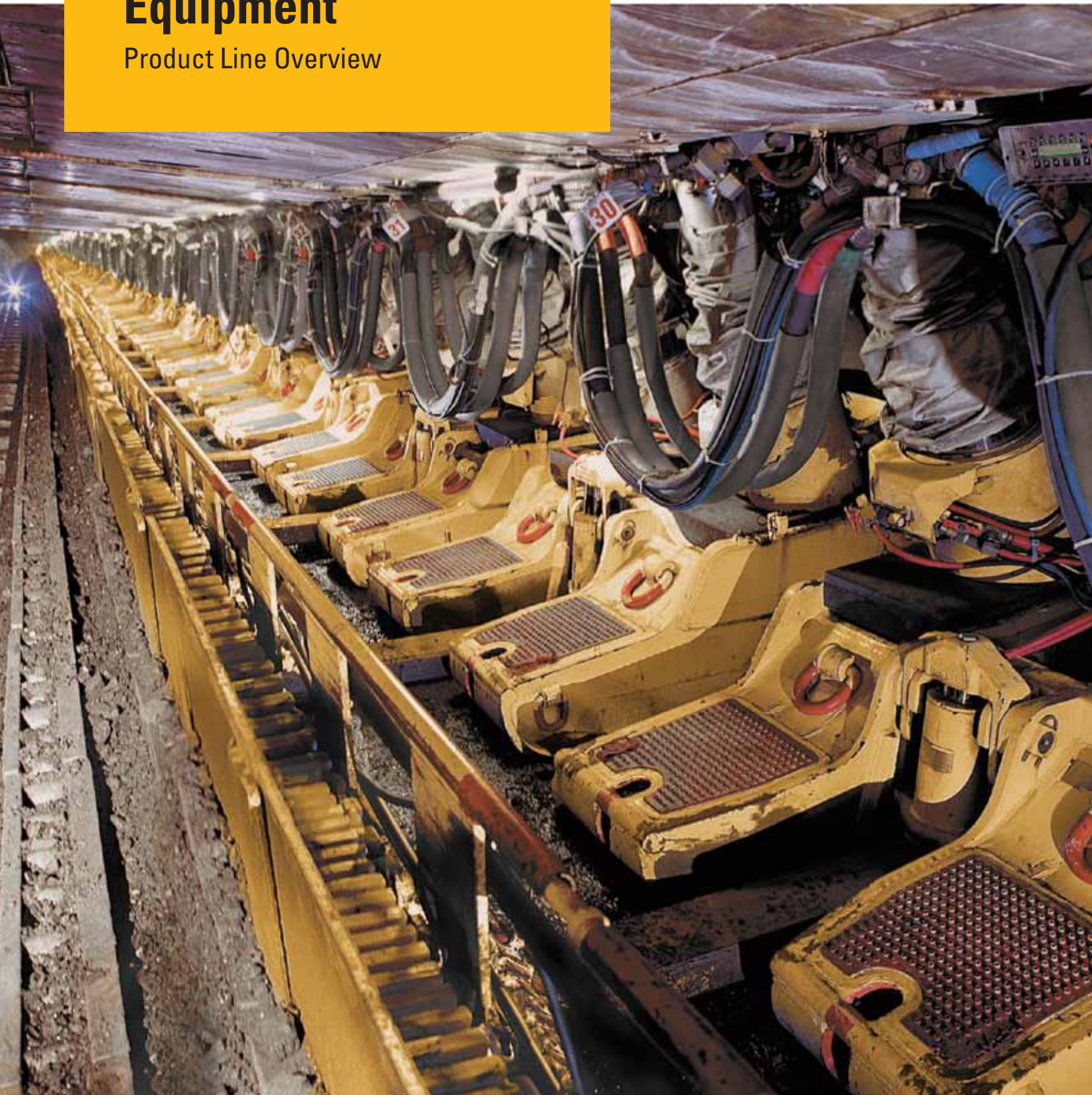


Longwall Mining Equipment

Product Line Overview



Roof Supports



Customized Design

Caterpillar is the world leader in longwall roof support technology. In the early 1970s, demanding mining conditions in German coal mines set the stage for extensive R&D in roof support technology. Steeply inclined coal seams both thick and thin, weak roofs and massive sandstone roofs, soft floors, and geological faults called for a high degree of customization.

The resulting expertise has been deployed and applied to all mining areas of the world and provides customers with state-of-the-art technology customized to maximize control of the roof and floor of their longwalls. This not only eliminates downtime resulting from control of the strata surrounding the coal seam; but also facilitates automation of roof support systems, even in very difficult geological conditions.

Seamless Range

A full range of roof supports are available for mining heights from 550 to 7 500 mm (1.80 to 24.60 ft), with support capacities in excess of 1 750 tonnes. As with all Cat® products, top quality and leading innovation result in products that deliver maximum performance and system availability, long service life, and lowest possible cost of ownership.

Two-meter Roof Supports

The two-meter-wide roof support offers several advantages over conventional 1.50- or 1.75-meter-wide shields. Fewer shields mean lower investment and fewer shields to handle and maintain – and fewer parts to malfunction. Longwalls are easier to steer and relocation is done faster as there are fewer shields to move.



Two-meter-wide roof supports



Taking the Shearer to the Next Level

Your shearer is the most critical part of your longwall production process. That's why high-performance longwall operations demand shearers that deliver the highest productivity, availability and reliability. Cat shearers were always designed to meet these demands. But Caterpillar has taken them to the next level.

Survival of the Fittest

To do this, we invested heavily in refining our successful range of shearers. We started by reviewing and analyzing all more recent shearer installations and setting goals to improve productivity, availability and reliability. This was not a redesign, but an evolution – keeping the best tried-and-tested features of the existing design, while using the latest findings from science and technology to improve features and add new ones.

Shear Performance

With high-powered ranging arms and haulage units, Cat shearers cut and load up to 5 000 tonnes (5,500 tons) per hour and more, depending on mining conditions. The unique one-piece mainframe design offers maximum structural integrity and service life. The mainframe is available as a split unit in the event of transportation limitations. Featuring the superior Jumbotrack shearer haulage system, the shearer also offers advanced integrated automation and communication options

Key Improvements

Cat shearers incorporate numerous new features and benefits. The key improvements include:

- Extremely powerful PMC™ Evo-S control system with state-of-the-art Ethernet communication
- Improved, innovative downdrive design
- Ranging arm with longer service life
- Further development of the modular haulage and electrical control box
- Enhanced power pack with easy access
- Online vibration monitoring with VibraGuard™
- Clear wiring and use of plug and play for easy maintenance
- Trapping Shoe Ix (Insert Exchange) allows for longer service life and is safe and easy to replace
- Future-proof design allowing upgrades – such as stronger ranging arms and haulage units or addition of coal sizer – during rebuild
- Mainframe designed to handle 1 200 kW ranging arms and 200 kW haulage units – EL3000 only



Automated Plow Systems



High-level Automation

We have been designing and building longwall plows since 1941 – and things have come a long way. Technical developments since 1990 have once again established plowing as the preferred longwall mining method for seams below 1.8 m (71 in). Cat plows offer world-leading features that other manufacturers cannot and a cost of ownership that far outstrips the shearer when mining thin and medium seams. Their reliability, high-productivity and ability to mine in-seam make them the ideal choice for longwall mining medium and thin seams.

Cut any Coal

There was a time when the application of plows for longwall mining was limited by the type of coal to be cut. With Cat, this is no longer the case. Advancements in drive, control and transmission systems – with more powerful motors, stronger plow chains, increased plow speeds, higher advancing force provided by the roof supports, precise control of the cutting depth, and plow bit design improvements – all combine to allow Cat plows to be used for any coal hardness and with higher efficiency than other longwall extraction methods in low and medium heights. This is supported by greater installed power than any other manufacturer – up to 1 600 KW (2,160 hp) with the GH1600.

Any incremental plowing as offered by Cat means that the plow cuts a precisely defined depth, regardless of coal hardness, seam structure and faults. On older-style systems, the cutting depth is typically controlled by adjusting the shield advancing ram pressure, with the result being that cutting depths vary with coal hardness.

Horizon control is provided by the hydraulic steering cylinders and allows exact control of the plowing angle, ensuring that the plow does not dive or climb unless required by the seam geology. This control capability also allows mining of seams with an inclination of up to 60°.

Cat offers plows systems as complete and fully-automated or semi-automated versions. Cat plows undergo constant development to meet special requirements for our customers.



High-Capacity AFC Systems

Moving Mountains

No matter how fast your shearer can cut, you can't keep cutting until you move the coal away from the face. Cat Armored Face Conveyors (AFCs) are designed to keep things moving and to carry the maximum possible amount of coal smoothly away from the coalface. They are designed for high availability and economy in operation. They are easy to maintain and offer long service life and a great return on investment to mine operators.

Best in the Long Run

Cat AFCs excel through cutting-edge technology, quality, experience and superior product support. Of course, that's what any AFC manufacturer would like to promise. But we can. Our engineers invented the AFC in the early 1940s. Of the ten most productive mines in the world, eight use our face conveyors.

Several systems have successfully operated in 350 to 470 m (1,150 to 1,540 ft) faces producing up to 5 000 tonnes (5,512 tons) per hour and 10 million tonnes (11 million tons) per year. Our experience and track record are unmatched in super-long and high-capacity face conveyors.

And of course, Caterpillar – recognized as a world-leading developer and manufacturer of integrated longwall systems – has a long history of engineering solutions that meet the needs of mine operators. That's why our longwall systems have been in service in all major coal-mining regions of the world for decades.

Meeting all Needs

From AFC tail drive to entry belt conveyor return end, Cat AFC systems are designed for a variety of performance requirements in low, medium and high seams, for short and long faces. Caterpillar meets the demand of today's high-capacity shearers and, of course, our own automated plow systems.

The PF Range

The line pan is the backbone of the AFC – literally. They not only convey material from the face, but also act as the guide rail for the shearer – with traction forces of up to 1 000 kN.

Caterpillar offers a range of line pans to suit different needs. These range from the PF3 for capacities of up to 1 300 tonnes (1,433 tons) per hour to the state-of-the-art PF6 with a capacity of 5 000 tonnes (5,512 tons) per hour.



PF6 line pan

Intelligent CST Drive System



The Drive for Productivity

With constant pressure for greater productivity, improving the performance of longwall systems remains a key goal for mine operators. At Caterpillar, all aspects of longwall operation and machinery are continuously reviewed to find ways to improve productivity and reduce the overall cost of mining. The performance of the face conveyor system is continually improving.

Improved Performance

Ever more powerful systems require ever more horsepower, heavier chains and faster conveyor speed with maximum availability. What was needed was a truly intelligent drive system for face conveyors, which led our engineers to develop the CST (Controlled Start Transmission) drive system meeting the following requirements:

- Currently available power up to 1 200 kW (1,950 hp) per transmission unit
- Safe startup of the face conveyor
- Full utilization of the installed power
- Highly durable components
- Compact dimensions
- High level of efficiency



Longwall Automation



Unparalleled Control

Excellent automation is the basis for the success of a longwall – the quality and reliability of the automation system are key factors in the success of the operation. Caterpillar is the only manufacturer that is able to provide a complete modular family of powerful controllers that integrate fully with Cat longwall equipment. This means one-stop shopping, no interfacing problems and products customized to your needs.

Full Range, Full Integration

Based on the successful Cat PM4 series, the PMC™ family is a new generation of controllers designed to meet the control needs of a whole range of applications in underground mining and explosion-hazard areas. State-of-the-art microcontroller technology and increased computing power allow a completely new dimension of automation, offering all the functionality you need for enhanced control of drives, roof supports, cutting systems and ancillary equipment. It also offers features for advanced networking, visualization and automation.

Design Criteria

Cat longwall automation systems are designed for

- Maximized automation of the whole longwall
- Maximized production
- Maximized safety
- Optimized use of equipment
- Minimized component overload
- Minimized exposure of mine personnel to unsafe and dust-laden areas
- Ease of use

The PMC™ Family

A Controller for Every Need

The PMC™ system offers a tailored control unit for each of the various longwall functions:

- PMC™-R for roof support systems
- PMC™-D as drive control
- PMC™-V for visualization and parameter setup of the drive system
- PMC™-P node computer to act as interface between the Cat controller network, third-party systems and the mine computer. The module implements data transmission to the surface via optical fiber, modem or copper wire.
- VCU for visualization and control of all longwall operations at the surface or with an explosion-proof computer underground

Roof Support Carriers



Packed with Power

Longwall moves represent an enormous challenge to underground transportation logistics due to many variables such as the height and width of roadways, the radius of bends, and the various types of ground conditions. Caterpillar offers a full range of roof support carriers to meet the needs of our customers' operations.

Development and Design

As the world's leading supplier of longwall technology, Caterpillar has always taken great care to design and manufacture the best longwall movers available. Our outstanding experience in the development and design of rubber-tired vehicles has contributed to the success of our four-wheel roof support carriers.

After studying operations all over the world, we have selected the best concepts and designs for the varying conditions and regulations encountered in underground coal mines.

With Caterpillar, you can choose from a range of roof support carriers designed to provide maximum lift and carrying capacity at dimensions adequate for different mine layouts and various transportation tasks, such as maneuvering and positioning roof supports in the longwall face and transporting roof supports from one face to another.

Smart Move

The Cat range of battery- and diesel-powered roof support carriers meets all the requirements that could be encountered in longwall moves around the world.

Each vehicle focuses on specific conditions of mine layouts, geology, the load to be carried, and safety and emissions regulations.

All Cat roof support carriers have one thing in common: They are built to meet both current and future requirements in longwall moving by providing a combination of compact power, capacity, maneuverability, and long-term availability and efficiency.



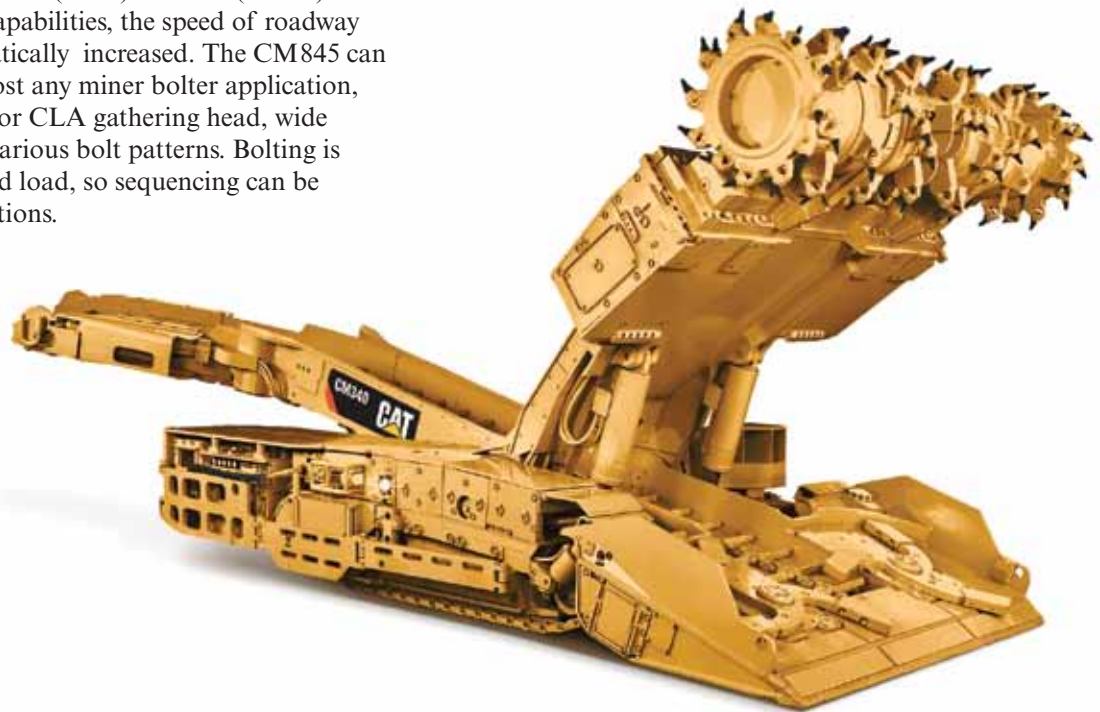
Continuous Miners



Roadway Development

Before longwall mining begins, gate roads are driven to the back of each panel by continuous miners. The Cat CM200 Series of continuous miners are the machines of choice to perform a room and pillar operation to develop longwall panels. The gate roads provide passages for longwall equipment, workers and conveyor belts used to transport coal to the surface.

Roof support is one of the main bottlenecks in entry roadway development. Caterpillar offers a miner bolter model to solve this problem. With one-pass mining at cutting heights from 2.4 m (7.8 ft) to 4.1 m (13.6 ft) and roof and rib bolting capabilities, the speed of roadway advancement is dramatically increased. The CM845 can be configured for almost any miner bolter application, with a cross conveyor or CLA gathering head, wide or narrow head, and various bolt patterns. Bolting is independent of cut and load, so sequencing can be adapted to roof conditions.



Belt Systems & Belt Products



Advanced Technology Solutions

Caterpillar offers a full range of rugged belt conveyor systems and products unsurpassed in performance and service life – custom-designed solutions to handle the most demanding bulk-material handling applications, both on the surface and underground.

Belt Terminal Groups

Caterpillar offers two types of belt terminal groups – pre-engineered and engineered.

Pre-engineered Belt Terminal Groups

Cat pre-engineered belt terminal systems are designed to be mobile, modular and flexible. Pre-engineered belt terminal groups are easy to move in the mine and use in different areas, reduce lead times, and can be used in multiple applications.

Engineered Belt Terminal Groups

Cat engineered belt terminal systems are designed for more robust applications with very specific customer requirements in mind, and are designed as a joint effort between Caterpillar engineers and our customer.

Drives

Cat drives are designed for ease of setup, installation, and transportation in and around the mine. Engineered drives are designed based upon customer-driven parameters and requirements and ensure the right fit for customer applications.

Hydraulic Take-Ups & Storage Units

Take-ups and storage units apply slack removal and responsive belt tension for all bulk-material handling conveyor systems.

Remote Discharges

Designed for in-line, 30-, 60- or 90-degree transfer points and efficiently transfers material to the conveyor belt.

Tail Sections

Cat tail sections are designed to accept loading from a variety of haulage equipment and other belt conveyors.



Pre-engineered combo drive

Belt Structures & Rolls

Belt Structures & Rolls

Caterpillar has a full range of rugged and reliable belt systems and belt products unsurpassed in performance and service life – custom-designed solutions to handle the most demanding bulk-material handling applications, both on the surface and underground.

Belt Structures & Rolls

Caterpillar offers world-class quality components for bulk-material conveyor systems in underground and surface mining applications. Complete bulk-material solutions with belt widths ranging from 18 to 96 in are supported by a robust line up of 4, 5, 6 and 7 in idlers both in-line and offset with CEMA C, D and E class ratings, along with custom-built engineered class pulleys.

Steel Rolls

A new shaft-end configuration for the Cat steel roll allows retrofitting to virtually any competitor's frame with a unique retrofit adaptor. The end cap (bearing housing) has been redesigned for increased strength and a close fit to the deflector cap. Our new automated assembly process includes three separate, metered grease inputs to ensure every roll has plenty of grease for a lifetime of trouble-free operation. And Cat idler PAL™ (Positive Automatic Lubrication) ensures life-long grease management system during both operational and non-operational periods. It keeps grease where you need it: In the bearing.

EXALON™ Rolls

In most bulk-material applications, it is the shell life that determines the life of an idler roll. Caterpillar has developed EXALON™, a proprietary high-molecular-weight polyethylene which provides three times the abrasion resistance of a steel roll. And Cat idler PAL™ (Positive Automatic Lubrication) ensures life-long grease management during both operational and non-operational periods.

Each Cat idler roll is processed through an automated assembly system which tests and records rotational torque, total indicator run-out, and axial end play. Upon acceptance, each idler roll is permanently marked with a serial number and date of manufacture.

As a result of this identification, Caterpillar can offer a 3-years-to-life warranty on all components, excluding the shell life of each roll.

Engineered Class Pulleys

Cat engineered class conveyor pulleys are a completely engineered solution for all bulk-material handling applications. These pulleys are ideal for use in both surface and underground mining applications.

Caterpillar offers a line of Turbo-Disc and T-Bottom pulleys. These pulleys have proven their legendary strength and reliability under some of the most severe conditions imaginable. They perform reliably, driving conveyors with installed power in excess of 3 750 kW (5,000 hp).



Longwall Mining Equipment

For more complete information on Cat products, dealer services, and industry solutions, visit us on the web at mining.cat.com and www.cat.com

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