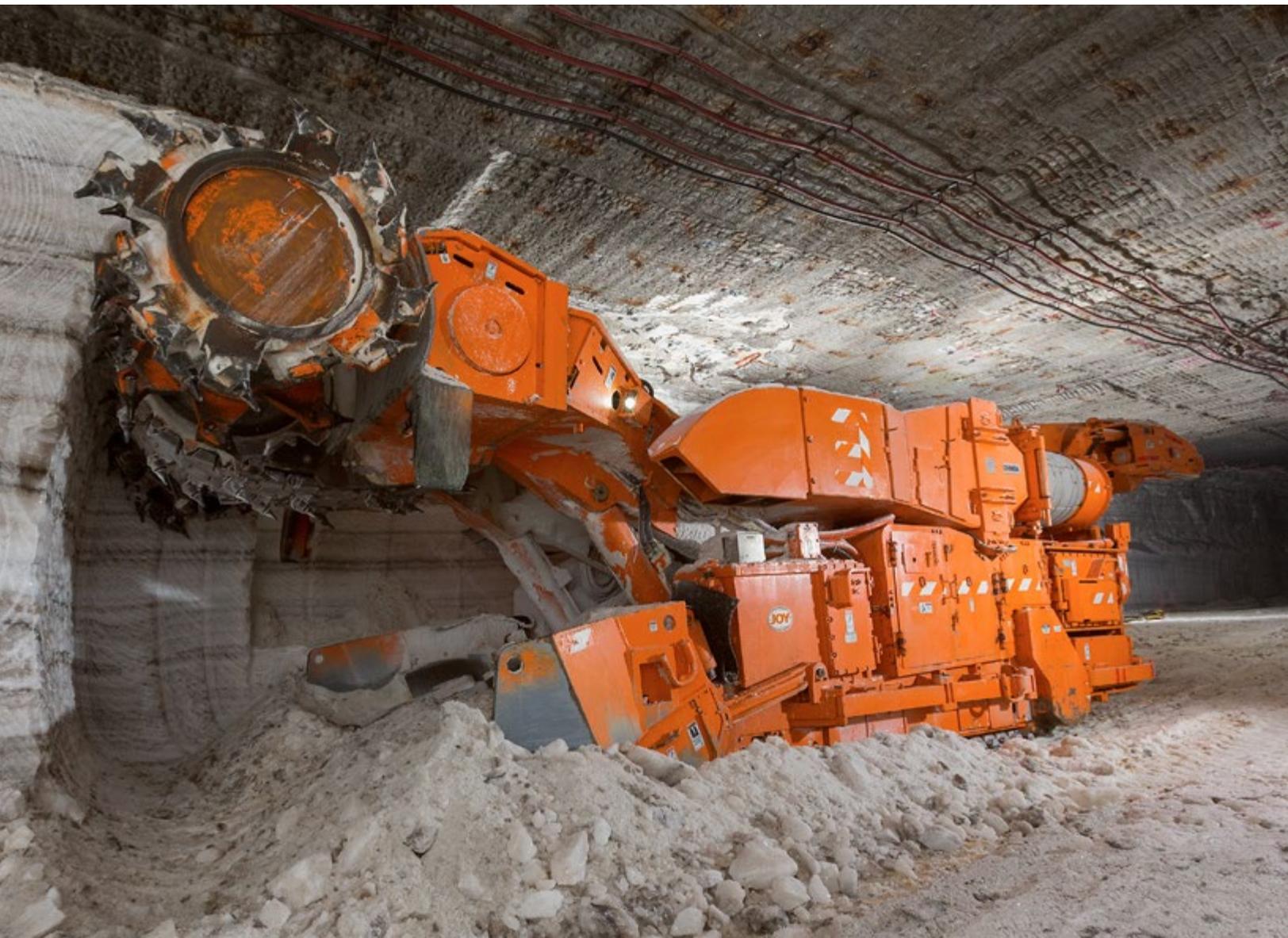


KOMATSU



12HM Series Continuous Miner Product Overview



Who we are:

Since 1921, Komatsu has stood for unrivaled quality and reliability. Our enduring global success stems from the principles of our founder, Meitaro Takeuchi, who envisioned a sustainable future built through globalization, quality first, technology innovation and talent development. These defining principles, along with an emphasis on safety and compliance, remain part of our Komatsu DNA. With each brand and company added to the Komatsu family, we expand our capabilities, leveraging our global teams to push beyond what can be done and create what can be imagined. We believe partnering directly with our stakeholders and being in the workplace (gemba) is the best way to gain insight into their challenges, win their trust and develop cutting-edge solutions.

What we do:

Komatsu is an indispensable partner to the mining, forestry, industrial and construction industries that maximizes value for customers through innovative solutions. With a full line of products supported by our advanced IoT technologies and global service network, we help customers safely and sustainably optimize their operations. Our **Komatsu, P&H, Joy and Montabert** equipment and services are used to extract fundamental minerals and develop modern infrastructure.



12HM series

For the industrial minerals market, Komatsu offers the 12HM (Heavy-duty miner) series continuous miner. Within this series is the 12HM46, the largest and most powerful drum type continuous miner manufactured. Utilizing common continuous miner components, but designed to meet specific applications, 12HM continuous miners are successfully operating in trona, gypsum, potash and salt mines around the world.

12HM continuous miners are successfully operated in mines around the world.

The basic elements of each continuous miner are similar in design, following field proven philosophies perfected by Komatsu over the years. Each machine employs Komatsu's multi-motor concept with outboard access to motors, gearcases, controllers and other major components. The philosophy calls for the isolation of major components for easier troubleshooting and maintenance. The continuous miners use individual motors with direct drive transmissions to power the cutter, traction, gathering and hydraulic systems. This permits service or repair quickly and easily, thus reducing downtime and maintenance costs.

Cutting system

As the 12HM continuous miners are the largest manufactured by Komatsu, the cutting systems have been designed to match the machine mass. This series of miners is available either with chainless 51 1/2 in (1310 mm) or 53 3/4 in (1367 mm) cutter head drum diameter or with Ripperveyor cutter head drum diameter up to 62.5 in (1588 mm). Depending on the cutter head design, the cutting horsepower can be as much as 1220 HP (910 kW - 60 minute rating). Through Komatsu's experience in this market, we also realize that all applications are different and therefore, we provide a number of different cutter bit spacing configurations.

Application specific cutting

A wide variety of cutting options...

The 12HM is available in solid head or Ripperveyor models and in drum diameters ranging from 51.5 to 62.5 in or 1200 to 1588 mm. With this availability, the cutting system can be sized to match seam conditions. Rated cutting power as high as 1220 HP (910 kW - 60 minute rating) is available within this product line.



Smartzone Proximity System

The Smartzone Proximity System is an integrated training device that helps teach personnel to operate a continuous miner from safe working zones, and to otherwise stay clear of danger zones due to the machine's tram and conveyor swing functions. Its unique ability to track, recognize and log operator movement around the machine provides an additional layer of analysis for in depth training initiatives. The Smartzone Proximity System option is currently available on all continuous miner models.

Bolted construction

Due to shaft restrictions at many industrial mineral mines, access is often limited. With this in mind, the 12HM series has been designed in several bolted configurations to allow for such restrictions. After complete assembly and testing at a Komatsu facility, the machine is disassembled to the required size, shipped to the mine and reassembled with technical assistance from Komatsu. The machines are designed to be reassembled without, or with limited, welding of components.

High capacity conveying system

The conveying system on the 12HM features a 38 in (965 mm) conveyor for increased production capability. In addition to the dual gathering head system, the machine is equipped with single rear conveyor drive or optional dual rear conveyor chain drive. A cam style take-up automatically provides proper conveyor chain adjustment as the conveyor swings.

Haulage system compatibility

The 12HM series continuous miners can be designed to match mine specific haulage systems. Different conveyor lengths and conveyor chain speeds are available to optimize the haulage system performance, whether it is batch or continuous haulage. For continuous haulage capability the conveyor can also be supplied to match up with an attached haulage system.

Total Control

The latest in VFD technology...

Today's 12HM traction system builds on years of field-tested performance to offer even more durability and continuous miner maneuverability. Patented Optidrive AC electronics are coupled to a compact all-gear transmission to provide smooth and reliable performance. Cutter motor feedback control loops and an electronic traction motor differential optimize sump performance in even the most demanding of applications. Various track frame widths are available to suit specific floor conditions and entry widths.



Komatsu history

Tradition in quality and pride...

With over 6,000 continuous miners shipped since 1948, Komatsu leads the mining industry with innovations that increase productivity and improve operator safety. Innovations such as air scrubbers, Wethead cutterhead drums, AC traction motors, noise reducing conveyor systems, and hydraulics manifolds are just a few examples. All are industry firsts from Komatsu, the world leader in underground mining innovations.



12HM46 with Titan Cutter Head

With the most mass, cutterhead width and installed cutting power — up to 850 kW — the 12HM46 with Titan Cutter Head is our most productive continuous heavy miner.



Addressing corrosion
Pin and bushing design...

Through years of mine experience and in-house testing, Komatsu is able to provide a pin and bushing design that can withstand the often corrosive environments of industrial mineral applications. This significantly extends component life, making the machine more productive.



Technological features

BPX Remote

For remote commands used to control automation, Joy continuous miners in the HM series come standard with BPX Remote. This remote features two-way communication, an interchangeable battery pack, ergonomic controls and layout, and enhanced field repair options to help limit downtime and repair cost. For places where multiple machines will operate in close proximity, different frequencies are also available.

Dual-sprocket chain conveyor system

All 12HM continuous miners are available with the patented Joy dual-sprocket continuous miner conveyor chain. The dual-sprocket chain is 50% stronger in tension than conventional chains and is driven by two parallel 8-tooth sprockets which provide better torsional rigidity. Combined, these features reduce the probability of abrupt chain breakage. Increased contact area between the chain and sprocket significantly decreases the amount of wear, increasing the working life of both components. The dual-sprocket conveyor chain has an even pitch and travels smoothly around the sprocket and return-roller, reducing the noise generated by up to three decibels and consequently reducing the exposure level of the typically located continuous miner operator.

The dual-sprocket chain is 50% stronger in tension than conventional chains.

Dust collector systems

Building on years of experience on continuous miners operating in coal mines, Komatsu now offers flooded bed dust collector systems for use in industrial mineral applications. As industrial mineral applications typically have larger entry sizes, these dust collector systems are designed with larger airflow options. Maintenance of the system is kept to a minimum by offering large access doors and water spray flushing systems.

Flexibility in industrial mineral mining

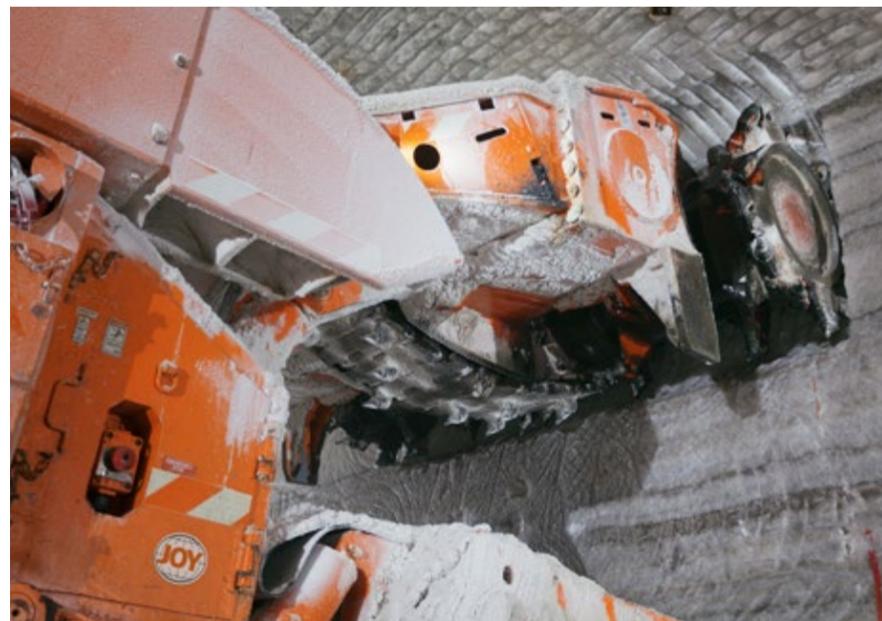
To help keep your miner operating at excellent performance, the 12HM46 is specifically designed for tough industrial mineral applications, such as pins and bushings that resist corrosion, a common issue in industrial mineral mining. And for mines making long, single-pass cuts, retractable drums eases backing out, reducing tram time between cuts so you can increase productivity.

Engineered for perfection

Why high voltage...



The potential for increased machine performance is due to the decrease in percent voltage drop (for a given current) occurring in a trailing cable when higher voltage is induced on that cable. Since motor torque varies with the speed of the voltage, any decrease in machine voltage has a drastic effect on motor performance.



High voltage operation

The relationship between machine input voltage and mining rate has long been recognized. For this reason, the 12HM series machines have been designed to operate at 2300 or 4160 volt for 60 Hz markets and 3300 volt for 50 Hz markets. In addition to the potential for increased performance, high voltage operation also provides lower costs associated with component failures and the potential to use a trailing cable with a smaller conductor size as compared to a medium voltage machine.



12HM automation

The Faceboss control platform enables operators to consistently operate at the optimal balance of production rate and cost.

Competitive and market pressures require that Komatsu's customers produce product at an ever increasing rate and at an ever decreasing cost per ton. These objectives are made all the more challenging by the worsening attributes of available reserves and the ever deteriorating operating conditions in which machinery must operate.

Using a combination of operator assistance tools, automated sequences, advanced diagnostics, machine performance monitoring and analysis tools, the Faceboss control platform enables operators to consistently operate their Komatsu underground machinery at the optimal balance of production rate and cost.

Product optimization

The Faceboss control platform can maximize continuous miner productivity in a variety of ways:

- Optimized cutting**
 Rate of cutting is automatically maximized during sump and shear cycles by ensuring optimal cutter loading through the control of the traction motor speed and hydraulic shear rate respectively
- High availability feedback**
 Control loops protect all electric motors on the continuous miner from jam and thermal overloads, ultimately extending motor life and minimizing machine downtime
- Maximum flexibility**
 Different operating parameters for the typical cycle cutting requirements (e.g., full pass, half pass, cross cut, etc.) can be pre-defined, and are easily and quickly selected via the continuous miner remote station to prevent unnecessary delays
- Continuous miner automation (CMA)**
 Consistent operation is now possible — even while changing operators or across multiple shifts. Establish specific cut cycles (sump, shear, floor clean up, etc.) in a sequence table with CMA. From the Faceboss display, the operator can cycle through a number of preset cycles to match conditions. This sequence can be run for multiple cycles without input from the operator. CMA allows for control over all motors except the pump during these automation sequences, allowing for tighter control of the stabilizer shoe and scrubber system to match a mine's needs.

Reliability through design

All Faceboss hardware has been designed and tested specifically for underground applications. Testing at extreme temperatures and vibration levels ensures that each component can stand up to harsh conditions. Further testing to destruction in a typical conditions allows Komatsu engineers to better understand the failure modes of each component in order to improve the overall design and reliability.

Multilingual display

On a standard control platform...

The Faceboss control platform can be configured to display a variety of languages. In combination with local field personnel, this multilingual control platform helps Komatsu underground equipment to achieve the goal of operating at the lowest cost per ton, regardless of where the equipment is located.

This platform is standard across all Komatsu underground equipment, reducing inventory to support a typical fleet. Common practices reduce training burdens and overall knowledge required for electrical maintenance personnel. This enables maintenance and trouble-shooting performance to rise to a more productive level.



Outby communications

With the Joy continuous miner connected to a surface computer, the Faceboss control platform enables the real-time monitoring of the machine from remote locations (Remote Machine Monitoring - RMM).

In addition to RMM, the Faceboss control platform continuously buffers and streams operating data to the surface computer. The surface computer, installed with Joy Surface Reporting Software (JSRP), interprets this data and generates value-added production reports directly following each shift and emails the report to the appropriate mine/Komatsu individuals. This feedback mechanism allows management to intervene where required to make positive change. Similarly, monthly production and engineering reports are generated and communicated to provide a higher-level interpretation of the operation.

Advanced diagnostics

The Faceboss control platform includes an onboard graphical display, which includes a log of events, messages and alarms. Machine operating parameters are continuously monitored and recorded during machine operation. This stored information is used to help determine the root cause of machine failure quickly and easily.

For quick and easy reference, on-board service manuals are accessible through the on-board display. Supplementary to the service manual are step-by-step instructions for regular maintenance operations and help text for systematic trouble shooting.

User friendly interface

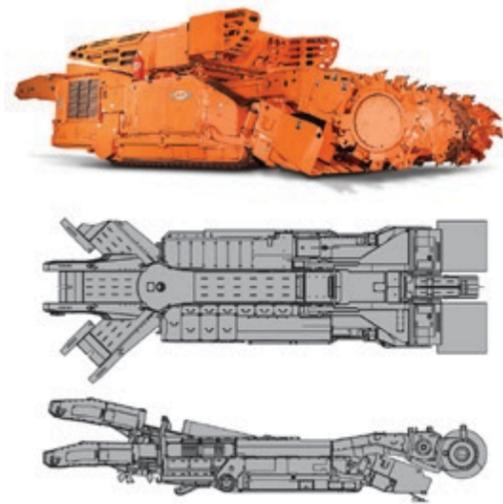
Machine setup/configuration...

Graphical on-board interface with intuitive screens simplifies initial machine setup. These same screens make it easy to adapt to changing mining conditions without the need to open an XP enclosure. In addition, preset tram functions can be selected from the remote to allow the operator to make on the fly cutter feedback adjustments as conditions dictate. The roof and floor cutting limits used with automation sequences are conveniently adjusted via the remote.



General Specifications

Joy 12HM continuous miner



| | 12HM26 | 12HM27 | 12HM36 | 12HM46 |
|--|---|---|---|---|
| Cutter head design | Ripperveyor head | Solid head | Ripperveyor head | Ripperveyor head |
| Cutter head diameter | 1475 mm (58") | 1200 mm (47.25") 1310 mm (51.5") 1367 mm (54") | 1475 mm (58") | 1475 mm (58") **1588 mm (62.5") **Optional, higher power cutterhead |
| Maximum cutting height | 3830 mm (12'-6") 4600 mm (15'-1") | 3350 mm (11') 3960 mm (13') 5000 mm (16'-5") | 4200 mm (13'-9") 4600 mm (15'-1") | 3500 mm (11'-6") 4500 mm (14'-9") 5500 mm (18') 6000 mm (19'-9") |
| Minimum cutting height *Without dust collector | 1820 mm (6'-2") 2100 mm (6'-10") | 1700 mm (5'-7") 2100 mm (6'-10") 2410 mm (8') | 1900 mm (6'-3") 2400 mm (7'-10") | 1860 mm (6'-1") 2700 mm (8'-10") 2800 mm (9'-2") 3000 mm (9'-10") |
| Weight | 95,255 kg (210,000 lb) | 86,180 kg (190,000 lb) | 117,935 kg (260,000 lb) | 154,220 - 184,090 kg (340,000 - 405,000 lb) |
| Ground pressure | 231 kPa (34 psi) | 209 kPa (30 psi) | 269 kPa (39 psi) | 260 - 317 kPa (38 - 46 psi) |
| Ground clearance | 305 mm (12") | | | |
| Conveyor width | 965 mm (38") | | | |
| Tram speed | First - 4.6 m/min (15 fpm) Second - 9.1 m/min (30 fpm) Third - 19.8 m/min (65 fpm) | | | |
| Machine input voltage | 950 volt @ 60 hz 2300 volt @ 60 hz 4160 volt @ 60 hz | 950 volt @ 60 hz 2300 volt @ 60 hz 4160 volt @ 60 hz | 2300 volt @ 60 hz 4160 volt @ 60 hz 3300 volt @50 hz | 2300 volt @ 60 hz 4160 volt @ 60 hz 3300 volt @50 hz |
| Cutter | 235 kW (315 hp) @ 950 V 60 hz 250 kW (335 hp) @ 2300 V 60 hz 250 kW (335 hp) @ 4160 V 60 hz | 240 kW (322 hp) @ 950 V 60 hz 245 kW (328 hp) @ 2300 V 60 hz 245 kW (328 hp) @ 4160 V 60 hz | 250 kW (335 hp) @ 2300 V 60 hz 250 kW (335 hp) @ 4160 V 60 hz 285 kW (382 hp) @ 3300 V 50 hz | 210 kW (280 hp) or 425 kW (570 hp) @ 2300 V 60 hz 250 kW (335 hp) or 425 kW (570 hp) @ 4160 V 60 hz 261 kW (350 hp) or 410 kW (550 hp) @ 3300 V 50 hz |
| Pump | 40 kW (54 hp) | 40 kW (54 hp) | 70 kW (94 hp) @ 2300 V 60 hz 70 kW (94 hp) @ 4160 V 60 hz 52 kW (70 hp) @ 3300 V 50 hz | 120 kW (161 hp)* applies to 2300 V 60 hz, 4160 V 60 hz, and 3300 V 50 hz |
| Gathering head | 50 kW (67 hp) x 2 @ 60 hz 45 kW (60 hp) x 2 @ 50 hz | | | |
| Traction | 60 kW (80 hp) x 2 | | | |
| Total power *Does not include dust collector fan(s) | 730 kW (978 hp) @ 950 V 60 hz 750 kW (1005 hp) @ 2300 V 60 hz 750 kW (1005 hp) @ 4160 V 60 hz | 740 kW (992 hp) @ 950 V 60 hz 750 kW (1005 hp) @ 2300 V 60 hz 750 kW (1005 hp) @ 4160 V 60 hz | 790 kW (1059 hp) @ 2300 V 60 hz 790 kW (1059 hp) @ 4160 V 60 hz 832 kW (1115 hp) @ 3300 V 50 hz | 852 kW (1140 hp) or 1352 kW (1815 hp) @ 2300 V 60 hz 840 kW (1125 hp) or 1472 kW (1975 hp) @ 4160 V 60 hz 1168 kW (1565 hp) or 1382 kW (1855 hp) @ 3300 V 50 hz |



JS-Series Bit Holder Cutting System



The JS series bit holder features a rear access hole for easy bit removal saving time and energy. The induction case-hardened bore provides extended life of the bit blocks through multiple sleeve change-outs. Lower profile helps alleviate potential wear that can shorten the life of the block.

JoyCut™

With Joy drums, you are getting quality, workmanship and expertise.

It begins by measuring and recording the existing cutting system and practices to establish baseline data. Geological samples are taken from the face for testing in our controlled

laboratory. Komatsu has 65 years of experience and an extensive database to consult for identifying the right configuration and components to meet your requirements.

Increased productivity

- Increases machine utilization by reducing maintenance and downtime
- Improves product size and reduces fines

Lower total cost of ownership

- Maximizes bit and sleeve life for lower replacement costs
- More efficient cutting system leads to reduced component wear and less maintenance

Enhanced safety

- Reduces fines and dust for improved worker environment
- Decreases maintenance requirements to reduce worker contact with the machine

Smart Solutions

Integrated Smart Solutions help solve customers' toughest challenges using data-driven intelligence, collaboration through partnership and experience-based service execution. They are a way of partnering with customers to help reduce costs and increase productivity, in line with customers' operating and financial goals.

Komatsu service facilities have given world-class service a new home.

Smart Service Centers are strategically located around the world in order to conveniently serve our customers. With each new service center built, Komatsu products and people are becoming more connected, allowing for expanded benchmarking. Located strategically in zones of mining activity, each service center brings local support that is world-class. Services offered are structured to fulfill the lifecycle of mining equipment, optimizing equipment for productivity and safety.

Our commitment to world-class service is delivered through world-class processes and metrics. Our Joy OpEx processes bring operational excellence by prioritizing the elimination of waste, simplifying processes, automating and removing people from harm's way. We leverage those principles throughout our network, with the ability to rapidly customize locally, helping customers work smarter, worldwide.



Smart Solutions are integrations of smart connected Komatsu products and systems, advanced analytics and direct services customized to solve customers' toughest challenges.

Smart Solutions at work:

Costs

- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

Safety

- Automate processes and controls
- Increase awareness through training and standard setting

Productivity

- Improve system availability, performance, utilization and consistency
- Leverage extensive Komatsu engineering knowledge to solve problems



Smart Solutions

Komatsu Mining Corp. Group

mining.komatsu



Product designs, specifications and/or data in this document are provided for informational purposes only and are not warranties of any kind. Product designs and/or specifications may be changed at any time without notice. The only warranties that apply to sales of products and services are standard written warranties, which will be furnished upon request.

Komatsu, Joy, Montabert, P&H and other trademarks and service marks used herein are the property of Komatsu Ltd., Komatsu Mining Corp., or their respective owners or licensees.

© 2022 Komatsu Mining Corp. All rights reserved.