

Cat Rock Straight System Mines Hard Rock with Longwall Efficiency

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The Cat® Rock Straight System is a fully mechanized longwall system designed for continuous mining of flat and tabular deposits and reefs of hard rock minerals. The system combines the use of a hard rock shearer that uses Cat Activated Undercutting Technology, which is specifically designed for the extraction of bedded hard rock deposits. A low-profile hard rock chain conveyor and hard rock hydraulic roof supports complete the system, which delivers simultaneous cutting, loading and hauling—controlled by the proven Cat longwall automation system.

The Rock Straight System is the first commercial continuous mining and hauling system for underground hard rock applications, and it is now commercially available after extensive field testing. The efficient mining system is designed to replace conventional drill-and-blast operations in low heights, ranging from 1.3 to 2.0 meters (4.2 to 6.6 ft) and in bedded deposits such as some types of platinum, copper and gold deposits. The system can follow the seam and maximize ore mined while keeping dilution to a minimum.

Additional benefits include reduced health and safety risks. The electrically powered rock cutter and hard rock conveyor have no exhaust emissions, and there is no need for explosives use in the production cycle. Compared to conventional hard rock mining, fewer people are needed underground, and remote control places the operator in a climate controlled cabin.

Hard Rock Miner

Cat Activated Undercutting Technology is the key to the success of the cutting machine, the HRM220. The design of the two cutting heads enables the picks to attack the rock from an optimum angle to exploit its tensile strength, which is only 10 to 20 percent of its compressive strength. The activation movement optimizes velocity, momentum and impact of each pick—while moving the pick away quickly to minimize wear and heating. The result is reduced energy consumption and replacement cost of cutting tools.

Each of the cutting units is powered by a 132-kW (177-hp) motor and can cut rock exceeding 120 MPa (17,404 psi) uniaxial compressive strength. Cutting unit haulage speed can be as much as 6 meters per minute (19.7 ft per minute), depending on the properties of the cut rock. High capacity haulage in

combination with a maximum cutting depth of 100 mm (3.9 inches) delivers high production rates. The independent cutting units can be positioned at different heights to maximize the productivity of a single cutting sequence.

The HRM220 incorporates electronic modules that enable control, monitoring and protection of the miner. Remote operation and diagnosis of major components can be done from the operator cabin via on-screen information. Of course data can be transferred to a surface location for analysis when needed.

The robust mainframe protects electrical equipment and hydraulics from cutting and haulage forces, resulting in superior reliability and longer life. The cutting system has a total weight of 41.0 tonnes (45.2 tons).

Hard Rock Conveyor

The Hard Rock Conveyor, HRC30, builds on Caterpillar's extensive experience in longwall conveyor technology, adapted to hard rock applications. The newly developed apron face conveyor is very low profile, designed to transport rock in low cutting heights. A single flight bar chain moves the apron pans across the length of the cutting face as they ride on the line pans. The apron pan system ensures reduced wear when moving abrasive rock.

The number of line pans can be varied to suit different face lengths up to 100 m (328 ft). The durable conveyor uses high-strength steel for long service life and reliable operation. Haulage capacity is 160 tonnes (176 tons) per hour.

Hard Rock Roof Support and Automation

Caterpillar engineers designed the HRS1220 Hard Rock Roof Support specifically for the Rock Straight System. Based on proven longwall roof support designs, the two-legged shield incorporates a solid base connected with an advancing mechanism on each side of the base.

The supports feature a working range of 1060 to 2155 mm (41.7 to 84.8 inches) with a yield load of as much as 2599 kN (377 psi). The supports are proven durable and reliable in the Caterpillar test center in Germany and in mine applications.

The Cat PMC-R electro-hydraulic control system provides advanced roof support automation. It has proven to be flexible, reliable and productive in mines around the world. In addition to optimizing productivity, the system provides equipment monitoring and remote diagnostics.

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