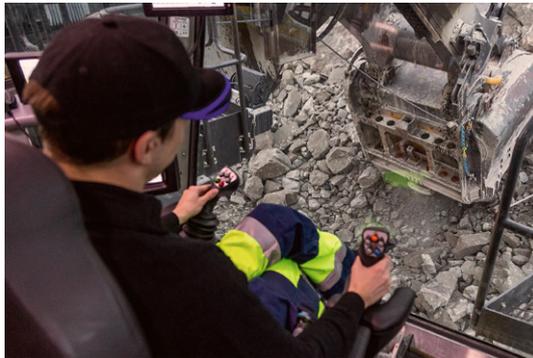
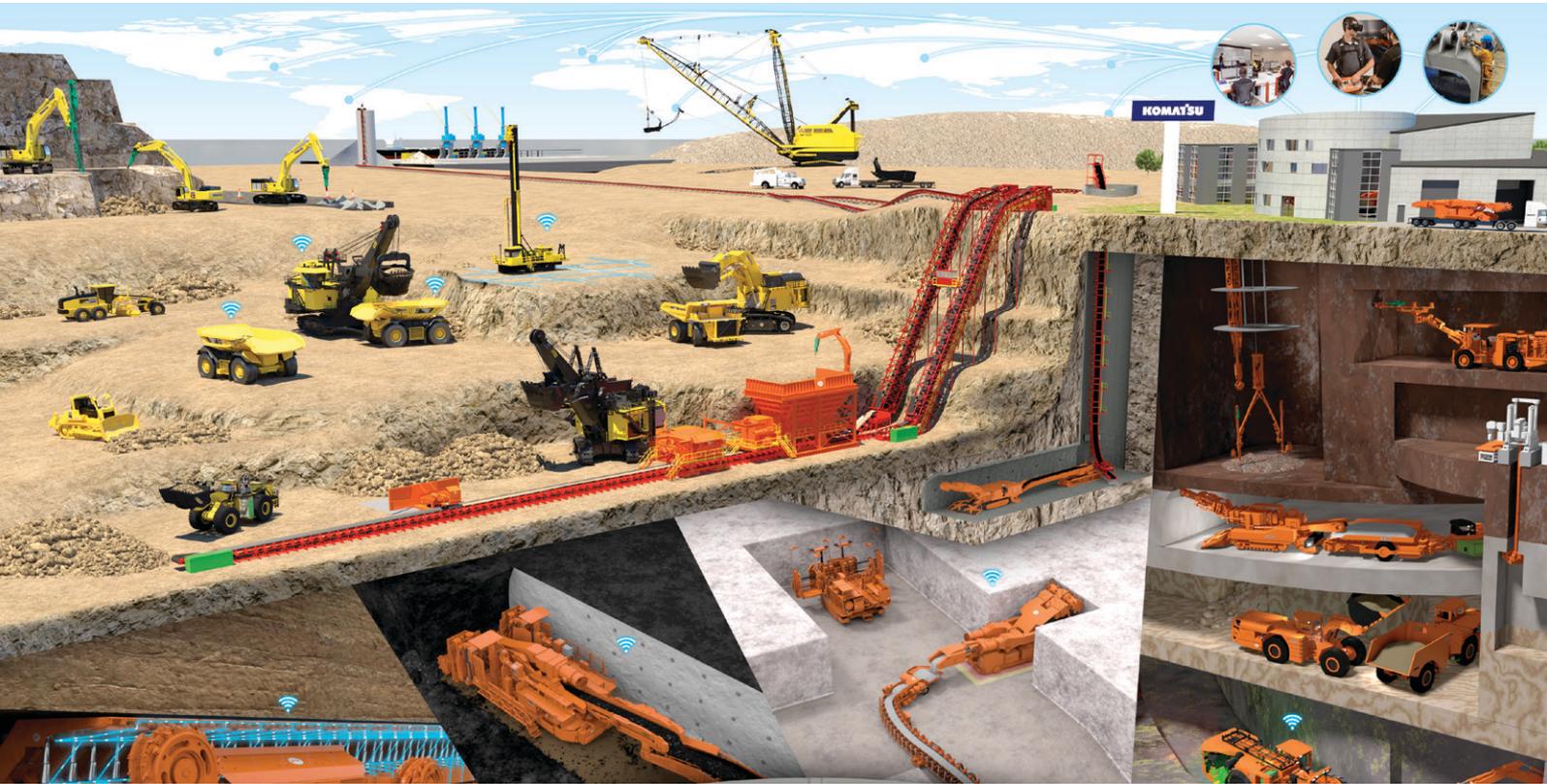


KOMATSU

Smart Solutions





Smart Solutions

The mining industry is changing rapidly due to the need to improve efficiency, reduce costs and increase safety. With these challenges in mind, Komatsu is helping bring mining performance to the next level.

Optimising mine performance to achieve the lowest cost per ton and enhance safety is now more achievable than ever – thanks to the increasing amount of data and information available in real-time. At Komatsu, we're leveraging the Internet of Things (IoT) to rapidly increase onsite insights, powering data-based decision making essential to today's modern mining operation.

Our Smart Solutions teams collaborate with management and onsite personnel to determine the best mix of equipment, services, training, technology, monitoring and data analytics options to create value. Solutions offerings are customised to each customer's specific needs and designed to deliver the lowest cost per metric tonne in alignment with customers' financial and operating goals.



"The ability to have the right part and right person in the right spot, or make an operational decision across a fleet, has significant impact to operations that measure downtime in tens of thousands of dollars an hour. Every second counts and we aim to help customers avoid unplanned downtime while safely maintaining production targets."

Michael Rikkola
Director of Analytics



Komatsu's mining products now stream more than 60,000+ data points per second

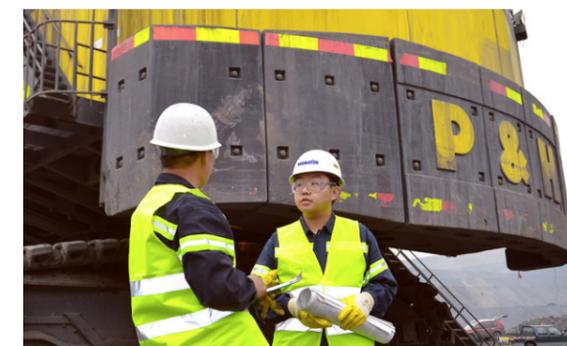
Smart products

The amount of data flowing off connected mining equipment has grown significantly in recent years. Komatsu's mining products now stream more than 60,000+ data points per second, more than double what was measurable just a few years ago. In the next five years, it's anticipated that number will grow to half a million data points per second. Starting with a foundation of best-in-class Dantotsu (unrivaled) Products that can be programmed for specific operation conditions, we then leverage data insights to further optimise performance and reduce unplanned downtime.



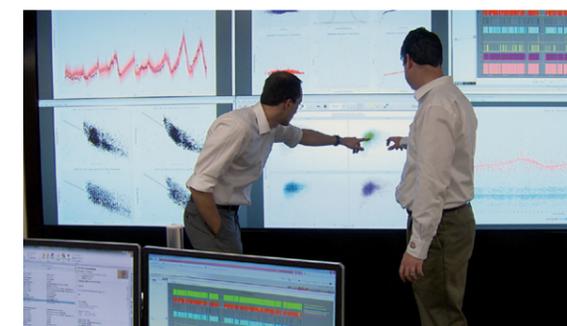
Global service network

With a focus on safety first, we provide essential services to maximise availability, prolong machine life, optimise performance and help customers tap into the advancing capabilities of connected products. Working hand-in-hand with mine site crews, our teams help implement technologies and services to consistently help improve mining operations. From technical and field service teams to life cycle management and monitoring, our wide range of service offerings can be customised to directly address customer needs.



Advanced analytics and processes

Smart Solutions leverage connectivity, big data, high-speed computing and advanced analytics to optimise performance in real time. To accurately predict machine behaviour, there must be an understanding of what normal looks like. Customised models, known as digital twins, are built unique to each machine and the conditions they are in. As the conditions change, so do the models and predictions. Effective data analytics focuses on looking at abnormalities in the data from typical operation and highlighting abnormal behaviours to improve performance.





Customised Smart Solutions offerings are significantly improving productivity, cost curves and safety at our customers' mines. Here are some examples of other potential benefits:

Costs

- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimised costs for power/fuel, labour and rebuilds
- Optimising maintenance events by conducting automated machine inspections to predict component failures

Safety

- Automated processes and controls reduce the probability and/or severity of mishaps at the mining site
- Increased awareness through training and standard setting
- Minimising exposure of maintainers to high risk areas

Productivity

- Improved system availability, performance, utilisation and consistency
- Improved awareness via on-demand reports and dashboards
- Leverage extensive Komatsu engineering knowledge to solve problems



Smart Solutions at work

Data ➔ **Information** ➔ **Direction** ➔ **Results**

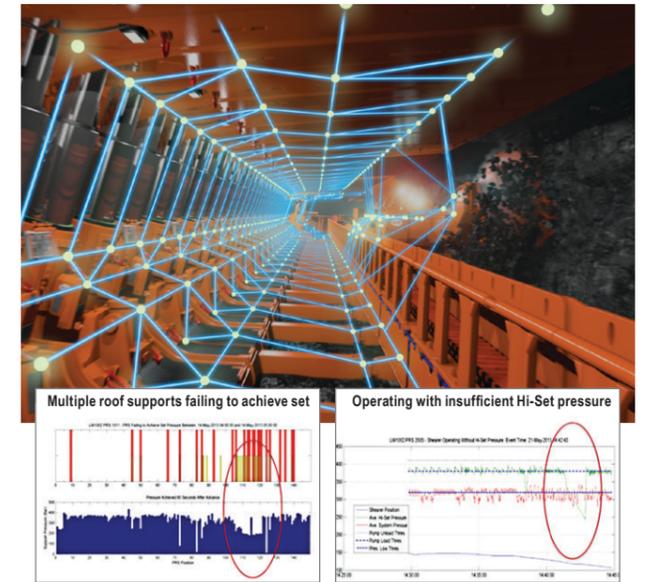
Underground mining: Joy longwall systems

Smart, connected Joy longwall systems include complex networks linked to highly sensitive gyroscopes, and thousands of sensors that are constantly reporting out on the performance and health of the system.

During operation, as the longwall system moves forward, the roof is collapsing behind it. Sensors placed in the roof supports transmit data to the surface. Complex algorithms translate the data points into visual information that can predict significant changes in operating conditions in the mine.

"In one example, the roof support data analyzed by Komatsu's algorithms detected a roof cavity forming. With advanced analytics, we were able to predict roof instability, impossible to see with the naked eye, and define the root cause for those changes. This allowed for immediate actions that impacted the overall mine productivity."

– Rudie Boshoff, Global Director – Lifecycle Management and Smart Solutions



Surface mining: P&H electric rope shovels

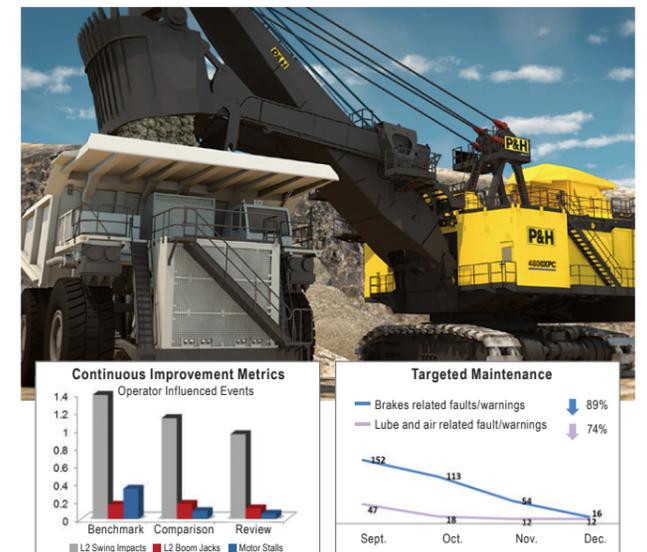
Smart Solutions team members helped a mining client reduce operator-induced damage on their fleet of electric rope shovels, avoiding additional maintenance costs, and increasing the availability and productivity of the fleet.

"Shovel operators were not aware of the damaging effect swing impacts were having on their machines. Collisions between the dipper and the bank while swinging accumulate damage in the handle structure and ultimately result in cracking that requires significant machine downtime and cost to fix."

"Using combined offerings customised as a Smart Solutions package, we were able to engage with the customer to understand how the established operating behaviours and environmental conditions combined to increase the likelihood of swing impacts. We used data from the machines to illustrate the problem. We quantified how individual collisions contributed to the overall damage observed on the machine. All this information was used to guide an operator training plan, to set targets for improvement and to monitor ongoing performance."

"By providing that visibility and understanding, we were able to achieve an annual reduction of 40% in swing impacts, reducing wear on the machines and increasing availability."

– Anthony Reid, Sr. Manager – Analytics



Dantotsu mining solutions

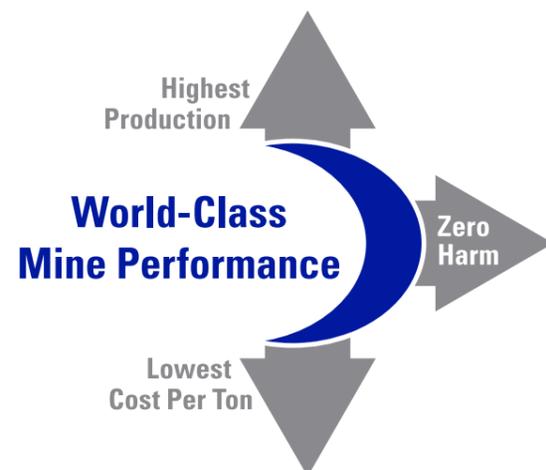
Our commitment to quality and reliability is part of everything we do, making it possible to provide the mining industry Dantotsu Products, Dantotsu Service and Dantotsu Solutions; unrivaled by any in the world. Ideas inspired by needs at the site become part of our integrated approach to research, development and design; resulting in ground breaking advancements for the mining industry, including fully automated haulage solutions, and advanced fleet monitoring and management systems.



“Komatsu analytics are man and machine working together. Computers are great at processing huge amounts of data without losing focus, so we get them to methodically sift through every piece of data to search for unusual patterns. When they find something, an experienced machine expert is at hand with product knowledge to provide the customer with a diagnostic and repair strategy”

Antoine Desmet, PhD
Analytics Manager, Smart Solutions

KOMATSU



Global network

Smart Solutions centres are strategically located around the world in order to conveniently serve our customers. With each new service centre built, Komatsu products and people are becoming more connected, allowing for expanded benchmarking.

Located strategically in zones of mining activity, each service centre brings local support that is world-class. Services offered are structured to fulfill the lifecycle of mining equipment, optimising equipment for increased availability and performance.

Our commitment to world-class service is delivered through world-class processes and metrics. We employ operational excellence by prioritising the elimination of waste, simplifying processes, automating and removing people from harm's way. We leverage those principles throughout our global network, with the ability to rapidly customise locally.

Ready to take mine performance to new levels?

Talk to our Smart Solutions team today.



Contact your Komatsu Mining service representative for more information on Smart Solutions or visit mining.komatsu

Komatsu Mining Corp. Group

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