



## The Future of Mining: Informed by Industrial IoT

Digital Transformation and Data Analytics Are Key to a Cleaner, Safer and More Efficient Mining Sector

**ANALYTICS TURN DATA INTO INSIGHTS**

**The mining industry is being driven toward digitization by a range of challenges and forces. Ore grades are declining as international competition increases. Demand for commodities is sustained and operating costs are higher than ever, while prices are volatile. Digital disruption cannot be ignored.**

Smarter productivity must be a top priority.

The Austmine 2019 conference's strong focus on data, analytics and innovation was timely. The time has come for data to be used as a strategic asset in the effective and competitive management of all businesses and to drive innovation that challenges the industry status quo.

Increasingly, the mining sector will be informed by the industrial internet of things (IoT), providing even more opportunity for data collection. Unanalyzed data adds no value, but insights gained from data will fuel innovation.

Insights developed from mining operations data will be used to enhance asset productivity, ensure wise and efficient use of resources, reduce costs and improve throughput while managing health and safety requirements.

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# Digital Transformation Informed by Subject Matter Experts

Years of mining knowledge, learnings and expertise cannot suddenly be replaced by a computer rack. The most satisfying results happen when a subject matter expert with decades of experience suddenly sees in the data what he or she instinctually felt was occurring, and can now confidently instruct the business to act upon it.

There are many roles within any mining operation that are stretched across numerous tasks, with individuals often in fire-fighting mode and relying on instinct and experience to make day-to-day decisions. Data analytics will help mining companies identify efficiencies and opportunities for productivity gains so funds and key personnel can be re-allocated to support a focus on innovation.

Instead of having a process engineer reading dials and relaying information to operators, that task can be automated, and data as well as insights can be presented to the operators through a user-friendly dashboard. The process engineer's time and energy are better spent on more rewarding work, helping to make the most of raw materials usage and refinery processes.

The smartest organizations see advanced analytics as a way to validate, through data science, the intuition of their best and brightest. They see productivity gains and technology solutions like automation and analytics as a means to free up their people's time to focus on higher value contributions.

## Three Ways To Improve Mining Operations With Data Analytics

Working with your technology partners to apply data analytics to your operations can help asset-heavy industrial verticals realize extensive operational gains in at least three key areas:

1. Productivity
2. Safety
3. Sustainability





## EXAMPLE

### Optimize Maintenance for Productivity and Savings

The preventative maintenance of heavy machinery and mining equipment is critical to improving asset productivity. Small gains in asset productivity can provide huge financial gains to your business. With powerful multidimensional analysis, companies can compare combinations of data in new ways, to yield insights that wouldn't otherwise be evident and match maintenance to need and predictable patterns.

Caterpillar Marine uses predictive analytics powered by Hitachi Vantara's Pentaho, a platform for data integration, orchestration and business analytics, to efficiently manage water-borne assets for its industrial fleet customers.

For one shipping company, Caterpillar Marine's investigation of a \$35,000 problem resulted in a \$6.4 million gain.

Every two years, the shipping company was cleaning the hulls on its fleet of eight ships to remove barnacles, seaweed and so forth, at a cost of \$35,000 per ship. Management started questioning what value they were getting from this routine. After analyzing historical fuel use data, what they found out was surprising. The drag on the ships, resulting from dirty hulls, was costing the shipping company \$1.3 million per vessel in poor fuel efficiency every two years.

More frequent cleaning was required. Further data analysis overlaid trend lines of cleaning costs with the penalty of fuel inefficiency, and identified the intersection point. The optimal schedule was six hull cleanings every two years. The result was improved productivity and produced a net cost savings of more than \$800,000 per ship.



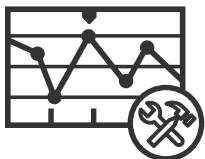
## EXAMPLE

### Predictable Pattern Improves Productivity and Safety

Maintenance of heavy assets is not just about productivity. Unplanned outages can have a big impact on safety at the worksite, which effects everyone. One of Caterpillar Marine's industrial fleet customers was experiencing fuel pump failures across its fleet of tug boats every two to three months, leaving boats suddenly dead in the water. Not only did this create the potential for disgruntled clients and loss of repeat business, but also, when this outage happened during the movement of a large vessel in port, the situation became very dangerous.

Data analysis revealed that each fuel pump's pressure started to decline about seven days before it failed, and the rate of decline accelerated about four days before it finally died. Now the company had a predictable pattern.

It set company sensors to monitor for this pattern and scheduled maintenance accordingly, during planned downtime. Using trending information to predict the failure of a single part – the humble, but critical fuel pump – saved that shipping business \$35,000 per boat in annual maintenance costs. It reduced the risk of customer loss due to downtime and improved the safe working conditions of its operators.



## EXAMPLE

### Process and Resource Usage Improvements Support Sustainability

One mining outfit engaged Hitachi Vantara to help improve handling and processing.

The project began with an examination of one process at a time, looking at how each one impacts on processes both up and downstream. As often happens with these types of projects, there was no need to ask the mine to invest in new sensors or other equipment for data collection: it was already storing and collecting all the data it needed.

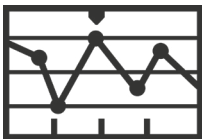
Data analysis identified subtle differences in how crews were configuring equipment and responding to events that, together, were causing a negative effect on overall throughput. Some of the crews were achieving better throughput than others, but looking at each one separately was never going to get the best result.

Analyzing a significant amount of data across all crews at a granular level highlighted inefficiencies that people who are focused on succeeding within their stage in the process could not identify.

These weren't major spikes in performance, but subtle variances that had a compounding impact over time. Find and fix the configuration variances that are causing the issue, and with each crew set up you can add incremental improvements in overall productivity and throughput.

Even a 2% increase in productivity could be worth a million dollars a month.

Improving processing and handling systems means you can maximize output with minimal resource intensity. Using the minimal amount of high-grade resource to fill an order will have a direct correlation to the longevity, and sustainability, of any mine.





## The Future of Mining Is Already in Progress

Today's mines and mining companies are data-rich environments. Like many organizations around the world, mining companies are struggling with the amount of data they have. They are trying to figure out not only how and where to store it all, but also what to do with it.

Finding value in the data you have requires modernizing your data management strategies and analytics capabilities, but organizations need not speculatively invest in new data-gathering equipment and solutions. Most mining organizations have years of structured and unstructured data in silos across the business, just waiting to be categorized and assessed for use. And they are collecting new types of data from sources such as sensors, drones and other industrial IoT devices.

**You already have the data you need** to support specific business objectives. The majority of easy gains in productivity in mining have been made, but opening up the data for analysis delivers those hard-to-get 3-5% gains across the most important measures of your business, which can have a profound effect in delivering:

- Improvements in overall asset productivity.
- Increased individual process throughput.
- Reductions in external resources such as water and chemicals.
- Reductions avoidable health and safety incidents.

Analyzing the data you are already storing and collecting will help you improve your operations, plus support faster and better-informed decision-making to achieve business goals and drive innovation.

**The things that data analytics makes possible are not “sci-fi futuristic” but rather near-future realities.**

Existing comprehensive, integrated data analytics solutions and platforms can:

- Leverage the speed, capacity and automation of artificial intelligence (AI) and machine learning without demanding that every user knows how to code.
- Represent your data sets as visualizations and models so they are easy to digest, understand, share and use.
- Rapidly analyze reams of real-time data, to a granular level, to identify things human analysts would never find on their own.
- Scale across your whole operation and along the supply chain.
- Leverage the knowledge of your own subject matter experts, as they guide the questions you ask of your data, identify relevant data sets and sources, and inform development of the algorithms that are used to mine your data.
- Package your data into insights you can actually use.
- Deliver the resulting insights into the hands of people who need to make day-to-day operational decisions, as well as long-term planning decisions.

It's doable. It's happening. It's already in progress.

# Connect Operational Technology With Information Technology

**Hitachi's origins are in mining.** In Japan, in 1910, the company's first product was an induction motor developed for use in copper mining. Many in the mining sector would associate Hitachi with machinery, equipment and vehicles. That's the operational technology (OT) side of a huge organization with many different companies. **Hitachi Vantara** is the part of the business that focuses on IT or information technology, including analytics.

Thanks to Hitachi's 100+ years of heritage in OT, Hitachi Vantara's 60+ years in IT and our comprehensive analytics capabilities, Hitachi is uniquely positioned to help mining companies achieve maximum asset productivity, with a focus on health and safety, using minimal resources.

Hitachi has dedicated significant investment, more than \$800 million, in social innovation and mining innovation in Australia. We support digital transformation through long-term co-creation and social innovation with our clients. We use our diverse group company capabilities to partner with Australian mine operators to help find innovative and effective solutions to meet industry challenges.

The near future of mining will be built on advancements in operational technology, connecting the OT with IT, and turning captured data into insights to support and inform mining innovation.

## Harnessing Data Analytics: Five To-Do's

What leaders in the mining sector are going to do with data, thanks to analytics and the insights gained from their data ... *that* will be innovative.

**To make data analytics work for your business, you'll need to:**

- 1. Use the data you've been amassing for years,** in new ways. Structure and leverage the data you have been storing, but not actually using.
- 2. Incorporate the new data types your organization is actively generating.** Leverage the data you can and should be collecting from the modern and connected machinery and equipment in which you've invested.
- 3. Analyze an appropriate blend of your data enriched with other relevant data sets,** such as transactional or supply chain data, machine performance specifications from the manufacturer, weather pattern information, GPS data and more.
- 4. Deliver timely insights to the point of impact** to enable decision-makers to make sense of them and act upon them.
- 5. Modernize your data management infrastructure, governance and strategies** for the IoT, machine learning and AI era.

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