MONDAY, 28 NOVEMBER 2011 14:11

Omega Highwall Mining completes a safe and successful start up

By Lee Buchsbaum, Associate Editor and Photographer

Driving through the red and orange autumn foliage covering the Virginia hills near Richlands, J.D. Fairchild, regional sales manager-Highwall Miners, Caterpillar (Cat), spoke about the history of the highwall mining machine, a history intertwined with his own. “For the last 14 years, I’ve worked with our team to sell these machines all over the world. They are nothing but an evolution. We listen to our customers, the coal miners who operate these machines, and together we find ways to improve on our current design. That’s how we went from the first highwall miner to the current SHM-77R, how we’ve gone from a 600-ft capacity miner to a 1,000-ft super machine,” said Fairchild.

Manufactured in Beckley, W.Va., originally by Superior Highwall Miners, which was acquired by Bucyrus before being merged with Caterpillar Global Mining, highwall miners have grown in size, so too have markets for them. Omega Highwall Mining recently purchased the first Cat highwall miner to work the Townhill mine. Omega is a contractor for Wellmore Coal, a subsidiary of United Coal. United Coal is owned by Metinvest, a vertically integrated steel producer. The company has many mines and mills within the Commonwealth of Independent States (Russia) and the Ukraine. It also has manufacturing operations in Italy, the U.K. and Bulgaria. United produces met and steam coal from reserves located in the Central Appalachian region. Highly regarded as one of the leading U.S. met producers, United was acquired by Metinvest in April 2009.

The former Superior factory in Beckley, now a Cat integrated manufacturing operations division (IMOD) facility, built the new HW300 in August. The recently deployed yellow highwall miner, or “No. 77” as Fairchild affectionately refers to it, now sits on a bench before an exposed highwall quietly pushing 20-ft beams into the mountain. On an average shift, the machine’s four crew members advance the cutterhead about 1,000 ft into the coal bed. They will produce more coal than many of the small underground mines located nearby at a fraction of the cost. As far as safety, there is no comparison. None of the coal miners venture underground.

Permitting new mines in Appalachia has become an almost impossible task, particularly for surface operations. Highwall mining, however, presents some unique opportunities. By working “pre-law walls” or contour mines abandoned prior to the enactment of the 1977 Surface Mine Control and Reclamation Act, highwall mining operations also reclaim the land.

Jeff Taylor and Bobby Berry own Omega Highwall Mining. They began mining the 44-inch Jawbone metallurgical seam during October 2011. The Jawbone has been mined extensively throughout the area, but bad top prevented this particular block from being extracted. Previous developments, contour and auger mining, sterilized the property for decades until this yellow highwall miner arrived on the scene.

Highwall Mining Evolves

From the bridge of the highwall miner, an operator advances a cutterhead, or an unmanned cutter module, into an exposed coal seam. The machine rests on crawler tracks on the bench below the highwall. Coal is extracted in parallel rectangular (the width of the cutterhead) entries spaced at various intervals. The cutter module is pushed into the seam by a string of push beams that use a set of twin screw conveyors to clear the coal from the cutter module and transport it to the rear of the machine. A slewing conveyor stockpiles coal on the bench and a front-end loader places the coal in dump trucks.

The Cat HW300 can operate on benches as narrow as 59 ft. It trams easily from entry to entry and discharges coal in tight spaces. The machines can be easily moved from pit to pit or from mine to mine.

Highwall mining encounters some of the same horizontal and vertical stresses as those found in room-and-pillar mining. “Successful highwalling is all about negotiating the conditions while determining the feasibility of a certain property and location. The height of the overburden determines the width of the barriers, or fenders, between each of the entries. As the height of the overburden increases, so does the amount of coal left in place to ensure ground control stability,” said Fairchild.

The highwall miner’s depth of advance into the coal seam is also determined by how much force has to be applied to the string of push beams. This force must overcome changes in elevation due to undulations and rolls as well as any roof material that may fall on top of the push beams. All standard Caterpillar highwall miners are supplied with 49 push beams to travel 1,000 ft.

“In the first month of production, operating two 12-hour shifts a day five days a week, our crews produced just over 57,000 raw tons with an average entry depth of 887-ft. I’m really proud of our highwall miner crews during this first full month of production and I feel we should be able to increase our monthly production to 70,000 tons a month,” said Joe Scott, highwall miner superintendent, Omega Highwall Mining.

Typically there are four crewmembers on the unit per shift; an operator, a ground or “pad man,” a technician and a forklift operator. “The rate they are producing is 1.5 to two times greater than what we had initially budgeted. So far, I’m very impressed with the guys and the highwall miner,” said Taylor.

The machine is outfitted with Cat’s low profile cutter module that cuts an entry 116 inches wide from floor to roof rock-coal interface. The low profile cutter module is able to mine a maximum coal seam height of 66 inches and a minimum height of 28 to 30 inches. Once in operation, the cutter module is pushed into the coal seam by two sump cylinders located in the center of the highwall miner, which generate pushing forces up to 150 tons.

The highwall miner operator uses a programmable logic controller (PLC) to set the mining parameters that keep the cutter module within the coal seam. “By monitoring the amperage of the cutting motors, the operator can lower or raise the set-point of the cutting drum to avoid cutting floor or roof rock. If the amp gauges spike, then the cutterhead is out of the coal seam, indicating

that it is cutting the harder rock," said Fairchild. On the bridge, the operator uses two touch screens to control and monitor all of the machine's functions.

The HW300 is equipped with enclosed push beams and an anchoring system to cope with roof falls during the mining cycle. The roof rock that falls on the push beams does not mix with the mined coal, thus reducing out of seam dilution. As roof rock collects on the push beams, it adds weight to the mining string. If too much rock collects on the push beams, the string is retracted from the entry and the rock is removed by the coal loader and the unit can go back into the entry to complete the mining cycle. The anchoring system "pins" the machine to the pit floor to reduce sliding of the system during these high force conditions.

At the Townhill mine, crews began their push into the seam at an existing highwall where years ago shallow auger holes had been drilled into the coal seam. "You can breeze through the existing auger holes pretty easily. They're anywhere from 100- to 120-ft deep and a 20-ft beam advances in three to five minutes. Once you get back past the 120-ft mark to the solid coal block, you average about six to seven minutes per beam," said Scott. But, as conditions change, the operator can adjust his run time to make it push faster.

The Impact of VFDs

Geography, regulations and geological conditions are external factors that determine where and how a highwall miner can be used to extract coal. A physical factor that limits the penetration depth of the highwall miner is the high starting torque required to rotate the augers that convey the mined coal. The HW300 controls the high starting torques through the use of variable frequency drives (VFDs) that can be programmed to optimize the torque and speed requirements of the auger system and chain conveyors.

"We had reached our capacity limits with auger design. The controlled starts through the VFDs allow us to consider going deeper into the coal seam" said Fairchild. VFDs have other advantages. "We expect to see better component life in gear boxes, motors, chain conveyors, drive shafts and bearings due to the controlled starting of electric motors that reduce current inrush and impact loading of mechanical systems. We have seen a reduction of fuel costs for units that receive their primary power from generator sets and a reduction of dust and noise by using load sensing on the chain conveyor units. During push beam change out, the VFDs sense the chain conveyors are lightly loaded and reduces chain conveyor speed by 80%. We have taken a technology embraced by the mining business and applied it to the highwall miner to make it a better, more productive machine," said Fairchild.

No. 77 Meets Expectations

Omega officially started highwall mining at the Townhill mine October 10. "Thus far, our deepest hole has been 962 ft. The last couple holes we had a little trouble with the miner—not too much since we were at 930 ft on one of those pushes. I think 1,000 ft is definitely doable at this site and we should hit that here before too long," said Taylor.

Omega recognized that some of the pre-law highwalls in the area that had previously been contour mined and augered was now quite capable of serving as a profitable business platform for deep penetration highwall mining. "Not only can we extract large amounts of harder to access coal, but

because this region was mined prior to 1977, Omega is now able to perform reclamation work on an area that had not been previously mitigated. We will leave the land in better condition than we found it and improve the area in which we live and work," said Taylor.

Worker productivity is one of the biggest advantages of highwall mining over underground mining. With the improvements made to the HW300, Omega is able to out-produce its underground mine. "When you perform a cost per ton analysis of the highwall miner against the underground mine, you reduce costs 75% and get four times the production. We also operate a small deep mine with approximately 13 employees. They can only produce one fourth of what the highwall crew can do. Historically, for an underground mine in this area to produce 4,000 clean tons a month is a pretty good number. We can probably recover somewhere around 1,000 to 1,200 clean tons per day with this highwall miner as we continue to iron out our problems. We're producing close to 1,000 clean tons a day now, or approximately 2,500 raw tons. And we're just getting started," said Taylor.

Having quality coal, sound geology and a dedicated crew contributes to an operation's success; having good sales and technical support is vital as well. "We've been very impressed with all of the Caterpillar representatives. J.D. has helped me every step of the way as we've planned and executed this mine. It's been a great relationship and we look forward to that for a long time to come," said Taylor.

United Coal Understands the Highwall Mining Advantage

J.P. Richardson, newly appointed president of both United Coal's Wellmore and Sapphire divisions (the latter in Kentucky), is closely following No. 77's progress. After a long career in the Virginia metallurgical coalfields, today Richardson is helping ramp up United's plans for increasing production of high grade coking coal. The efficiencies gained by the highwall miner are a major part of his plans. "You can probably replace three underground contract deep mines with one well-placed productive highwall miner. They are also very consistent. With our geology, underground production can often be unpredictable. But the highwall miner tends to produce a more consistent tonnage day in day out. It is very attractive from that standpoint. It would be very hard for our company to be able to economically deep mine these reserves in any other way because the expense of underground mining and raw coal transportation would make it very tough to have ever gone after that coal block," Richardson said.

"The increased productivity at the mine allows for a higher transportation cost on the back end. Raw coal is trucked more than 20 miles to United's Wellmore No. 8 prep plant in Big Rock, Va. Coal recovery is right around 50%," Richardson said.

But high quality means higher prices. "The Jawbone seam is right on the cusp of a high-vol or mid-vol coking coal. It is generally in the 29 volatility range, but it's very low sulfur. It's an excellent coking coal," Richardson said.

Richardson laments that the very best reserves have already been mined, but he predicts the trend to return and take additional cuts off of some of the old walls will continue. "There was a lot of bench out there that was mined in the 1960s and 1970s that was very narrow. Operators took a contour cut with a very narrow contour—much too narrow for a highwall miner. You're going to see a lot of areas where people will try to get permits to go in and take an additional 60-ft cut off a given

wall. That will allow them to effectively highwall mine that space. Permitting is a major issue and with these pre-law walls, you can go in and recover a large amount of coal, while creating virtually no additional disturbances to the environment," Richardson said.

While No. 77 may be the first yellow highwall miner to arrive on United's property, "this isn't our first rodeo. The predecessor to United had several of these machines at one time, though they were smaller and older. Those machines' maximum hole penetration was 400 ft. But they mined a lot of coal during that time," Richardson said.

United Coal's Wellmore subsidiary also performs extensive highwall mining in the company's Pocahontas division using two operating machines as well. "Those are also owned and operated by a contractor. We hold the coal lease, and market and clean the product. But we contract someone to do the work for us," said Richardson.

Taylor also believes that if the current market continues, highwall mining in the area may continue for another five to eight years if the company elects to exploit adjacent seams located above and below the current area of operations. "We may be able to stair step down to the next seam when we have some open bench on the Jawbone. Then we can take that material and reclaim this wall and create new pits as we go forward," said Taylor.

Highwall mining will have other opportunities as small reserves of high grade resource blocks are identified. "I'm thinking less of the million ton blocks and more of the hundreds of thousand ton blocks instead. With the efficiencies and mobility of this unit, there are many things we'll be able to do on smaller acreage boundaries going forward. We have a lot of plans for No. 77. We hope to acquire some siblings for her one day too," said Taylor