JOYGLOBAL

Longwall Systems
Product Overview

Complete Longwall Systems

Joy is a leader in the development of innovative mining technology and equipment designed to help mining operations become the most productive mines in the world while operating more safely and at the lowest cost per ton.

Joy offers a complete range of longwall equipment to suit the needs of mining operations worldwide. Globally recognized as the leading manufacturer of complete longwall systems, Joy provides its customers with a single, accountable source for shearers, roof supports, face conveyors, stageloaders, crushers and mobile belt tail pieces.

Globally recognized as the leading manufacturer of complete longwall systems.

All of the elements of modern, high production longwall systems are provided in an integrated manner for maximum productivity gains and lowest cost per ton. In addition to developing the most technologically advanced products, Joy provides professional project management capability to deliver an integrated system on-time, to specification and on-budget.

When only the best will do . . .

JOY complete Longwall Systems represent the ultimate solution for high production longwall mining. Joy incorporates the best-of-breed shearers, roof supports, face conveyors, stageloaders, crushers and mobile belt tail pieces to deliver a complete longwall system that is in a class of its own. Output productivity of this integrated system simply cannot be matched by integration of stand-alone components. When a mining operation calls for the most productive, most reliable longwall system, there is only one place to find it.

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

Industrial Minerals

Mechanizing Extraction...

Joy offers complete longwall systems designed specifically for the rock densities of salt, potash, gypsum and trona. Fully mechanizing the extraction of industrial minerals improves safety while increasing productivity. Customers utilizing these advancements have seen up to 40% cost savings versus the traditional drill-and-blast method.

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

Custom designed to meet exacting cycle and operating requirements.

Turbo Transmission Technology

The simplest, most reliable high torque starting capability for large AFCs.

Stageloader

Moves continuously and provides necessary overlap to suit mining conditions.

Crusher

Extremely rugged and trouble-free with little maintenance required.

Remote Visualization

Zero Harm Mentality...

This optional feature provides real time video using cameras that are integrated into the design of the ranging arm chassis. Video signals are displayed at the Remote Operation Center on independent monitors. With automated water sprays to keep the camera lenses clean, this feature enables the possibility of operating the machine from a remote location with a familiar handheld device.

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 Joy product lines. In longwall mining applications, this platform enables users to utilize proven machine control as well as the latest advancements in automation for maximum productivity. The control software is designed to minimize an operator's exposure to dust, water spray and noise by keeping personnel on the upwind side of the machine.

The latest development within FACEBOSS is the integration and data exchange between the shearer and roof support systems which provides a more automated longwall. This integration and data exchange results in the most consistent and efficient cycle times while minimizing the need for human intervention and improving overall safety on the longwall face.

Advanced Shearer Automation

Further increasing productivity and reducing operator exposure to dust and noise, this newest level of shearer steering technology allows for the programming of fully-automated cutting sequences, including gate end turnarounds. The latest feature included with advanced shearer automation is the ability for the user to create an initial cutting profile and extraction heights by use of a graphical offline planner. With this plan, the machine automatically replicates the profile until conditions change. The operator then has the ability to override control of the roof drum to follow the preferred horizon. Utilizing this new roof horizon data, the remainder of the cutting sequence is fully automated per the pre-defined extraction heights. This advanced level of automation enables the most efficient cycle times possible while providing consistency from one day to the next.

Remote Operation

The HHX remote uses reliable two-way radio communication to control the shearer and display operational and diagnostic information on an integrated LCD screen. As an integral part of the FACEBOSS platform the remote fully supports Advanced Shearer Automation. The large capacity, removable battery pack allows long intervals between recharging on the dedicated charging station. With an ergonomic design and minimal complexity, the HHX remote offers comfortable operation and high reliability.

FACEBOSS RS20s

The FACEBOSS RS20s system requires no special gate-end computer for control and is the fastest and most powerful shield control system ever supplied by Joy. These systems are globally fitted on the most automated and productive longwalls.

The RS20s system is supplied with a complete automation library of over 100 face cutting sequences to suit virtually all conditions. Using shearer initiation with gate-end automation, no operators need to be specifically deployed for shield operation.

Surface Data Communication Link

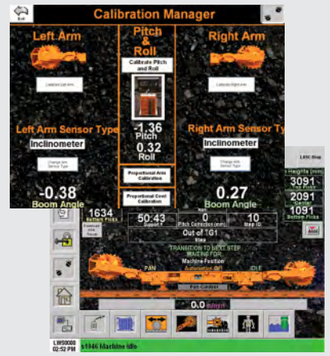
With the Surface Data Communication Link, real-time operational information is transmitted via an ethernet connection to the surface. This information is identical to the information available underground. The Surface Data Communication Link includes a data storage feature that allows recorded data to be played back for in-depth analysis without affecting production.

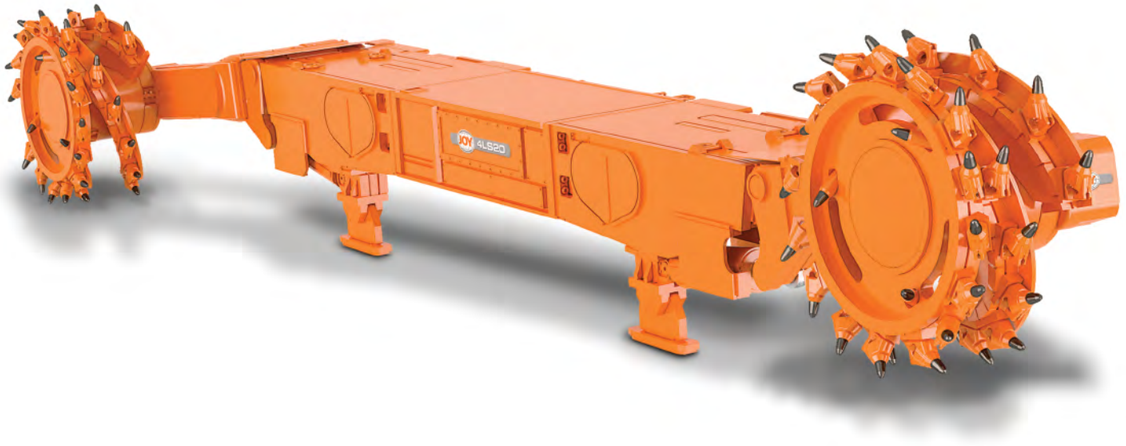
Many mines are now using mine-wide Supervisory Control And Data Acquisition (SCADA) systems to monitor the production process. The Joy Outby System provides an Object Linking for Process Control (OPC) interface that enables information from JOY equipment to be easily transferred to the mine's SCADA system. All major manufacturers of SCADA systems support OPC.

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.





Longwall Shearers

Joy built the first all-electric shearing machine in 1976. Today, JOY Shearers are utilized around the world by the most productive mines, in the most demanding environments. A wide range of shearer models is offered to accommodate seam ranges from one and a half to seven meters. The advantages of the modular design, OPTIDRIVE variable frequency drive and new Advanced Shearer Automation system provide high productivity with lower costs and a focus on a zero harm mentality.

Modular Design Advantages

Joy's modular design consists of five main structural elements.

The body of the shearer consists of three high tensile steel fabrications bolted together to form a slim main section with no under-frame. This design provides maximum 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, which forms the center section, contains the electric control system. The Joy design features gob-side access to the electrical controller section and motors which means that normal maintenance can be carried out in a safer working environment.

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 Joy 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 are made using technology from the JOY Powered Roof Support product line. These cylinders have double the pressure rating when compared to the industry norms. In-house manufacture of bit holders and cutter drums creates a higher degree of integration and allows engineers to better understand the drum's affect on machine performance. Gearing is designed and manufactured in our own factories using proprietary processes which contributes to maximum performance.

Drums

Custom Designed...

At Joy, drums are custom designed to meet your unique conditions. JOY drums are manufactured 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 longwall shearer.

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. Joy also integrates the cowl turning mechanisms into the ranging arm designs creating rugged components that require little maintenance.

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

Joy OPTIDRIVE

Increased Productivity...

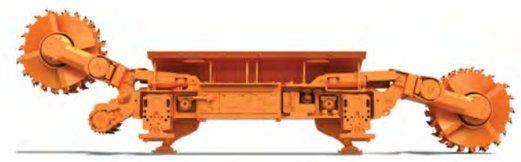
JOY OPTIDRIVE is a power-matched, integrated drive transmission that includes gear-box, AC electric motor, Variable Frequency Drive (VFD) and control technology. The holistic design approach provides an optimal, rugged and reliable solution for shearer traction systems.

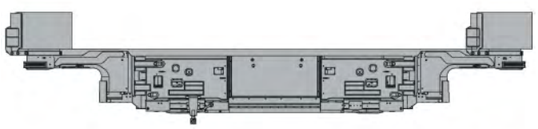
Joy History

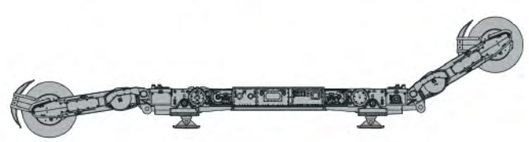
Tradition in Quality & Pride...

The Joy shearer, introduced in 1976, was the first multi-motor shearer and this design concept became the global standard for all longwall shearers. Joy 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 and through Life Cycle Management agreements, replacement refurbished machines, built to OEM specifications, are available for exchange at panel moves. In addition, Joy provides the highest level of face automation that allows customers to benefit from safer, consistent, repeatable operation.

JOY Longwall Shearers







	7LS1D	7LS2A	7LS3A	7LS5	7LS6C	7LS7	7LS8
Cutting Height	1.5 m - 3.0 m	1.6 m - 3.5 m	2.0 m - 4.0 m	2.0 m - 4.0 m	2.0 m - 5.5 m	2.8 m - 6.5 m	4.5 m - 7.2 m
Machine Height	1.0 m - 1.3 m	1.0 m - 1.3 m	1.45 m - 1.70 m	1.5 m - 1.9 m	1.5 m - 2.0 m	2.3 m	2.4 m
Machine Weight	52,000 kg	59,000 kg	60,500 kg	81,700 kg	103,400 kg	147,500 kg	182,000 kg
Frame Thickness	498 mm	520 - 590 mm	520 - 590 mm	590 mm	725 mm	1100 mm	1100 mm
Haulage Pull	800 kN	800 kN	800 kN	800 kN	1200 kN	1200 kN	1500 kN
Maximum Haulage Speed	32 m/min	33 m/min	34 m/min	30 m/min	30 m/min	30 m/min	26 m/min
Pump Motor	2 @ 11kW	2 @ 11kW	2 @ 11kW	2 @ 20 kW	30 - 55 kW	55 kW	55 kW
Haulage Motor	2 @ 65 kW	2 @ 80 kW	2 @ 80 kW	2 @ 110 kW	2 @ 110 - 150 kW	2 @ 150 kW	2 @ 200 kW
Lumpbreaker Motor	NA	55kW (575V)	56kW (575V)	130 kW	110 kW - 270 kW	270 kW	270 kW
Available Ranging Arms	J450A J450D J450E J450F J525E	J450A J450D J450E J450F J525E J525F	J450B J525F	J525F J750A	J525F J750B J1000A J1000B	J750B J1000A J1000B	J1000B

	J450A	J450B	J450D	J450E	J450F
Length of Ranging Arm	2179 mm	2179 mm	2179 mm	2249 mm	2249 mm
Cutting Motor 60 Hz (max)	420 kW	420 kW	420 kW	420 kW	420 kW
Minimum Drum Diameter	1450 mm	1650 mm	1450 mm	1450 mm	1450 mm
Minimum Drum Width	880 mm	965 mm	940 mm	880 mm	880 mm
Drum Speed (60 Hz)	44, 54, 65 RPM	36, 43 RPM	44, 54, 65 RPM	55, 60, 66 RPM	66 RPM

	J525E	J525F	J750A	J750B
Length of Ranging Arm	2483 mm	2483 mm	2601 mm	2601 mm
Cutting Motor 60 Hz (max)	600 kW	675 kW	750 kW	750 kW
Minimum Drum Diameter	1550 mm	1650 mm	1750 mm	1950 mm
Minimum Drum Width	960 mm	940 mm	1040 mm	1040 mm
Drum Speed (60 Hz)	47, 56, 61, 66 RPM	38, 45, 49, 53 RPM	38, 43, 52 RPM	27, 32 RPM

Roof Supports

Joy has over 60 years of experience designing and manufacturing longwall roof supports and has achieved ISO 9001 2000 approval from the UKAS Accreditation Testing Laboratory. With installations around the world, Joy has met or exceeded the customer's rigorous requirements with ratings up to 1750 tonne (2000 tons); in widths of 1.5, 1.75 and 2.05 meters; for height ranges from 0.8 up to 7.8 meters.

Structural design is a particular strength of JOY roof supports. The design and the attention to detail of the structures has been recognized throughout the mining industry. These detailed and controlled fabrications enable JOY roof supports to provide reliable service with a lower cost of ownership and fewer rebuilds required during their service life.

Leg Construction

JOY roof support legs are designed and tested to achieve extended life. The internal seals work with the cylinders to provide a long service life between rebuilds with leg bore sizes ranging from a 125mm bore to 480mm. Single, double and triple telescopic designs can be provided depending on support range requirements. Along with the FEA and fatigue analysis software, Joy 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 and hence large feed pipes combined with high fatigue life requirements, Joy has developed a new leg design that allows large capacity feeds to be used by the legs. To achieve high fatigue life, no welds are used on the leg cylinder and the feed is attached by a patented locking system. This system is designed to contain the highly pressurized fluid to the cylinder without the use of life-limiting weld methods for the attachments.

Cycle time is an important feature of roof supports ensuring that on high production longwalls, the roof control does not slow the shearer cutting rate. Joy uses the latest technology available to calculate pressure drops, optimize fluid velocity, calculate flow rates and optimize hose sizes to give the best solution.

Roof Support Ergonomics

Improved Safety & Comfort...

Memory flexible inserts are used around all leg interfaces to keep areas free from debris build-up that can lead to undesirable bending loads being seen by rams and leading to breakages. The use of such inserts also assists on longwall face changes, enabling easier closure of the roof supports for transport between longwall panels. The walkways on the units incorporate special self cleaning anti-slip mats to help the longwall crew travel on the face without slipping.

Roof Support Electronics

JOY roof supports are controlled using the FACEBOSS electronic control system which integrates into the longwall and mine-wide system to enable automatic control of the longwall operation, including fully automatic shearer and roof support gate turn rounds. All the information from the longwall system can be transmitted to the surface and viewed throughout the mine network and with the mine's agreement relayed in real-time back to Joy enabling utilization of our "Smart Services."

JOY roof supports provide reliable service with a low cost.

ComPak Valve System

Compak, Joy's hydraulic control system, is a well established, proven and reliable valve system for controlling modern automatically operated longwall roof supports. The system provides multifunctional control with solenoid actuated pilot circuits receiving instructions either by operator push button or more normally, automatically from the FACEBOSS electronic control system.

Quality Assurance

All Joy structural fabrications undergo detailed finite element analysis with experienced in-house engineers. Structures undergo overload tests of up to 20% and are fatigue-tested at twice their rated load to verify their stated strength. The structural testing is conducted at the Joy testing laboratory, which houses the world's largest rated purpose design rig. The roof supports are also subjected to lateral fatigue testing in combined tests. Joy designs and delivers roof supports that are tailored to the mine's life/needs from a life of 28,000 to 90,000 cycles.

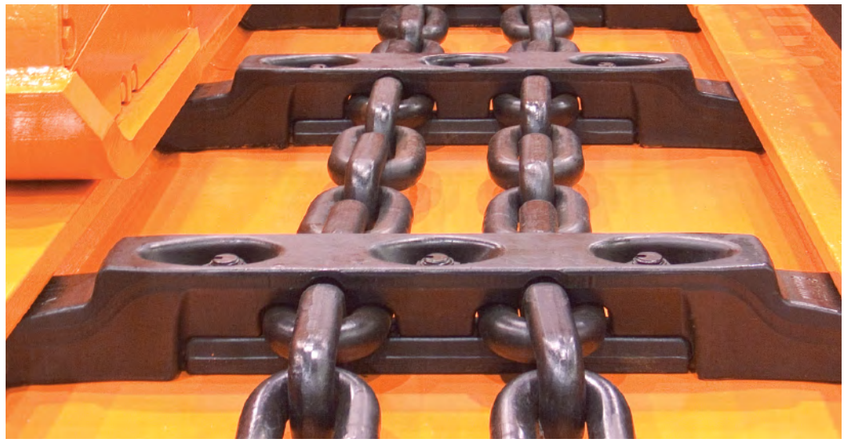
Physical Prototype

Hands-on Training...

Sessions are held with customers at their mine, using exact solid models of their roof supports, to establish desired valve positioning and cable runs. This helps to promptly deliver the best solution.

To increase ease of maintenance and setting of mine auxiliary items, Joy conducts a physical exercise with the maintenance and engineering staff of all customers.

Armored Face Conveyors



Joy manufactures all the key elements for the armored face conveyor (AFC) including the head and tail frames, line pans, gear boxes, sprockets, couplings and shearer haulage systems.

Cast design provides tighter tolerance assurance.

The JOY AFC design uses cast steel sigma sections with exacting tolerances. This casting technology eliminates the weld fabrication of clevis and pan connections, which are less reliable. The cast design provides tighter tolerance assurance which is essential in today's marketplace. Joy's high specification abrasion-resistant upper deck plates, selected to meet pan life requirements, result in maintenance free, long life fabrications.

AFC Linepans

JOY AFC linepans have become the linepan of choice for heavy duty applications. The simple but rugged linepan construction is superior in fatigue resistance compared to other construction techniques, 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. A full monitoring package is available on all transmissions. Sizes are available for all AFC capacities including 11kV electric motors up to 1800kW. These advanced transmissions are specifically designed for low cost overhauls.

Innovative Solutions

'S' shaped center post...

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

AFC Couplings

Since 1994 the Turbo Transmission Technology (TTT) coupling has been supplied on Joy AFC equipment and is still in service today. TTT coupling is capable of high frequency heavy load starts without overheating or equipment damage. These ultra-reliable units have no bearings or seals, require very little maintenance and minimize the cost of overhauls. These units are extremely fault-tolerant and exhibit no loss of torque under normal voltage drop situations. Couplings come with onboard water filtration and the latest control valve has separate pilot filtration to help prevent problems caused by water quality. The latest version of the Joy couplings can be de-mounted in one convenient unit.

BROADBAND Long Life Chain

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

First installed in 2004, over the last eight years the chain has conveyed over 80 million tonnes on AFC & BSL applications in high productivity longwall installations operating in many major markets. JOY BROADBAND long life chain provides the greatest opportunities to longwall operators planning their future developments or upgrade requirements.

Turbo Transmission Technology

Joy has supplied Turbo Transmission Technology (TTT) couplings in various forms since 1994 and these couplings have become the coupling of choice for all the major mining companies on a worldwide basis due to the simplicity, ease of operation, high performance and reliability of the units. The TTTF is the latest variant of this high performance coupling and like its predecessors is only available from Joy.

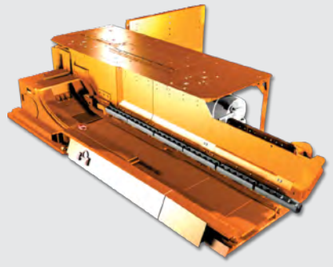
The latest features of the TTTF include the ability to dismount the unit in one piece from the gear train, a robust filtration system and uprated valve design to cope with fluctuations in water quality.

The TTTF 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.

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.



Outby Equipment

Stageloaders

JOY Stageloaders are manufactured using a fully customized approach that incorporates proven design technologies. An extensive range of features is available to suit the longwall environment and the customer's needs. Machined joints are fully sealed for dust and noise limitation. Ultra-reliable crusher designs are available including pick shaft and high inertia impact style units.

Crushers

Joy manufactures a complete range of stageloader crushers designed to be extremely rugged and trouble-free with little maintenance required. Built for difficult conditions, these crushers can efficiently handle lump coal and oversize rock which eases conveying and improves system productivity. To suit customer preference, JOY Crushers are available in 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 maximum 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. Product size adjustment is accomplished by vertical movement of the roll shaft assembly, which is carried out by means of hydraulic cylinders that facilitate rapid adjustments.

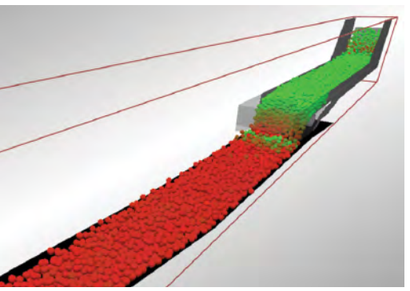
Mobile Belt Tail Pieces

The complete range of Joy mobile belt tailpieces enables longwall retreats to take place without stopping the belt or interrupting the flow of coal 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.

The two basic types of self-propelled units are those driven directly from the shield support hydraulic system, and those that have an "on-board" 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

Optimize, Improve & Increase...



Joy has invested in bulk materials simulation software for use in design of the AFC product line. This software provides the simulation and analysis required to enhance innovation and helps design engineers optimize the performance of bulk materials handling including:

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

Smart Services

JOY Smart Services combines all of Joy's value-added offerings into one package, under one roof as an integrated solution to our customers. The facilities and services feature technological advancements in prognostics, remote health monitoring, reliability and asset management, advanced training and integration of mining processes/system optimization with 24-hour support.*

Our service strategies are delivering responsive and competitive service solutions, meeting the needs of our customers and driving unprecedented value in our customers' operations.

Joy Global service facilities have given world class service a new home.

At the core of Joy's Smart Services vision is our Performance Life Cycle Management (PLCM) strategy, which brings together all of the innovative people, services and products that Joy has to offer.*

Performance Life Cycle Management focuses these services, to align with our customers' needs, cultivating a zero harm mentality and delivering the highest productivity at the lowest cost per ton, from the time you receive your new equipment for the entire life cycle of the equipment.

Prognostic Intelligence - State of the art predictive software analyzes the data streamed from your machines. The software predicts malfunctions, failures or process gaps at the earliest instance.

- **Responsive Technical Support**
- **Prognostic Intelligence**
- **Advanced Technical Training**
- **Performance Optimization**
- **Remote Health Monitoring**
- **Proactive Reliability**
- **Interactive Information Delivery**
- **24/7 Technical and Logistical Support**
- **Genuine Service Products**
- **Machine & Component Rebuilds**
- **Comprehensive Asset Management**
- **Authentic Parts & Components**
- **On-Site Machine Revitalization**
- **Performance Life Cycle Management**

*All services are not yet available in all regions of the world.

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