

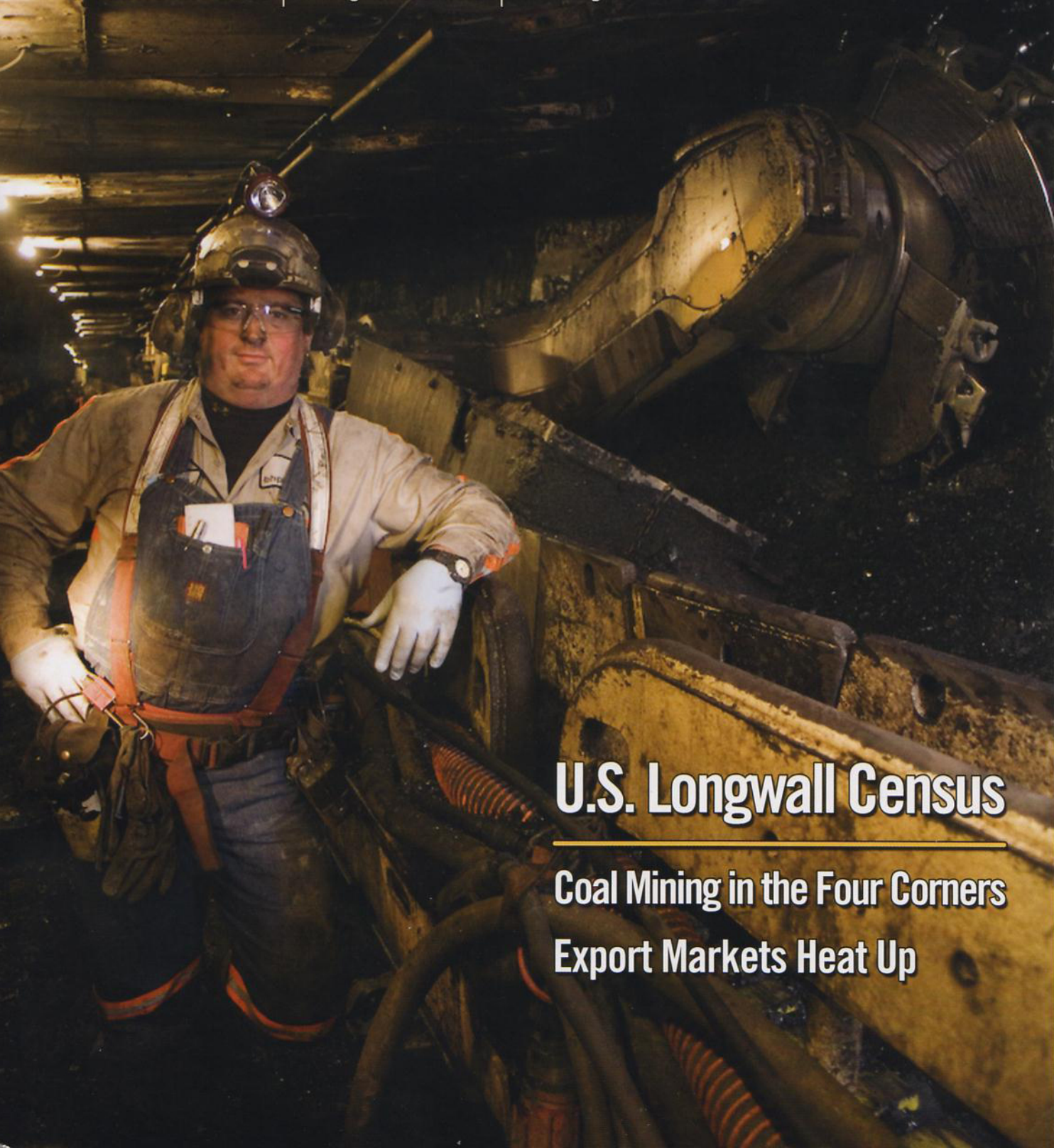
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U.S. Longwall Census

Coal Mining in the Four Corners
Export Markets Heat Up

ROTARY BLASTHOLE DRILLING UPDATE

New technology improves precision and penetration rates

BY STEVE FISCOR, EDITOR-IN-CHIEF



The DR460 has Sandvik's new brand colors: dark orange, gray, and white.

Blasthole drilling rigs are the unsung heroes of open-pit mining. Rarely do they see the spotlight as much as their counterparts on the loading and hauling side of the operation. Surface mines, however, rely on these machines and their operators to drill consistent blast patterns quickly.

An improperly drilled blast pattern can lead to poor fragmentation and over break. When the overburden is blasted poorly, large pieces in the muck pile can cause headaches for the loading tools, which disrupts productivity throughout the operation. Likewise over-drilling will mix valuable coal with the cast or ruin a thin seam.

Over the years some mines have moved to an angled drill pattern to improve highwall stability and the cast. But that technique also adds another variable to the mix, especially when the drill

pipe tends to drift off center. Even though the spacing at the surface looks great, the spacing at the bottom of the hole could be awful. Of course, the drill operators have to keep all of this in mind while trying to drill as many holes as possible.

Recently several original equipment manufacturers (OEMs) and mining industry service providers have announced new tools that will help drill operators do their jobs better. The OEMs are making drills that operate more safely and efficiently. Moreover, technology and GPS navigation systems are allowing the mines to drill blastholes with pinpoint accuracy.

Sandvik Launches the DR460

During January, Sandvik unveiled the DR460 rotary blasthole drill at its manufac-

turing facility in Alachua, Fla. It is a diesel-powered, crawler-mounted unit that drills 251- to 311-mm (9-7/8- to 12-1/4-inch) diameter blastholes.

With 260 hp (input) on the multi-pass machine, the DR460 has 37% more rotary horsepower than Sandvik's previous model, the 190-hp D75. "Nothing magical. We simply engineered more hydraulic power to the rotary head," said Tim Murphy, vice president drilling, Sandvik Surface Mining. "When ground conditions allow, the operator can increase his rotation without sacrificing torque."

From a service and reliability perspective, the DR460 offers a full perimeter walkway for improved access. This extra wide walkway allows the operator and service technicians free access around the rig. The drill has been engineered to meet stringent Australian standards (MDG15) for electric and hydraulic design. The hydraulic system has been designed to reduce the amount of hoses in one location by moving the hydraulic valves to be close to the point of use. Furthermore, by focusing on routing, securing, and shielding (wires) there is a dramatic improvement of the reliability of these systems. The electrical system has been encased and isolated from the hydraulic system to keep the two from interacting in an effort to reduce fire hazards.

"We have used piping to eliminate as much hose as possible and all of the piping is secured to the machine," said Murphy. "The purpose is reliability over time. Hoses tend to chafe. Although it's impossible to completely eliminate it, you try to minimize it where you can." The hydraulic lines are secure through stop clamps eliminating plastic zip ties.

A spacious FOPS rated, 4.4 m² (47 ft²) cabin offers the operator an extremely comfortable work environment. "The electro-hydraulic controls are mounted in the chair and the chair faces floor-to-ceiling windows providing an unobstructed view of the drill deck," Murphy said.

The standard DR460 is engineered to operate at an ambient temperature of up to 54°C (130°F). The DR460 can also be



Perimeter walkways offer better access.

equipped with optional cold weather equipment that includes generator sets and machinery housing for arctic climates. "In extreme cold, we use Mesabi coolers," Murphy said. "Because of the thermal expansion capability, they handle cold oil better than an aluminum core."

The main goal of the DR460 is to increase productivity while adding features to improve reliability, operator acceptance and serviceability. The pull-down force is up to 356 kN (80,000 lb) and bit load 445 kN (100,000 lb) for maximum productivity in hard rock formations. The DR460 is capable of drilling benches up to 75 m (246 ft) with 12.8-m (42-ft) long drill pipes. "The DR460 has a longer single-pass capability than our previous models and our competitors," said Murphy. "Many mines are using hydraulic excavators and they prefer a 10-m bench. With 42-ft pipe, the DR460 give the mine a 10-m bench." The first machine is going to a Canadian coal operation and Sandvik will have one on display at MINExpo.

Drill Navigation System Offers Added Features

Operating a drill productively on a mine site requires accuracy in navigating around the pattern and in drilling the blastholes to a specified elevation. DrillNav Plus is a robust, easy to use blasthole navigation system which supports angle drilling, according to its developer Leica Geosystems. It provides the mine manager with instant feedback on drilling as well as production performance measurements. Mines can design drill patterns in the office and download them to the drill, or the operator can layout standard patterns on board the drill.

The key to increasing drill efficiency lies in giving accurate, real-time feedback to the person who controls the process. As the drill navigates around the pattern, DrillNav Plus system shows the pattern replicated on a moving map on the operators' display. The operator can see where each hole should be drilled and the location of the previously drilled holes. In addition, the bit depth can be displayed relative to a specified elevation rather than to a depth below current ground level.

The system accurately measures and records a range of parameters including meters/feet drilled, penetration rate, drilling and non-drilling time, tramping time, production delays, and hole ID.

The DrillNav Plus is fitted with the Leica 1200, dual frequency Real Time Kinematic (RTK) GPS as standard. This leading edge technology provides for 4-cm horizontal accuracy and 6-cm vertical accuracy. Each hole can be drilled accurately to a defined elevation above sea level, reducing over and under drilling and therefore reducing the possibility of over break.

Eliminating the need to stake a pattern, it frees the mine surveyor to attend to more important tasks around the mine site. It provides the drill operator with a moving map to allow quick navigation to the desired hole location. Problems with lost or buried stakes are eliminated and surveying is not required.



The system will automatically record the start and duration of all delays. Accurate delay detection allows for detailed analysis of lost time improving drill utilization. A drop down list of possible reasons for the delay is presented to the operator. Simply touching the appropriate delay on screen will tag the delay with the operator's reason.

DrillNav Plus's human interface is via a 10.4-inch color LCD touch screen with

P&H Introduces C Series Drills

The C-Series drills, introduced in mid-2006, characterize P&H's most advanced technologies. The new-to-the-market 320XPC is the successor to the 120A and GD120 models that P&H Mining Equipment upgraded and marketed after acquiring Gardner-Denver's rotary drill line in 1991. P&H's two new C-Series models—the 300XPC and 320XPC—replace the 100XP and 120A rigs, respectively.

The 320XPC is the most advanced of the P&H production drilling rigs. It's designed to produce large holes—up to 22 in. diameter—down to a standard depth of 65 ft, providing bit loading forces of up to 150,000 lb and rotary torque of up to 25,000 ft-lb. Bailing air capacity is 3,000 cfm with the standard air compressor, and up to 3,850 cfm with an optional compressor package.

P&H's Centurion control system, among other duties, provides machine diagnostic information and manages the rig's automated drilling system through continuous

1,600nits brightness. The screen is crisp and clear and allows excellent visibility in direct sunlight conditions, as well as no glare at night. It is intuitive, easy to use, and configurable per operator.

Comprehensive data about each hole and the delays incurred is transmitted back to the office server by a secure telemetry system. This information is then stored in an open SQL database. A complete range of essential analysis tools allow the system to turn drill data into useful information. These tools are easily integrated with the Microsoft Office Suite and the mine manager can schedule reports at any frequency to be printed, e-mailed, or placed on intranets. This allows real-time fleet information to be easily shared and used in decision making to maximize productivity.

To integrate the office with the machine in the field, DrillNav Plus uses reliable spread spectrum radio systems. Both 900 MHz TDMA and 2.4GHz 802.11 are supported. This allows for a single radio infrastructure for machine monitoring at most mines to deal with the large volumes of data required for production and position information systems.



Leica's DrillNav Plus guides the drill and manages its operation.

monitoring to balance and optimize bit loading, bailing air, and rotary torque. Its constant monitoring of drilling conditions, says P&H, allows the drill to maintain a high level of production and accuracy from shift to shift without variations caused by different operator skill levels. Centurion also can help manage add-on control systems including GPS guidance.

The operator enters a few basic commands via the touch-screen terminal and the drill basically manages the drilling process. The operator monitors the P&H 320XPC's automated drilling system on a computer terminal mounted in the console array. The operator can intervene if necessary, but once the drill finishes the hole, the machine moves to the next targeted blast-hole using GPS.

Atlas Copco Unleashes the Viper

During September 2007, Atlas Copco debuted its latest technology for blasthole drilling at the Asia Pacific's International Mining exhibition (AIMEX), held in Sydney's Olympic Park. As one of the largest pieces of surface mining equipment in the main haul, the drill took center stage.

The Pit Viper PV275 made its first ever appearance at the Australian expo. Ideally suited for overburden drilling, this multi-pass rotary blasthole drill rig can drill to



Atlas Copco's Viper PV275 center stage at AIMEX.

depths of 60 m and deliver a bit-load force of up to 311.4 kN (75,000 lb).

The track-mounted rig is maintenance friendly and built with proven systems and technology, according to Atlas Copco. The Pit Viper also benefits from some new features to further enhance its productivity. These include:

- An Ingersoll-Rand low pressure 1,900 cfm, 110 psi air compressor or a 2,600 cfm, 100 psi compressor for rotary tricone drilling. A high pressure 1,450 cfm, 350 psi compressor is also

available for DTH hammer applications.

- An auxiliary breakout wrench that can be operated from the cab to break tight joints quickly and easily.
- Automatic cable tensioning that improves cable life and eliminates drill downtime for cable tensioning.

The Pit Viper series use a cable feed system because cables are lighter and less expensive than traditional chain feed systems. The cable also leads to smoother drilling, which in turn extends both bit and feed system life.

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