handovers, enhancing accountability.

## **3. Enhance training and documentation**

Providing comprehensive training for operators and supervisors on how to conduct effective shift handovers is essential. This training should cover the importance of clear communication, the use of standardised procedures, and how to use any available digital tools. Additionally, maintaining accurate and up-to-date documentation is crucial for ensuring that all necessary information is passed on during handovers.

## **4. Encourage accountability**

Creating a culture of accountability within your team can help ensure that tasks are completed and that any issues are promptly addressed. This involves setting clear expectations for what needs to be communicated during handovers and holding team members responsible for their part in the process.

## 5. Use data to drive continuous improvement

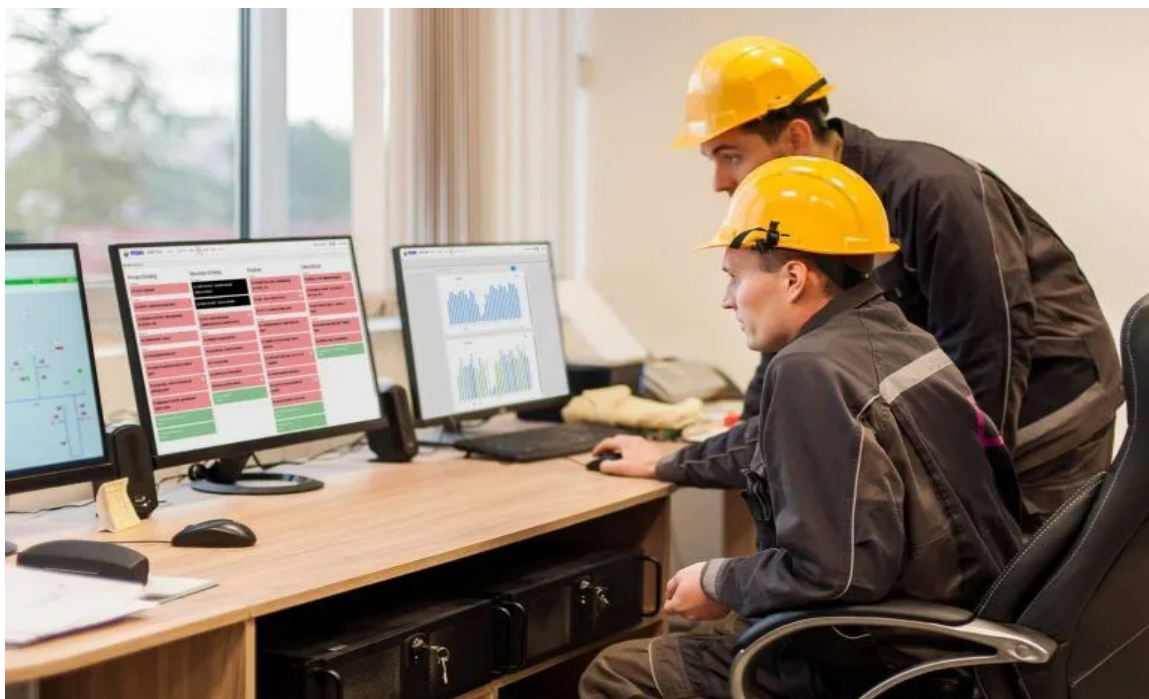
By collecting and analysing data from shift handovers, you can identify patterns and trends that may indicate underlying issues. This data can then be used to make informed decisions about how to improve the handover process, whether that involves adjusting procedures, providing additional training, or investing in new technology.

### **Strengthening efficiency in mining operations**

The shift handover process is a critical component of continuous mining operations. By addressing the common challenges and implementing the aforementioned strategies, operations managers and superintendents can ensure that their shift handovers are efficient, effective and safe.

Standardisation, technology, training and accountability are all key to successful shift handovers. By focusing on these areas, mining operations can minimise the risks associated with shift changes.

For those looking to enhance their shift handover process, the adoption of best practices and the integration of digital tools can make a significant difference.





Digital Transformation

# From Setup to Optimisation: A Journey with TCard in mining Operations

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The ability to adapt to new technology is a critical and in-demand skill in the mining industry. Over the years, digital solutions have steadily integrated into mining operations, streamlining processes, improving communication and enhancing productivity.

One tool designed to track and coordinate your tasks digitally is Mipac's TCard, a task management software that is built by miners for miners.

Mipac has successfully implemented TCard in a diverse range of operations. For these operations, TCard has transformed daily operations, enhanced task management and improved the success of the site.

So what are the steps involved in a typical TCard implementation?

# Stage 1: the setup – laying the foundation



Introducing a new digital tool into a mining environment can be complex and time-consuming. However, with TCard the process is designed to be as smooth and intuitive as possible, with an experienced team of TCard experts guiding you every step of the way.

The setup begins with a clear understanding of your operation's unique needs.

## 1. Understanding your operational context

Before diving into the setup, Mipac will map out the existing processes, workflows and tasks within your operation.

This involves identifying the key areas where TCard can have the most significant impact, such as shift handovers, task management and safety and risk management. By tailoring the setup to address specific challenges, the groundwork is laid for a seamless integration.

## 2. Configuration

TCard's strength lies in its ability to be configured to fit the unique requirements of any mining operation.

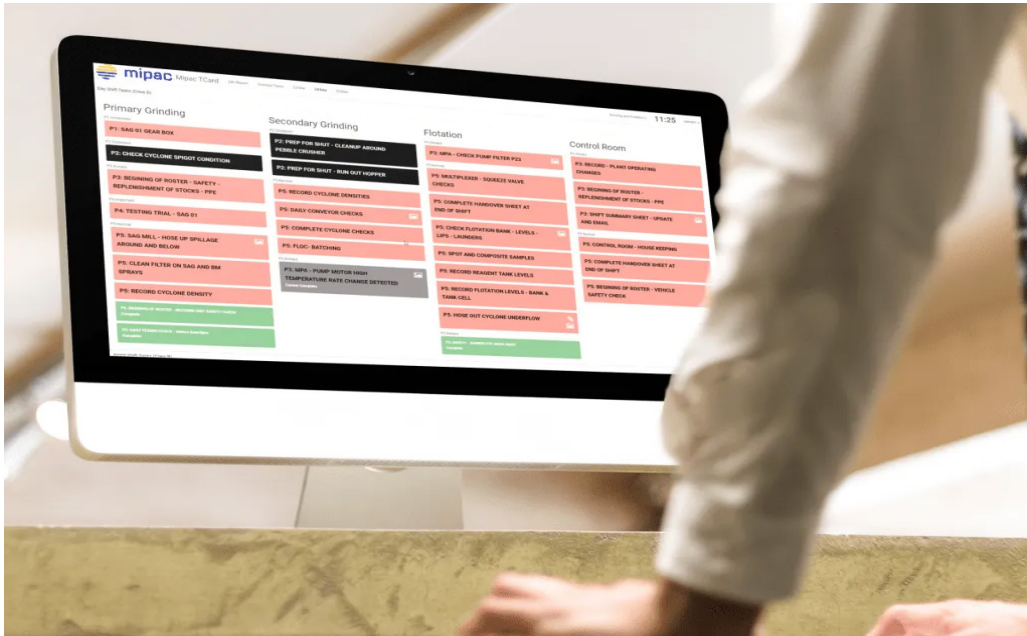
During the setup phase, the software is configured to match your site's operational procedures, multiple shift patterns and task schedules.

You will have a familiar interface that enhances, rather than disrupts, daily operations.





## Stage 2: Onboarding and early implementation - navigating the learning curve



Once TCard is set up, the next phase is onboarding and early implementation. This period ensures the tool will be used successfully in the long term.

### 1. Onboarding and training

Successful adoption of any new tool hinges on how comfortable the team is when they are using it. TCard's onboarding process is comprehensive, focusing on empowering operators, supervisors and managers to fully leverage the software's capabilities.

Training sessions are designed to be hands-on, allowing users to interact with the system in real-time, addressing any questions or concerns as they arise. Comprehensive online documentation ensures that new staff are quickly up to speed and will be able to independently use TCard.

### 2. Initial results and feedback

Even in the early stages, TCard delivers noticeable improvements in task management and operational efficiency. The ability to track and audit tasks

provides immediate value, reducing the likelihood of missed tasks and enhancing overall productivity.

Early successes, combined with ongoing feedback, refine the system and encourage increased adoption across the team.

At this stage, Mipac's experts typically recommend a phased implementation for a small group within the operation. Instead of rolling out TCard to the entire team, the focus is on a smaller subset of users, such as a single crew. These team members use TCard daily across their shifts, providing initial feedback that helps refine the system. This approach creates a faster feedback loop, allowing for adjustments based on real-world use. As the process is fine-tuned and the supervisors and managers become more comfortable, the rollout gradually expands from the initial group to include larger teams, eventually encompassing the entire workforce. This step-by-step method ensures a smoother transition and more effective adoption of TCard.

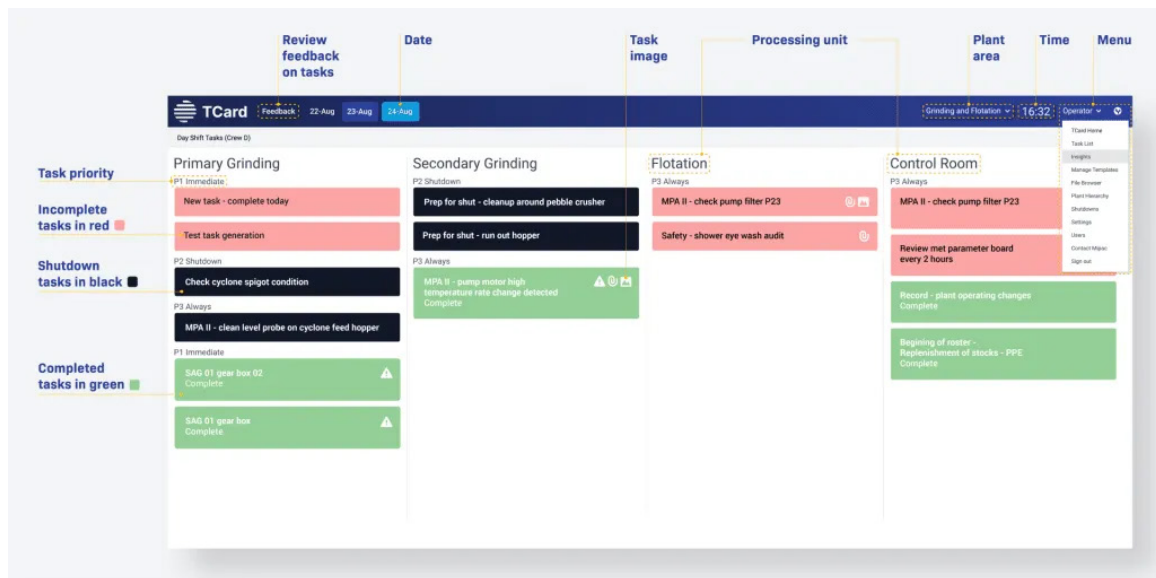
### **3. Building trust in the system**

Trust is built through consistent use, where operators and managers see firsthand the benefits of improved task visibility, streamlined handovers, and real-time communication.

From improved task visibility, streamlined handovers and real-time communication, teams can experience the benefits of TCard firsthand. With consistent use of TCard, operators and managers become more consistent, and familiarity and confidence grow.

## **Stage 3: Optimisation – unlocking the full potential of TCard**

With the initial implementation complete and the team well-acquainted with the system, the focus shifts to optimisation — maximising the benefits TCard brings to your operation.



## 1. Initial integration and adoption

As TCard is introduced into daily operations, operators and managers will begin to notice how well it integrates with existing workflows.

During this stage, the team adapt to new ways of managing tasks and communicating across shifts.

## 2. Data-driven decision making

One of the most powerful aspects of TCard is its ability to capture and analyse data that was previously not being collected. This results in deeper insights into daily operations.

As TCard collects information on task completion, shift handovers and operational performance, this data can increase visibility and drive more informed decision-making across the plant.

Managers can identify trends, anticipate potential issues and adjust strategies to optimise efficiency and safety. This data-driven approach empowers your operation to continually improve and adapt to changing conditions, while also maximising production and minimising downtime. begin to notice how well it integrates with existing workflows.

### **3. Enhancing communication and collaboration**

As TCard becomes more deeply integrated into your operation, it improves weak coordination through better team communication and collaboration.

TCard's ability to provide a centralised platform for task management means that everyone, from operators to senior management, is on the same page.

This transparency helps break down silos, encourages teamwork and ensures that critical information is shared promptly and accurately.

As a result of the improved communication, operators and managers can expect to increase their visibility across tasks and miss fewer tasks, resulting in better outcomes.

Keep in mind, that the success of a TCard implementation hinges on the managers responding to and addressing operator comments and feedback that comes out of TCard. A fundamental part of the change management process is for the operators to be given a voice and receive feedback on their comments. If the manager ignores the operator's comments, the comments will soon stop and TCard will stop being used to its full potential.

### **4. Continuous improvement and adaptation**

The journey with TCard is an ongoing process of continuous improvement. As your operation evolves, so too does the way TCard is used.

Regular reviews of TCard's use, alongside feedback from the team, ensures that TCard continues to meet your operation's needs and supports its long-term goals.

## The TCard journey - a path to operational excellence

The journey from setup to optimisation with TCard in a mining operation is one of transformation. What begins as a tool for managing tasks and improving communication quickly becomes a central component of your operation's strategy for efficiency, safety and continuous improvement.

By carefully navigating each stage of this journey — setup, early implementation and optimisation — your operation can unlock the full potential of TCard. The result is a more streamlined, productive and resilient operation that is better equipped to face the challenges of the modern mining industry.

As the mining landscape continues to evolve, those who embrace tools like TCard will lead the way in operational excellence. Whether you're just beginning your digital transformation journey or looking to optimise your current processes, TCard offers a path forward that is both innovative and practical.



# 5 Things your Mineral Process Plant should Stop using Excel for

Excel has been the default software for metallurgists for decades. It's not hard to see why: It's straightforward, easy to customise, and most people who work in a technical role in a mineral processing plant will have a good understanding of how to use it.

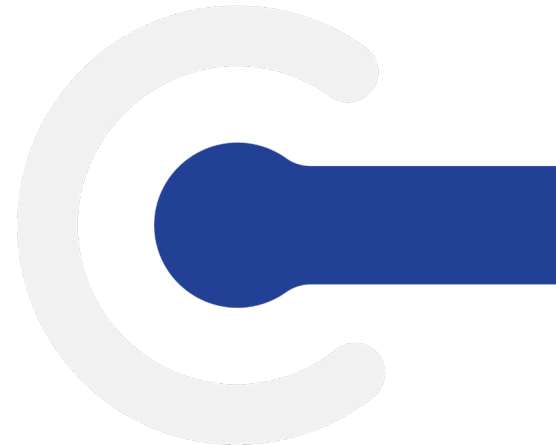
That familiarity has led metallurgical teams to stick with a known quantity, even if it's not really built to do the job it's being used for. These days, there are software options designed specifically for process plants that reduce errors, decrease time spent on data entry, and give you a quicker heads-up of production deviations.

Hans Liang, Minerals Processing SME at Mipac, says plenty of plants would benefit from ditching Excel, but find it hard to move on.

"Often you'll have a champion on site who will push for a new software product, but the moment they leave, people will just revert back to Excel, because that's what they've always used," Hans says.

Is it time to move on from Excel? Let's look at five situations where your processing plant should stop using Excel:

- Production reporting
- Metal accounting
- Logsheets
- Quality control
- Downtime reporting



## 1. Production Reporting

A lot of plants use Excel for production tracking by pulling data from systems like AVEVA PI. This approach often needs you to customise the sheets, which can burn through precious time. It also means you might not always be up to speed with everything that's going on in the plant.

“When you're dealing with a lot of data, you want real-time insights,” Hans says. “That's something Excel just isn't designed to handle effectively.”

Software platforms that are specially designed for production reporting such as AVEVA PI Vision (if it's a custom-built version) or the MPA software suite make it much easier to track metrics in real-time. They provide standard reporting templates, customisable displays and seamless integration with data sources. The result is improved visualisation, data that is easier to trace and contextualise, and automated updates so that you don't have to keep hitting 'calculate' manually.

## 2. Metal Accounting

“Excel can work for small, straightforward calculations, but for something as complex as metal accounting, you need a system that minimises the risk of human error and ensures compliance,” Hans says.

Dedicated metal accounting software such as Datamine's Production Accounting (PA), Caspeo's INVENTEO, Metal Management Solutions (MMS) WIRE provide the audit trails and data integrity plants need, with a centralised system that integrates information from different databases and different data sources. By providing a more structured and traceable system, this kind

of dedicated software reduces the sort of errors you tend to get with manual entry and ensures you comply with industry standards and regulations.

### 3. Logsheets

While plant operators often still use Excel for daily logsheets, it can be all too easy to miss critical information or lose track.

“When things need to be recorded consistently and accessed quickly, relying on Excel can lead to a lot of data gaps,” Hans says.

One way operators are getting around Excel is even more old school — using a physical notebook to handwrite log entries. Hans says the dangers of this traditional approach are pretty obvious.

“The data gets lost. Even if it doesn’t, you have to go digging through. It’s like going through a library and sifting through the records to try and find out what happened on a particular date.”

Specialised software options are now available and widely used. For example, the MPA software suite, with its dedicated Logsheets application can provide a more structured approach to capture data. Logsheets information is more visible and accessible, rather than being buried in handwritten notes, while smart backend capabilities automate data categorisation, which simplifies troubleshooting and reporting.

Time Stamp	Sag Mill Balls (t)	% Passing 150	% Solids Cof	% Solids Cuf	Ball Mill Balls (t)	SAG Mill 1 Throughput (t/h)
06:00	56.00	41.00	30.00	70.00	5.00	1100.33
07:00						761.53
08:00	6.00	56.00	30.00	70.00	5.00	818.28
09:00						520.72
10:00						654.40
11:00						858.49
12:00	5.00	65.00	39.00			1137.49
13:00						1159.13
14:00						1192.30
15:00						1170.64
16:00	4.00	75.00	40.00			1326.03
17:00						1159.74
18:00			65.00			1101.14
Targets	5	82	30	50	10	1100



## 4. Quality Control

A lack of automation — and real-time data — is also where Excel will let you down when it comes to quality control. If you have to remind yourself to spam that F9 key, it's all too easy not to notice when issues arise.

“Unless you've been refreshing constantly, you may have missed that production started drifting off maybe two hours ago,” Hans says.

“Quality control is better with automated alerts, but in Excel, you might not catch deviations until it's too late.”

Being able to track deviations in real-time with automated alerts allows operators and managers to oversee multiple data sources and respond quickly to any issues. Automated alerts not only let you know when something goes wrong but can follow a structured series of escalations to deal with the problem.

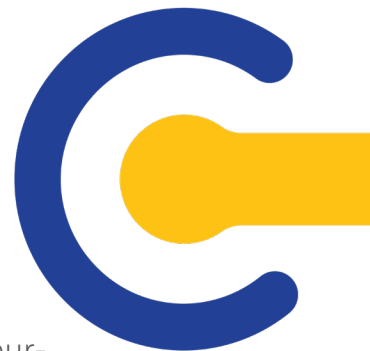
Digital TARP is designed specifically for this. Part of the MPA software suite, it tells you when a deviation occurs and activates the appropriate TARP. You can configure the app with standard response actions for common problems and the software will recommend the correct action response to fix them.

## 5. Downtime Reporting

Using Excel for downtime reporting can demand a constant and labour-intensive string of custom calculations, each of which invites human errors.

“If you don't have a dedicated delay accounting software, you need to set up your own calculations to determine when a conveyor went down,” Hans says.

Delay accounting software such as AVEVA Production Management or RtDuet automatically captures any downtime events and provides standardised reports that allow operators to easily identify where frequent failures occur. Built-in diagnostic capabilities can then inform decisions around resource



or capital funding allocation and maintenance. Even better, insights from the software can help shape predictive maintenance by helping managers understand and address the root causes of equipment failures.

## Is it time for your plant to let go of Excel?

Excel is still a great tool and offers a straightforward fix for a range of plant operations. But software has come a long way in the past few years, with platforms built specifically for mineral processing plants now making it easy to keep track of essential processes and data.

Adopting these more sophisticated tools improves real-time data handling, automates manual processes, and ensures accuracy for complex tasks like production and downtime reporting, metal accounting and quality control. To put it simply — these software platforms not only mean your job will get easier, but you'll also be able to optimise your plant and have consistent control over maintenance and throughput.





# Asset Performance Management

Special Feature



# Maximise Uptime, Minimise Costs: The Power of APM Software in Mining

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## Asset Performance Management (APM) software in mining

In the challenging landscape of the mining industry, where commodity price volatility continues to squeeze margins, the need to maximise operational efficiency is not just a goal; it's a necessity. Every hour of unplanned downtime translates to lost revenue—a reality that senior management and maintenance teams grapple with constantly. This perpetual pressure to address downtime can be overwhelming, but there is a solution that can bring relief.

This article delves into the pivotal role of asset management in mitigating downtime and optimising costs within the mining industry.

We'll explore the concept of Asset Performance Management (APM) software and how solutions like Aspen Mtell®, offered by AspenTech, a trusted partner

of Mipac, can bring a sense of relief to senior management and maintenance teams.

With APM software, mining companies gain the power to make data-driven decisions that ensure peak operational performance, putting them firmly in control of their operations and instilling confidence in their ability to prevent downtime.

## The high cost of downtime

### A mining achilles heel

Imagine this scenario: a crucial conveyor belt malfunctions mid-extraction, grinding production to a halt. The domino effect is immediate – lost productivity, delayed shipments, and a significant dent in the bottom line. Downtime in mining is a constant threat, and its impact can be staggering.

Consider this: the cost of unplanned equipment downtime in the mining sector can often soar to staggering heights, exceeding USD 1M an hour. This eye-watering figure, which can vary depending on the scale and nature of the operation, serves as a stark reminder of the significant financial burden that downtime can impose.

Beyond the immediate financial losses, downtime has a ripple effect throughout the entire mining ecosystem. Delayed deliveries can damage client relationships and erode trust. Additionally, the pressure to ramp production quickly after an outage can lead to safety hazards and further compromise equipment.

## The price of neglect

### When reactive maintenance backfires

While downtime is a critical concern, the opposite extreme – neglecting preventative maintenance due to cost pressures – is equally dangerous. Reactive maintenance, where repairs are only made when equipment fails, can have catastrophic consequences.

Firstly, reactive repairs are often more expensive than scheduled maintenance. Components that have reached the point of failure are more likely to require

complete replacement instead of a timely intervention that could have extended their lifespan.

Secondly, a reactive approach significantly increases the risk of catastrophic failures. Imagine a primary pump failing during a critical extraction process. This leads to significant downtime, poses potential environmental hazards, or even endangers personnel safety. This is where the proactive approach of APM software can make a crucial difference.

The key lies in striking a balance – proactively managing assets to prevent downtime while optimising maintenance costs. This is where Asset Performance Management (APM) software in mining comes into play.

## Enter APM software in mining:

### Data-driven decisions for optimal performance

APM software is a comprehensive solution for the mining industry. It surpasses traditional Computerised Maintenance Management Systems (CMMS) by leveraging data analytics and predictive modelling to optimise asset health.

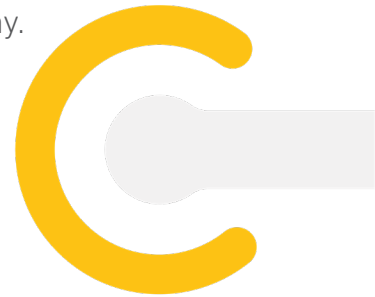
Here's how APM software empowers mining companies to achieve operational excellence:

#### Real-time monitoring

APM systems collect real-time data from sensors embedded throughout the mining infrastructure—from conveyor belts and crushers to pumps and processing plants. This data provides a holistic view of asset health, allowing for early detection of potential issues.

#### Predictive maintenance

APM software in mining doesn't just monitor; it predicts. By analysing historical data, sensor readings, and operating conditions, it can foresee equipment failures before they occur. This proactive approach empowers maintenance teams to schedule interventions, preventing costly downtime and extending asset life. It also reassuringly informs them about the software's effectiveness and makes them feel more in control.



**Data-driven decision making**

APM software provides valuable insights that senior management can leverage to make informed decisions regarding maintenance strategies, resource allocation, and budgeting. Management can prioritise

maintenance activities and optimise resource allocation by understanding the true health of their assets and the potential impact of different scenarios.

**Aspen Mtell®, a solution from AspenTech**, Mipac’s trusted partner, is a prime example of how APM software empowers the mining industry. Aspen Mtell® offers a comprehensive suite of tools specifically designed to meet the unique challenges of mining operations.

Here are some of the key features of Aspen Mtell® that make it a valuable asset for mining companies:

**Integration with existing systems**

Aspen Mtell® integrates with existing mine management systems, including CMMS and process control systems. This eliminates manual data entry and ensures a unified view of operational data.

**Advanced analytics and diagnostics**

Aspen Mtell® utilises advanced analytics and diagnostics to identify trends, predict equipment failures, and optimise maintenance schedules.

**Mobility and collaboration**

The solution offers mobile access, allowing maintenance personnel to access real-time data and collaborate remotely, enhancing operational efficiency and response times.



**Beyond cost savings: the broader benefits of APM**

While the cost-saving benefits of APM software are undeniable, the value proposition extends far beyond reducing downtime and maintenance expenditures. Here are some additional advantages:

### **Improved performance and user experience**

APM tools provide deep insights into application performance, pinpointing bottlenecks and slowdowns that impact user experience. By proactively identifying and resolving these issues, organisations can ensure applications run smoothly and deliver a positive user experience, increasing customer satisfaction and loyalty.

### **Proactive problem detection and prevention**

APM goes beyond reactive troubleshooting by enabling proactive monitoring. Analysing historical data and identifying performance trends can flag potential problems before they significantly impact users. This proactive approach allows for preventative maintenance and minimises the risk of major outages.

### **Improved decision making**

The data collected by APM tools provides valuable insights into application health and user behaviour. This data can inform strategic decisions, such as resource allocation, capacity planning, and application development roadmaps.

### **Greater business agility**

Organisations can respond more effectively to changing business needs by ensuring applications are performing optimally. APM empowers businesses to adapt and innovate quickly, maintaining a competitive edge in today's fast-paced environment.

## **Summary**

APM is not just about cost savings. It's about revolutionising the way businesses operate.

By harnessing the power of APM, organisations can optimise application performance, enhance user experience, streamline operations, and make data-driven decisions that drive positive business outcomes.

This transformative potential of APM should inspire and excite mining industry professionals about the future of their operations, sparking a sense of anticipation and enthusiasm.





# Maximising production: How asset reliability drives mineral processing excellence

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## Asset reliability in mineral processing

Asset reliability is the bedrock of operational excellence in mineral processing. This article explores its benefits and essential metrics and equips you with practical strategies to build a robust program. By implementing these strategies, you, the on-site maintenance professional, can significantly boost production uptime and efficiency, inspiring your team with the results.

## Why asset reliability matters

In the high-pressure world of mineral processing, reliable equipment is the backbone of smooth operations. Here's how a strong asset reliability program directly impacts your team's success:

## Boosted uptime

Minimise breakdowns and keep equipment running at peak performance through preventive and predictive maintenance techniques.

## Reduced costs

Costly repairs and production loss due to equipment failures become a thing of the past. Proactive maintenance identifies and addresses potential issues before they escalate.

## Enhanced worker safety

Unreliable equipment poses safety hazards. Asset reliability practices create a safer work environment for your crew

## Smarter asset management

Move beyond reactive “fix-it-when-it-breaks” maintenance. Leverage technologies like predictive maintenance (PdM) to analyse sensor data and anticipate failures before they occur. This allows for targeted interventions, maximising equipment lifespan and optimising resource allocation.



# Understanding key concepts

## Asset reliability vs. asset availability:

Reliability refers to an asset’s ability to perform consistently without failure.

Availability is a broader concept that considers reliability and the time it takes to repair a failed asset. High reliability contributes to high availability, but they are not the same.

### **Mean Time Between Failure (MTBF) and Mean Time to Repair (MTTR):**

MTBF is a statistical measure of the average time between equipment failures. MTTR is the average time to repair a failed asset and get it back in operation. Both are crucial for understanding asset performance and planning maintenance activities.

## **Building a world-class asset reliability program**

Here are essential practices to implement on-site:

### **Preventive Maintenance (PM):**

Develop a customised PM program for each asset based on historical data and manufacturer recommendations. This significantly reduces equipment failures.

### **Predictive Maintenance (PdM):**

Predictive Maintenance (PdM): Utilise techniques like vibration analysis, oil analysis, and thermography to identify equipment degradation before failures occur. Analyse data trends to schedule targeted maintenance activities.

This is where software solutions like Aspen Mtell® can be used to enhance asset reliability and performance with early warnings and real-time actionable insights, paving the way to operational excellence.

### **Reliability-Centered Maintenance (RCM):**

This methodology analyses equipment functions, failure modes, and consequences to develop an optimised maintenance plan. Data on failure history and criticality is essential for RCM implementation.

### **Root Cause Analysis:**

Analyse past equipment failures to identify underlying causes and prevent

recurrence. Data on failure events, operating conditions, and maintenance history aids in identifying root causes.

### **Continuous improvement:**

By continuously monitoring and improving your asset reliability program, you are fostering a culture of excellence and innovation. Data analysis helps identify trends, track KPIs, and measure the effectiveness of implemented strategies, inspiring your team to strive for continuous improvement.

## **Challenges and overcoming them**

### **Budget constraints:**

Focus on cost-effective practices like PM optimisation and data-driven maintenance decisions. Prioritise critical assets and implement PdM for early problem detection to avoid costly failures.

### **Skilled labour shortage:**

Implement knowledge transfer programs and train existing personnel on PdM techniques and data analysis—partner with external service providers for specialised tasks.

### **Data overload:**

Focus on collecting and analysing relevant data using a structured approach. Utilise CMMS (Computerised Maintenance Management System) software to manage and integrate data from various sources. This allows for data-driven decision-making without relying solely on expensive software solutions.

### **Aging infrastructure:**

Older assets are prone to failures, requiring frequent maintenance, parts replacements, and total overhauls. Continued maintenance could work, but it would only be a band-aid solution. Modernising the infrastructure is the better path to choose and will require comprehensive resource planning for asset replacement or refurbishment.

### **Resistance to change:**

Shifting from reactive to proactive maintenance cultures is quite formidable

because of entrenched practices and mindsets. Open communication, sincere engagement, and adequate training and support can help frontline workers accept the changes. These also facilitate smoother transitions.

## The future of asset reliability

The future of asset reliability is bright, with emerging technologies offering even greater possibilities:

### **Advanced analytics and Machine Learning (ML):**

Implementing these techniques can provide deeper insights from data, predict failures with higher accuracy, and optimise maintenance strategies.

### **Integration of IoT (Internet of Things):**

Sensors embedded in equipment can provide real-time data for continuous monitoring and proactive maintenance.

### **Digital twins:**

Creating digital models of plant assets can allow for the simulation and optimisation of maintenance strategies.

## Summary

By focusing on these practical strategies and effectively leveraging data, even without the latest software, you and your team can significantly improve asset reliability, driving production excellence in your mineral processing operations. Now, it's time to implement these insights and start reaping the benefits of a robust asset reliability program.



# Keeping the ore flowing: user-friendly APM tools for processing plants

## A guide to APM tools for processing plants

### Snapshot

Forget scrambling to fix breakdowns. The latest asset management (APM) tools are here to help. These new solutions are:

- **Easy to use:** No more data science degrees required! Designed for processing managers like you, these tools are a testament to your capabilities. They make APM accessible, empowering you to take control of your operations.
- **Packed with benefits:** Move from reactive repairs to predicting and preventing equipment failures. With APM tools, your workforce can access real-time data and make data-driven decisions, empowering them to take control of maintenance. This can lead to improved

efficiency and optimised inventory, and also foster a sense of ownership and engagement among your team.

- **Tailored for you:** From cloud-based systems to mobile maintenance apps, a user-friendly APM solution is designed to fit your processing plant's unique needs. This adaptability ensures that you feel understood and valued, knowing that your specific challenges and requirements are being addressed.



## Embrace the APM revolution and keep your ore flowing smoothly!

For processing managers and superintendents in the mining and mineral processing industry, the relentless hum of equipment signifies the sound of success. Every crusher, conveyor, and mill plays a vital role in transforming raw ore into a valuable product. However, an equipment failure can instantly disrupt this harmonious performance, leading to a cacophony of lost production, frustrated workers, and dwindling profits.

The good news? You don't have to conduct your operations on a knife-edge. Implementing a robust Asset Performance Management (APM) program, which includes a user-friendly dashboard that consolidates all your equipment data and a predictive maintenance algorithm that alerts you to potential issues, can be your conductor, ensuring equipment runs smoothly.

## The evolution of APM:

### No longer a maze, but a clear path to operational excellence

The mining and mineral processing industry has traditionally relied on reactive maintenance strategies – waiting for equipment to fail before taking action. This approach is akin to conducting an orchestra by ear, hoping for the best but often facing disastrous consequences.

The advent of APM offered a more proactive approach, allowing processing plants to anticipate and prevent failures. However, earlier APM systems were often complex, siloed, and required significant technical expertise.

This left many processing managers and superintendents feeling like they were staring at a tangled mess of wires, unsure where to begin.

## The rise of user-friendly tools and software

Thankfully, the landscape of APM has undergone a dramatic shift. A new generation of user-friendly tools and software is making it easier than ever for processing plants to leverage the power of APM. These solutions are designed with the specific needs of the mining and mineral processing industry in mind, offering intuitive interfaces, pre-configured workflows, and out-of-the-box functionality.

### From reactive to predictive:

It is critical to shift from a reactive “fix-it-when-it-breaks” mentality to a predictive approach that anticipates and prevents failures. Modern APM software utilises sensor data, historical trends, and machine learning algorithms to predict potential equipment issues. This allows for proactive maintenance, minimising downtime and maximising equipment lifespan. optimisation of maintenance strategies.

### Taming the data deluge:

Processing plants generate vast data from sensors and equipment. But without proper organisation and analysis, this data becomes an overwhelming



deluge, rendering it useless. Modern APM systems act as data wranglers, collecting, cleansing, and analysing sensor data to provide actionable insights. These insights can then be used to optimise maintenance schedules, identify equipment at risk of failure, and improve overall process efficiency.

### **Bridging the skills gap:**

The mining industry needs more skilled maintenance personnel. APM solutions can bridge this gap by automating routine tasks like data collection and reporting. This frees up valuable time for experienced technicians to focus on complex repairs and troubleshooting. Additionally, APM systems can provide technicians with step-by-step instructions and access to historical data, empowering them to work more effectively.

### **Optimising inventory management:**

Ensuring you have the fitting spare parts when equipment failure strikes is crucial for minimising downtime. However, maintaining a bloated inventory can be a significant financial burden. Modern APM software helps optimise inventory levels by analysing historical maintenance data and predicting future needs. This allows processing plants to maintain a leaner inventory while ensuring they have readily available critical parts.

## **The power of user-friendly tools**



### **Unlocking the benefits of APM**

By embracing user-friendly APM tools and software, processing managers and superintendents can unlock a host of benefits:

#### **Predictive maintenance:**

Move from reactive repairs to proactive interventions, maximising equipment uptime and lifespan. Imagine having a conductor who can hear the first notes of a malfunction and adjust the tempo to prevent a complete breakdown.

#### **Data-driven decision making:**

Gain real-time insights from sensor data to optimise maintenance strategies and resource allocation. No more flying blind – you'll have the data to make informed decisions about your maintenance program.

### **Improved workforce efficiency:**

Empower your maintenance team with the tools and information they need to work smarter, not harder. APM systems can automate tasks, provide technicians with real-time data, and streamline workflows.

### **Reduced inventory costs:**

Optimise spare parts inventory based on predicted maintenance needs. No more money tied up in unnecessary parts, and no more scrambling to find the critical component you need during a breakdown.

## **The user-friendly revolution**

### **A paradigm shift in processing plant maintenance**

Adopting user-friendly APM tools signifies a paradigm shift in processing plant maintenance. No longer the exclusive domain of data scientists and engineers, APM is becoming accessible to processing managers and superintendents at all levels. This democratisation of APM empowers plant personnel to take ownership of their equipment's health, fostering a culture of proactive maintenance and continuous improvement.

## **Beyond the basics**

### **Unveiling the potential of APM tools for processing plants**

The benefits outlined above are just the first movement in the symphony of advantages offered by user-friendly APM solutions. Let's delve deeper into the transformative potential of these tools:

### **Unleashing the power of IIoT:**

Industrial Internet of Things (IIoT) sensors are rapidly becoming ubiquitous in processing plants. These sensors collect real-time data on equipment vibration, temperature, and performance metrics. User-friendly APM software interprets this data, translating the raw sensor readings into actionable insights.

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### **The rise of machine learning and predictive analysis:**

Modern APM systems leverage the power of machine learning algorithms to analyse vast amounts of historical data and sensor readings. These algorithms can identify patterns and predict potential equipment failures with ever-increasing accuracy. This allows processing plants to move beyond simple preventative maintenance schedules and implement predictive maintenance strategies.

### **Data overload:**

Focus on collecting and analysing relevant data using a structured approach. Utilise CMMS (Computerised Maintenance Management System) software to manage and integrate data from various sources. This allows for data-driven decision-making without relying solely on expensive software solutions.

### **Mobility for maintenance management:**

Gone are the days of technicians being chained to their desks. User-friendly APM solutions offer mobile applications that allow maintenance crews to access real-time equipment data, work orders, and maintenance history directly from the plant floor. This mobility empowers technicians to work more efficiently, diagnose problems faster, and complete repairs quicker.

## **The user-friendly toolbox**

### **A glimpse into available solutions**

The world of user-friendly APM is brimming with innovative solutions designed to meet the specific needs of the mining and mineral processing industry. Here are a few examples:

### **Cloud-based APM systems:**

Cloud-based APM solutions eliminate the need for expensive on-premise hardware and software. These solutions are typically offered on a subscription basis, making them accessible to processing plants of all sizes. Cloud-based systems also offer the advantage of scalability, allowing processing plants to add or remove functionality as their needs evolve quickly.

### **Work order management software:**

Streamline your maintenance workflow with work order management software. These systems allow you to create, track, and manage work orders electronically, ensuring that no critical maintenance task falls through the cracks. Imagine a clear and concise program for each musician, ensuring everyone knows their role and executes it flawlessly.

### **CMMS integration:**

Many user-friendly APM solutions integrate seamlessly with existing Computerised Maintenance Management Systems (CMMS). This integration ensures all your maintenance data is centralised and accessible, fostering better decision-making and improved overall maintenance efficiency.

## **Summary**

### **Unlocking processing plant excellence**

By embracing user-friendly Asset Performance Management (APM) tools, processing plant managers and superintendents can navigate the path to production success.

These solutions empower you to:

- Minimise downtime and maximise equipment uptime.
- Optimise maintenance strategies and resource allocation.
- Improve workforce efficiency and empower your maintenance team.
- Reduce inventory carrying costs.

The result? A processing plant that operates at peak performance, delivering a harmonious blend of increased productivity, profitability, and safety. The user-friendly APM revolution is here to conduct your processing plant to new levels of operational excellence.



Operational technology  
and control systems to  
**transform** the mining  
value chain



# 27+ yrs

servicing the  
mining industry

# 720+

projects  
delivered

# 110+

site/plant  
operations

# 55+

countries around  
the world



We are very pleased with the performance of the smelter. The achievement of over 100% of nameplate capacity in just three months from startup is unprecedented. It is a credit to the design and project teams, and illustrates the strong capabilities of the whole Mipac team.

**Chairman and CEO**  
Leading North American  
Mining Company



At Mipac we go  
*beyond the solution*

## From Expertise to Innovation: Mipac's Proven Mining Solutions

At Mipac, we bring decades of hands-on experience and best practice technology to every mining, metals, and minerals project. With a strategic presence around the globe, we support our clients in addressing industry challenges like rising energy costs, declining ore grades, and the need for sustainable operations.

By leveraging global expertise in process automation, operational technology, and mineral processing, we're not just solving problems – we're driving performance.

Whether it's optimising legacy systems, improving data quality, or implementing next-generation digital technologies, our approach is tailored to deliver cost-effective, high-impact solutions.

With established relationships with industry leaders such as Anglo American, Glencore and First Quantum Minerals, we understand the evolving needs of mining operations and are well-positioned to help you increase productivity, reduce operational costs, and optimise performance.

Our team is committed to transforming operations through automation, digitalisation, and workforce development, ensuring that your operations are prepared for the future of mining.

**Count on Mipac as your trusted advisor, delivering proven solutions that make a difference – locally and globally.**

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