

KOMATSU



Longwall systems Product overview



Longwall systems

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:

To help mining, forestry, industrial and construction companies maximize value, we offer a full line of innovative products and services through our Komatsu, Joy, P&H, Montabert and Timberock brands. Advanced "internet of things" and automation technologies, along with a robust global service network, assists customers in extracting fundamental minerals and developing modern infrastructure more safely and sustainably.



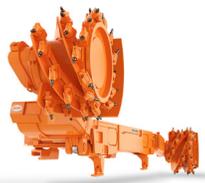
Complete longwall solutions

Longwall mining is more challenging than ever with taller and lower seams being extracted, both with longer face lengths and aggressive production targets. We partner with you to create complete custom-engineered and remotely managed longwall systems to maximize productivity, reliability and zero harm.

Globally recognized as a leading supplier of complete longwall solutions.

We provide Joy-manufactured AFCs, shearers, electro-hydraulics and controls/automation. We also offer Joy-engineered powered roof support (PRS) solutions through partnerships with manufacturers.

All the elements of modern, high production longwall systems are provided in an integrated manner for productivity and low cost per ton. In addition to developing technologically-advanced products and custom-engineered solutions, Komatsu provides professional project management and quality services to deliver an integrated system on time, to specification and on budget.



Longwall shearer

The most technologically advanced and productive shearers in the industry.



Armored face conveyor

Available for all seams with capacities up to 6,000 tons (5,400 tonnes) per hour.



Powered roof support solutions

We custom design PRS systems to meet your exacting cycle and operating requirements then work with your preferred manufacturer to meet your budget.



Longwall Controls & Automation

State-of-the-art technology, stand out reliability and enhanced functionality to provide advanced automation capabilities for maximum longwall productivity.



More than components, a total system for production and safety

Komatsu incorporates shearers, roof support solutions, face conveyors, stageloaders, crushers and mobile belt tail pieces into a complete longwall system that cannot be matched by integration of stand-alone components.

- Individual product design improvements are made with system implications already considered, balanced and optimized
- Complete electronic systems exploit communication, diagnostics and monitoring signals
- Personalized and dedicated engineering and service representatives produce excellent system coordination and production



Komatsu has one goal: to help mining operations become the most productive mines in the world while operating more safely and at the lowest cost per ton.

Industrial minerals

Mechanizing extraction...



Industrial minerals mining is growing, and we offer complete longwall solutions designed specifically for salt, potash, gypsum and trona. Fully mechanizing the extraction of industrial minerals can improve safety while increasing productivity. Customers utilizing these advancements have seen up to 40% cost savings versus the traditional drill-and-blast method.



Smart solutions

Data driven intelligence to create the next level of performance and safety.

Other coal clearance equipment



Stageloader

Moves continuously and provides necessary overlap to suit mining conditions.



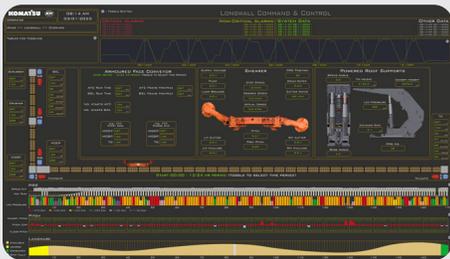
Crusher

Rugged and reliable with little required maintenance.



Remote management Zero harm mentality...

This optional feature provides users with the flexibility to operate the longwall system from anywhere within the mine's network, including the surface. Real-time remote capabilities enables faster decision making, driving efficiency and performance and enhances safety by keeping operators away from the face.



Longwall automation

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

Faceboss is the standard control platform across all Komatsu underground soft rock product lines. In longwall mining applications, Faceboss enables users to utilize proven machine control and the latest advancements in automation for outstanding productivity. The

control software is designed to minimize operator exposure by keeping them on the upwind side of the machine. Faceboss easily integrates and exchanges data between the shearer and roof support systems, delivering a more automated longwall via more consistent and efficient cycle times. It also minimizes the need for human intervention on the longwall face.

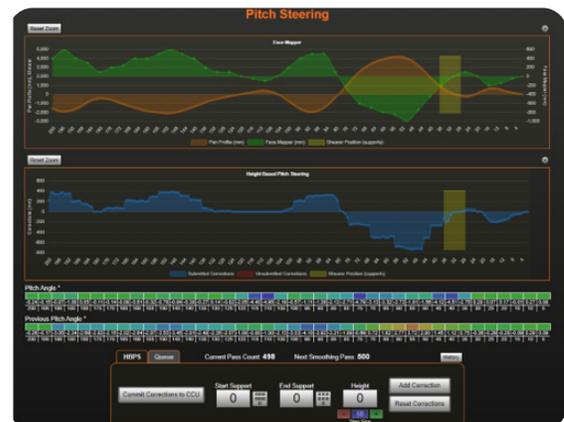
Advanced shearer automation

Further increasing productivity and advancing the journey to zero harm, our shearer steering technology allows for the programming of fully-automated cutting sequences, including gate end turnarounds. You create an initial cutting profile and extraction heights with a graphical offline planner and the machine automatically replicates the profile until conditions change. When the conditions do change, they are incorporated into a new cutting profile which is uploaded to the shearer for further automated operation. This advanced level of automation enables efficient cycle times while providing consistency from one day to the next.

Remote operation Height-based pitch steering

Pitch steering is a new automated cutting method that applies to the floor drum, designed to position the drum at a height that maintains a preconfigured pitch angle of the pans. It accurately plans the cut based on gate road surveys and geological information. The target angle is intended to reflect the actual angle of the seam being mined.

The floor can be managed from the surface using a web application or from the face using the PRS Mimic.





Faceboss RS20s

The Faceboss RS20s roof support electronic control system has a track record of exceptional performance and reliability with systems fitted on some of the most automated and productive longwalls. This proven technology is now expanded as the RS20s standardizes the control system across Komatsu longwall PRS and AFC, allowing operators more control. The control system can operate standalone or as a combined system, with seamless integration with the shearer. Commonality promotes easier parts management, maintenance and product support.

Faceboss RS20n — Next Gen longwall control system

Faster, more informed decisions about your mining operations can drive productivity. The Joy Faceboss RS20n longwall control system makes that possible by helping you unlock the benefits of automation and intelligent controls. It enables the connection of intelligent devices, sensors and technologies to the mine's network to support high levels of longwall automation. Designed for use on PRS and AFCs, the Joy Faceboss RS20n is the industry's first 1Gb/s two-wire Ethernet system, engineered for standout productivity and reliability. It enables high-speed video and data transfer, a full suite of advanced automation controls and exceptional remote management capabilities — all without the need for additional cabling or infrastructure.



User friendly interface

Simplified setup...

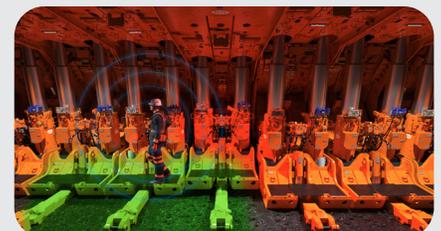
Standard on the Faceboss platform, a graphical onboard interface with intuitive screens provides simplified commissioning tools, user configurable options and real-time diagnostics.

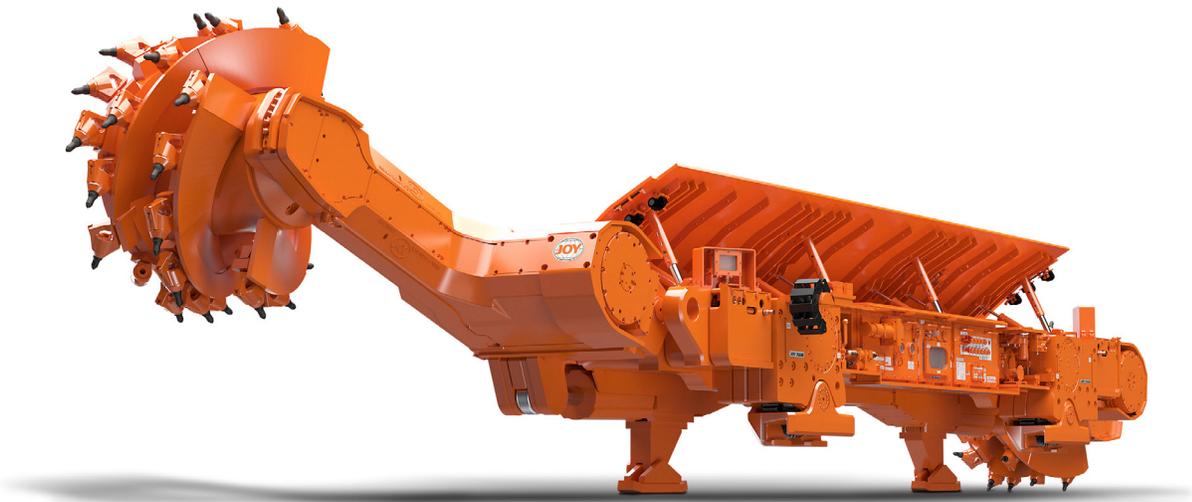


Personal proximity detection system

Drive to zero harm..

The Personal proximity detection (PPD) system is designed to detect and monitor the location of operators on the longwall face. The system advances the journey to zero harm by preventing movement of an advancing shield if the system detects a worker in harm's way.





Longwall shearers

Drums

Custom designed...



To meet your unique conditions, we custom-design your drums and manufacture them using our own patented design three-axis digital lacing machine to achieve precise bit locations and angles. The bit positions for each drum are digitally recorded for traceability. Final machining of drum bores is accomplished with state-of-the-art CNC turning centers to achieve a precise fit for your Joy shearer.

Komatsu built the first all-electric shearing machine in 1976. Today, the most productive customers around the world use Joy shearers in the most demanding environments. A wide range of shearer models accommodate seam ranges from 1.5 to 7 meters (5 to 23 feet). The advantages of the OptiDrive variable frequency drive, advanced shearer automation system and the modular design provide high productivity with lower cost and a focus on a zero harm.

Modular design advantages

The body of the shearer consists of three high tensile steel fabrications bolted together to form a slim main section with no under-frame for high under-body clearance for material passage in a given seam thickness. The elimination of the under-frame also makes underground transportation easier. The controller case center section contains the electric control system. To ease maintenance and improve safety, there's gob-side access to the electrical controller section and motors.

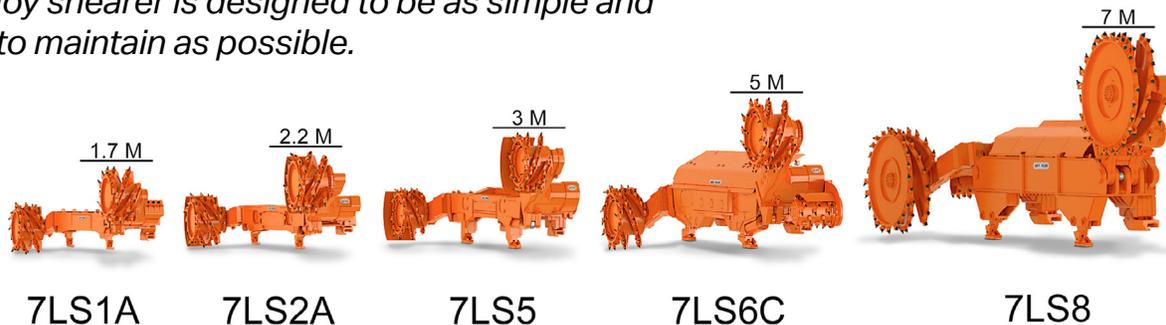
Two traction sections are bolted and doweled to each end of the controller case. The down-drives are bolted to the traction cases in an arrangement that permits the custom fitting of the shearer within the AFC and roof support envelope. A wide selection of Komatsu-designed and manufactured down-drives can be fitted to the shearer to suit mining conditions and AFC selection. High tensile steel ranging arm castings house the cutter motors and cutter gearcases. Ranging arm cylinders have double the pressure rating compared to the industry norms. Komatsu's manufacture of bit holders and cutter drums creates a high degree of integration and enables engineers to better understand the drum's effect on machine performance. Gearing is designed and manufactured in our own factories using proprietary processes to contribute to performance.



Rugged, reliable and easy to maintain

The modular construction of Joy longwall shearers allows for efficient manufacture and rebuild. The Joy shearer is designed to be as simple and easy to maintain as possible with special tools rarely required. Komatsu also integrates the cowl turning mechanisms into the ranging arm designs, creating rugged components.

The Joy shearer is designed to be as simple and easy to maintain as possible.



OptiDrive transmission *Increased productivity...*

Providing you a rugged and reliable solution for shearer traction systems is our OptiDrive transmission. It's a power-matched, integrated drive transmission including gear-box, AC electric motor, variable frequency drive (VFD) and control technology. Drives now programmable to implement electronic (vector) load sharing for added reliability.



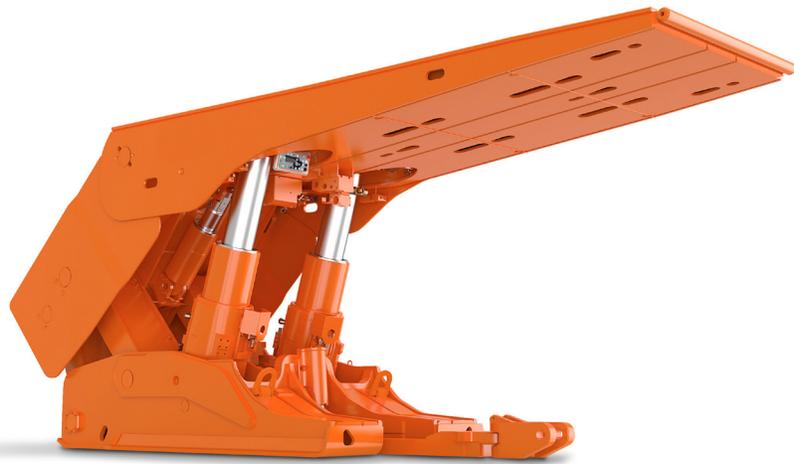
1 X Mega Drive, 1 X Bus Supply shown

Komatsu history

Tradition in quality and pride...

The Joy shearer, introduced in 1976, was the first multi-motor shearer and this design concept became the global standard for all longwall shearers. Komatsu expanded its worldwide market presence by providing safer, productive, reliable machines that produce at the lowest cost per ton. Joy shearers are supported with first-class service through life cycle management agreements. Replacement refurbished machines, built to OEM specifications, are available for exchange at panel moves. In addition, Komatsu provides the highest level of face automation that allows customers to benefit from safer, consistent, repeatable operation.





Roof support solutions

Miners count on roof supports for the safety and smooth operation of their longwall. For more than 75 years, customers have counted on Joy-designed longwall roof supports under the most challenging conditions. Installations met or exceeded the customers' rigorous requirements with ratings up to and over 1,750 tonnes (1,930 short tons); in widths of 1.5, 1.75 and 2.05 meters (5, 6 and 7 feet) and heights from 0.8 to 7.8 meters (3 to 26 feet).

Structural design and more time between rebuilds are particular strengths of Joy-engineered roof supports. Komatsu offers PRS design, engineering, quality and project management services, as well as key PRS components. Manufacturing is handled by manufacturer partners, or customers' own fabricator choice.

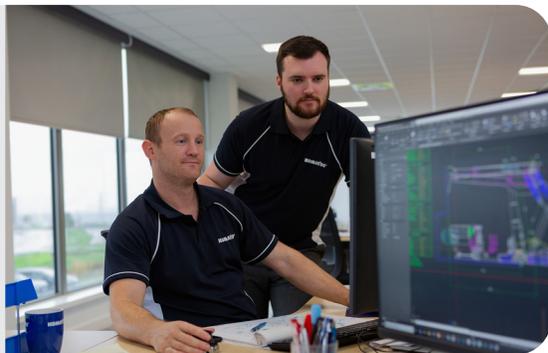
Legs and cylinders

Joy-designed roof support legs are designed and tested to achieve extended life. Our bespoke internal seals are known for a long service life between rebuilds; leg bore sizes range from 125 to 600 millimeters. Single and double telescopic design options can be provided depending on support range requirements. Along with the finite element analysis (FEA) and fatigue analysis software, Komatsu also uses the very latest CAD technology to enable the design of galleries and feed pipes to maximize flow and minimize pressure drops and turbulence. This is an important feature in optimizing hydraulic efficiency and keeping support cycle times to a minimum.

For large bore-diameter legs that require high flow, our innovative leg design allows large capacity feeds. No welds are used on the leg cylinder and the feed is attached by an innovative locking system for high fatigue life.

Hydraulic system design

Cycle time is an important feature of roof supports, ensuring roof control keeps up with the shearer cutting rate. Komatsu uses the latest technology available to calculate pressure drops, optimize fluid velocity, calculate flow rates and match hose sizes to deliver performance while complying with international standards.



Roof support design and engineering expertise

Over 75 years of roof support experience for confidence in your design.



Our top priority is developing a custom-designed and complete solution that helps you mine more efficiently and drive toward zero harm. We work directly with you to meet your needs with an extensive range of powered roof support design, engineering and technical support services.

Deep experience in longwall mining, the latest industry innovations and world-class technology equal technical expertise that produces results.



Roof support electronics

Joy roof supports are controlled using the Faceboss RS20s electronic control system which integrates with longwall and mine-wide systems to enable automatic control, including fully automatic shearer and roof support gate turnarounds. All the

Joy-designed roof supports provide reliable service with a low cost.

information from the longwall system can be transmitted to the surface and viewed throughout the mine network for real-time production analytics and decision-making.

Drive toward an autonomous face with our next generation RS20n control system and its 1 Gb/s ethernet high-speed communications backbone.

Next Gen Compak valve system

To help realize the potential of your longwall mining operations, Komatsu's latest hydraulic system development, the Joy Compak Next Gen, helps facilitate your shearer-cutting rate and delivers exceptional cycle time performance.

Global dual solenoid

Unlock the benefits of automation for PRS with the global dual solenoid.

Integrating the global dual solenoid makes PRS hydraulic control systems of any brand compatible with the Joy RS20s control system, delivering advanced Komatsu automation capabilities to impact your longwall operations positively.

Extensive testing capabilities

Comprehensive OE and extended life tests on all structural, hydraulic and control components are customized or specified to international standards. All new structural fabrications undergo detailed finite element analysis (FEA) with full engineering support throughout the process. Komatsu designs roof supports tailored to the mine's life requirements from 15,000 to more than 90,000 cycles.

Aftermarket engineering services

Improve uptime and extend the life of your core assets with our engineering services. We can tailor services like extended life testing, life cycle management (LCM) plans, valve gear health monitoring, and support reconfiguration to meet your individual needs and budget.

Ergonomic acceptance test (EAT)

To increase ease of maintenance and setting of mine auxiliary items, Komatsu provides customer support during the EAT physical exercise with the customers maintenance and engineering staff.

We hold sessions with customers using exact 3D solid models of their roof supports to establish optimal valve positioning and cable runs to the best ergonomic principles, which helps promptly deliver the best solution.



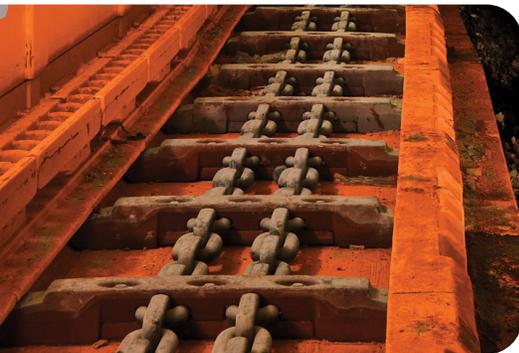


AFC

Komatsu manufactures all the key elements for the armored face conveyor (AFC) including the head and tail frames, linepans, gearboxes, sprockets, couplings and shearer haulage systems. The design of the Joy AFC uses cast steel sigma sections with exacting tolerances. This casting technology eliminates the weld fabrication of less reliable clevis and pan connections. The cast design

Cast design provides tighter tolerance assurance.

provides tighter tolerance assurance which is essential in today's marketplace. Komatsu's high specification abrasion-resistant upper deck plates, selected to meet pan life requirements, result in maintenance-free, long life fabrications.



Innovative solutions

'S' shaped center post...



Broadband chain now comes with an innovative 'S' shaped center post on the vertical link which is designed to prevent knuckling of the chain and therefore reduce the likelihood of chain wreck events.

AFC linepans

Joy AFC linepans are the linepan of choice for heavy duty applications. The simple but rugged linepan construction is excellent in fatigue resistance, and includes the option of standard or machined pan joints. Linepans are fully tested for articulation and horizon control characteristics. Customizable cast side sections allow material to be placed where needed to match customer-required service life. Highly abrasion-resistant materials are used in construction to achieve wear longevity.

AFC transmissions

All Joy AFC transmissions are continuously rated at the maximum stated capacity. Transmissions can be used in conjunction with a variety of coupling solutions and a full monitoring package is available on all transmissions. Sizes are available for all AFC capacities including 11 kV electric motors up to 1,800 kW. These advanced transmissions are specifically designed for low-cost overhauls.

Broadband long life chain

Available in five sizes from 38 to 60 mm in diameter, Joy broadband long life chain provides proven extended wear resistance without detriment to chain weight and conveying characteristics. This chain delivers excellent levels of conveying efficiency and reduced operating cost.



AFC couplings

Turbo transmission technology (TTT) coupling is capable of high frequency heavy load starts without overheating or equipment damage. They have no bearings or seals and require very little maintenance to minimize the cost of overhauls. AFC couplings are extremely fault-tolerant and exhibit no loss of torque under normal voltage drop situations. Couplings come with onboard water filtration and the control valve has separate pilot filtration to help prevent problems caused by water quality; couplings can be de-mounted in one convenient unit.

The TTT range of couplings is made up of the 562 and 650 size units. This range allows for up to 30,000 Nm of torque transmission and provides future upgrade opportunities for wider and higher production capability.

OptiDrive variable speed drive (VSD)

The medium voltage option (3,300 or 4,160 V) integrates the VSD with the motor to achieve better speed and torque control, resulting in a softer start/stop and faster acceleration. The variable chain speeds that match production conditions allow for increased capacity, improved cutting cycles and excellent efficiency.

AFC driveframes

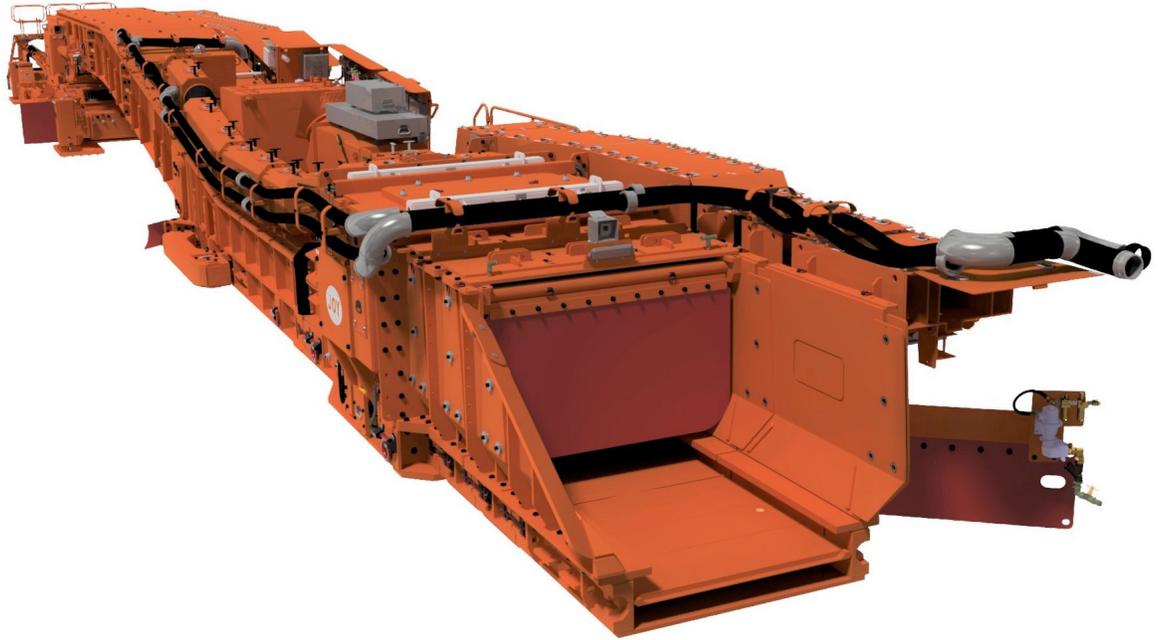
Innovative design...

In addition to the premium materials and world-class processes used in construction of Joy AFC driveframes, innovative design is utilized to achieve extreme reliability and reduced maintenance. Plug-and-play upgrades are also available for future power density increases.



AFC RS20s control system

Simplify, standardize and transform your longwall operations with AFC RS20s control system. Putting more control in your operators hands this standardised solution for both AFC and PRS provides a synergy of control across longwall operations. A key advantage of this control system is the commonality it can bring to your longwall assets, providing efficient operations, easy updates, and many other benefits.



Other coal clearance equipment

Stageloaders

An extensive range of features is available with Joy stageloaders to suit your longwall environment and needs. Machined joints are fully sealed to limit noise and dust. Crusher designs with impressive uptime are available, including pick shaft and high inertia impact-style units.

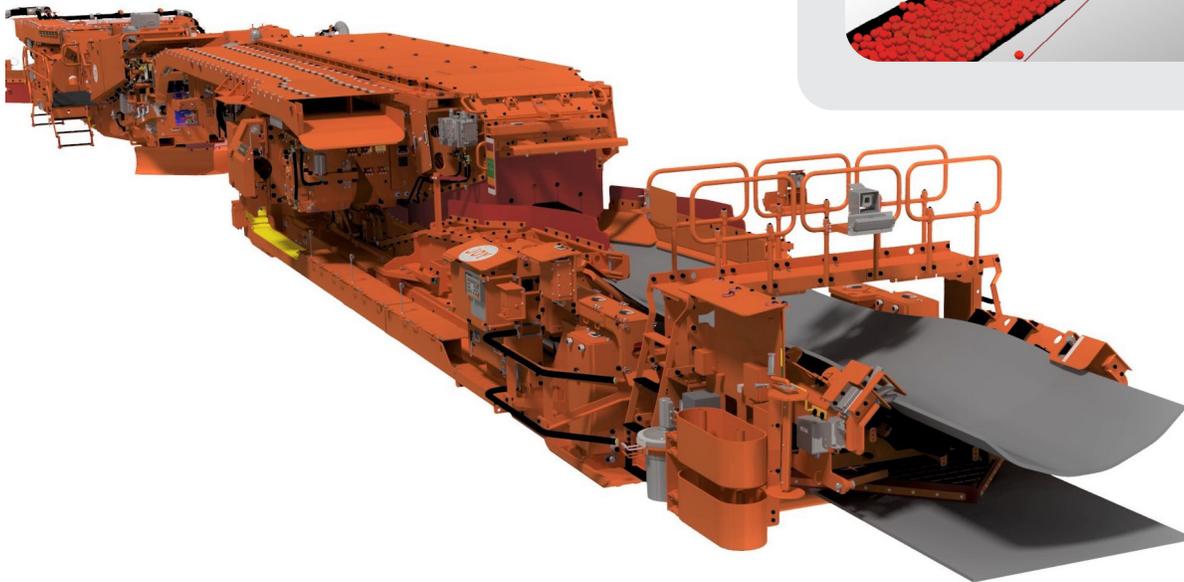
Crushers

A complete range of Joy stageloader crushers will help keep you up and running with minimal maintenance. These crushers are built for rugged conditions and can efficiently handle lump coal and oversized rock. They can also ease conveying and improve system productivity. To suit your preference, choose a direct gear-drive or a V-belt drive.

All Joy crushers incorporate a frame fabricated from heavy steel plate and strengthened by heavy ribs for excellent rigidity. Easy access to the crusher roll is provided through an inspection door in the top of the frame. Models are available that allow the top of the frame to be completely removed in order to lower the transportation height. Rapid product size adjustment is accomplished by vertical movement of the roll shaft assembly.

Mobile belt tail pieces

The complete range of Joy mobile belt tailpieces enables longwall retreats while keeping up production, as they do not stop the belt or interrupt the flow of material from the longwall face. Various models are offered for low, medium or high seam applications in either a “Matilda” style, or a self-propelled crawler and skid-mounted unit. Self-propelled units are driven directly from the shield support hydraulic system or an “onboard” hydraulic pump. The crawler-mounted units are complete with heavy-duty replaceable pads and are internal planetary gear driven. Roof jacks and belt wipers are standard equipment and leveling jacks are located on each corner.

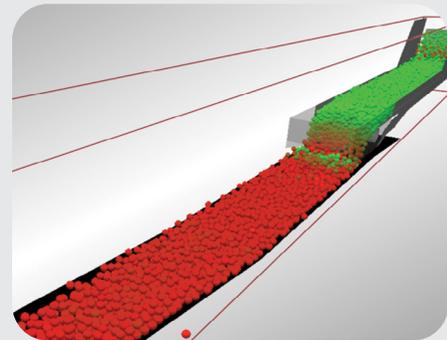


Bulk material simulation

Improve and increase...

You're always looking for incremental improvements for added efficiency — and so are we. We utilize bulk materials simulation software to design our AFC product line. This software provides the simulation and analysis required to help engineers continuously improve the performance of bulk materials handling including:

- Enhancing conveyor transfer points
- Refining the performance of linepan control
- Increasing efficiency of crusher design
- Refining design of discharge hoods and hoppers to control throughput





Komatsu Mining Analytics Platform delivers actionable data to customers

Komatsu Mining Analytics Platform (KMAP)

Visualize your data, streamline your processes and solve your toughest challenges with Komatsu's integrated suite of smart solutions. Channel your machine data into actionable insights with our cloud-based analytics and experienced field service teams to help reduce your operating costs, increase productivity, and meet your operational and financial goals.

Komatsu's worldwide, strategically located safety service centers provide you with expanded benchmarking and easier access to our dedicated service. Our tiered services are structured to fulfill the life cycle of your mining equipment and optimize it for productivity and safety while meeting different market expectations at the right price point to complement automation features embedded in your longwall systems.

We deliver our commitment to world-class service through world-class processes and metrics. Our continuous improvement process helps achieve operational excellence by prioritizing the elimination of waste, simplifying procedures, automating and removing people from harm's way. We leverage those principles throughout our network so you can rapidly customize locally and work smarter, which is the Komatsu Way, where we bring the learnings from our customers back to the workplace (Gemba) to improve product engineering.



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

Data and analytical solutions at work

At Komatsu, we are committed to providing timely reports and analytical information for your daily production planning and corrective actions. Our cloud-based analytics platform executes continuously (24/7/365) when data is ingested for all machines globally.

To positively impact your longwall operations, you can streamline your data for analytics processing. You can also review your information daily to understand how best to adjust your automation parameters and learn how that data can inform your parts planning, maintenance and repair strategies.

Costs

- Lower cost per unit by reducing overall parts and consumables expenditures
- Optimize costs for labor schedules, rebuild planning and equipment wear
- Increase your production rates by effectively reducing cost per tonne mined

Safety

- Avoid demanding or dangerous tasks by automating processes and controls
- Increase awareness through training and optimized machine settings
- Keep your people out of harm's way by reducing operator exposure

Productivity

- Improve system availability, performance and utilization
- Extend equipment life with consistent equipment operation
- Leverage extensive Komatsu engineering knowledge to streamline processes

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