

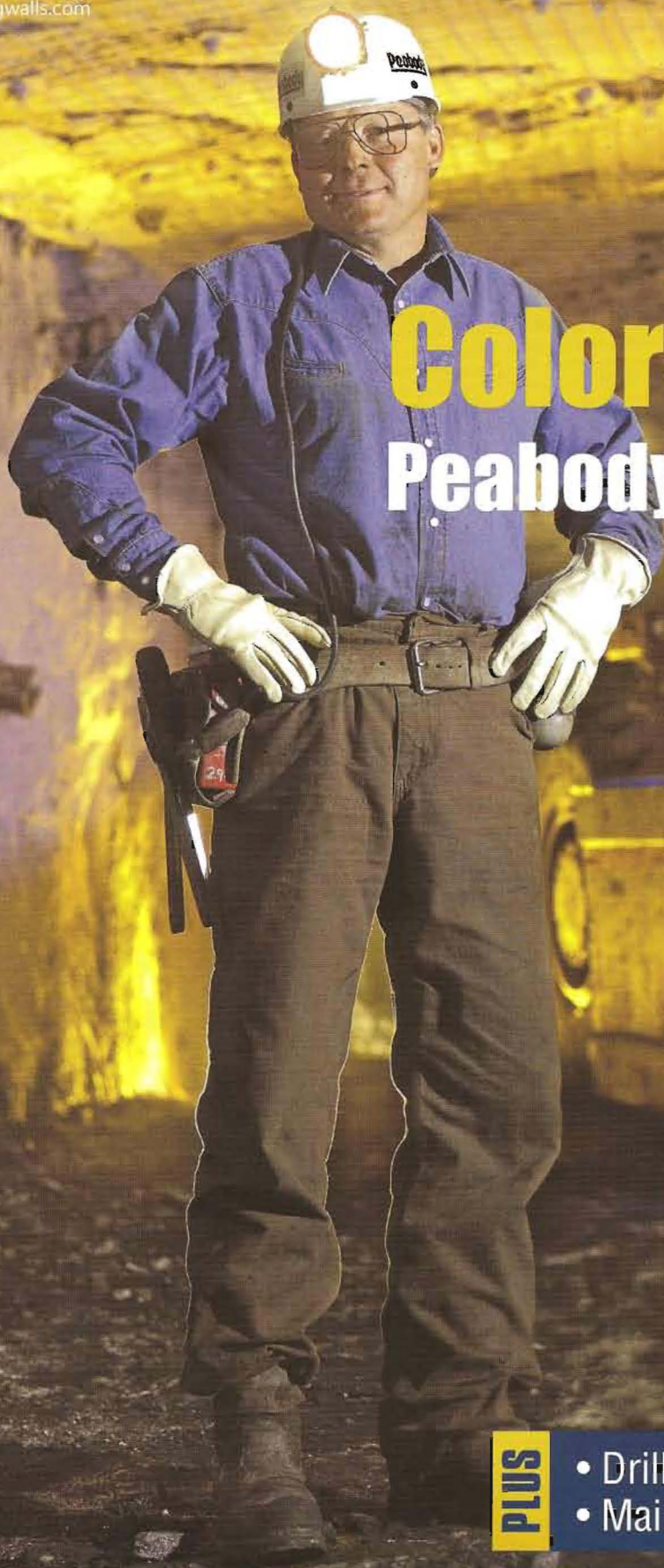
AMERICAN

LONGWALL

MAGAZINE

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Colorado giant: Peabody's Twentymile

PLUS

- Drilling and gas drainage
- Maintenance tips

Target drilling hits bullseye

LONGWALL coal mines assume considerable financial risk to be competitive in today's fluctuating global coal market. These large operations must manage large capital budgets, always looking ahead to realize their large investment. Simultaneously, they must manage their daily operations budget, at times struggling to overcome significant, and sometimes unforeseen and sudden, changes in mining and geologic conditions, as well as an ever changing marketplace.

A major hindrance for many of these longwall operations has been, and continues to be, coal bed methane. Worldwide, numerous longwall mine operators, either utilizing in-house or contracted capabilities, have proven the effectiveness of horizontal longholes. These longholes are either drilled from underground or from above ground, utilizing in-seam or vertical-to-horizontal coal bed methane wells, to maximize degasification time to mitigate methane caused production delays to continuous miner development and longwall production.

In-mine longhole or ultra-long borehole degasification

Since its inception in the spring of 1995, Target Drilling (previously known as AMT Drilling International) has utilized Advanced Mining

Technologies' DDM v2 Mecca permissible real-time survey system to drill 131 in-mine degasification longholes greater than 4000ft. This equates to more than 4.1 million feet total of in-mine borehole, including sidetrack footage to keep the borehole in the coal bed. This includes 61 boreholes greater than 4500ft in length, of which two in-mine boreholes were greater than 5000ft. The first was drilled in 1997 and the second in 2004.

TDI said the DDM technology, which is continuing to evolve with the DGS which is already permissible in Australia and soon to be in the United States, has raised the bar. In-mine boreholes once considered longholes when directionally drilled to about 2000 feet are now being drilled to more than 4000ft.

"When coal conditions are favorable, these holes have been drilled to depths greater than 5000ft in the United States and Australia by TDI and several other companies - all since 1995," TDI said.

Because of the relatively high fracture conductivity exhibited by the Pittsburgh coal bed, TDI's in-mine longholes shielding longwall continuous miner development have played a significant role in the increase in longwall panel dimensions at Foundation Coal's Cumberland Resources Mine. Dimensions have expanded from about a 1000ft face width by 10,000ft length to more than 1500ft face

width and 15,000ft length. This has been achieved by reducing ventilation requirements to dilute methane.

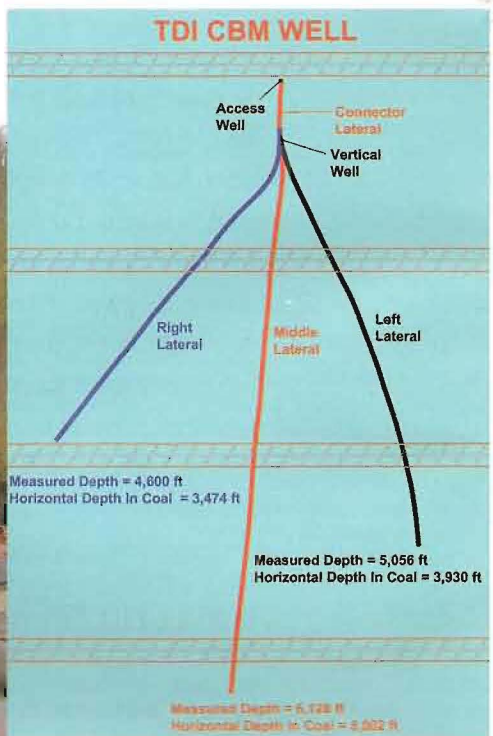
Although very effective in reducing methane emissions during continuous miner development and in the longwall panel mining, access to drill these in-mine shielding longholes sometimes only precedes longwall mining by less than two years. Additionally, once the continuous miner passes these shielding boreholes, gas production can decrease dramatically due to the high fracture conductivity of the coal bed.

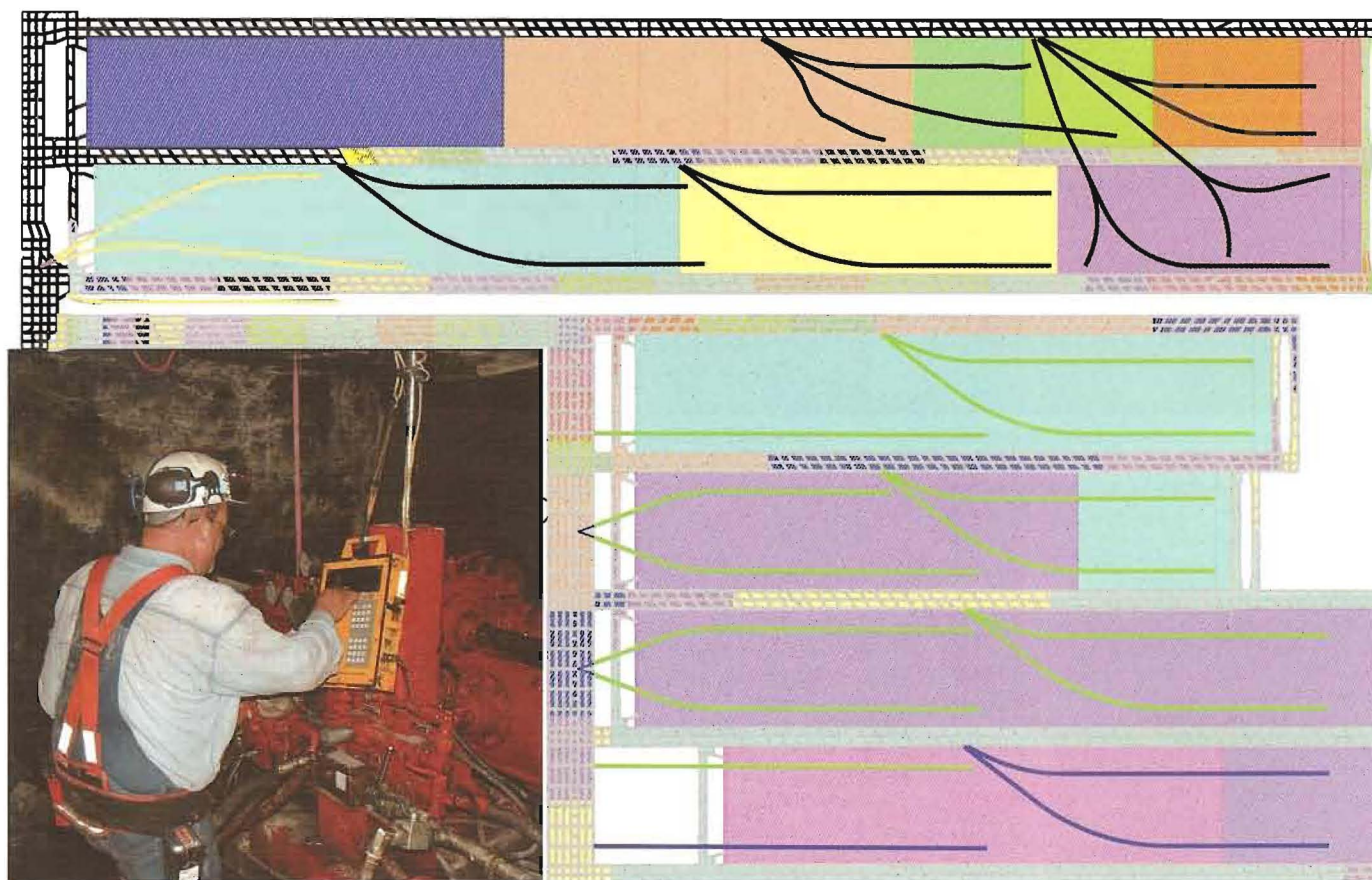
"Consequently, sale of the gas produced from these relatively short-productive-life boreholes might not generate adequate revenue to pay for them, although they certainly keep the CM section off gas," TDI said.

In addition to in-mine horizontal degasification, TDI directionally drills in-mine and surface boreholes from coal outcrops for coal exploration, identifying abandoned works, and for water drainholes. TDI has served on former Pennsylvania governor Schweiker's commission to investigate ways to prevent mining companies from mining into old works which included directionally drilled horizontal boreholes. All borehole collars, regardless of the application, are equipped with an annular, hydraulically inflatable blow-out preventor for wellhead control during drilling.



A TDI surface CBM well site and map of the well.





TDI underground with a Fletcher drill and Cumberland mine map with horizontal boreholes showing.

Surface vertical-to-horizontal CBM wells

TDI has expanded its horizontal directional drilling capability to include directionally drilled surface vertical-to-horizontal coal bed methane wells, with five wells completed to date. TDI has also drilled two vertical-to-horizontal wells targeting shallow shale approximately 2000ft below the surface.

TDI directionally drills the surface CBM wells and utilizes sidetracking (retreating to the coal bed if roof or floor rock are intercepted) to keep the parent borehole of the main coal laterals entirely in the coal or pay-zone. Along with casing the vertical-to-horizontal curve into the coal to case off unstable and often water bearing rock above the targeted coal bed, maintaining the coal laterals entirely in coal has culminated in TDI's ability to routinely directionally drill the coal laterals (generally three to four per CBM well) to horizontal depths greater than 4000ft in the coal, with several laterals to depths greater than 5000ft.

Total measured depth, or drill pipe string length, of TDI's laterals including the vertical-to-horizontal section have exceeded 6100ft.

TDI said production from the wells has been far greater than expected with initial production of over 750,000 cubic feet per day. Although a typical CBM well (three to four horizontal laterals) might cost in the range of \$1.5 million – including surface gas drying and compression equipment drilled by TDI or others – if the

CBM wells are planned and completed five to 10 years in advance of mining, the gas revenue generated by the CBM well will pay for itself many times over by the end of its productive life, TDI said.

“By the time it is mined into, maximum degasification of the coal bed will occur, capturing both the free gas in the natural fractures and the gas that desorbs from the coal matrix.

“Dewatering of the coal bed is another major benefit to coal operators. This is especially true in TDI's CBM wells because the coal laterals are maintained in the coal via sidetracking, if roof or floor rock are intercepted.”

TDI currently operates two surface top drive, pull down drills. The company is currently fabricating a third top drive surface drill in-house which will be completed in August.

TDI owns and operates all of the necessary drilling and accessory drilling, directional drilling and surveying equipment required to complete its CBM wells. It also offers EM steering equipment, EM steering system operators and coal directional drillers as a stand-alone business to companies that want to provide their own drills.

Sealing in-mine and surface CBM wells prior to mine-through

“Perhaps the single biggest deterrent to horizontal degasification boreholes, either in-mine or coal laterals extended from surface

CBM wells, has been overcoming the potential safety hazard during mine-through, especially if precautions are not adhered to or if the borehole has not had adequate time for degasification,” TDI said.

Predominantly, coal mine horizontal in-mine boreholes and CBM well laterals have been either water infused (flooded) or plugged with a cement slurry, sometimes with unsatisfactory results. Consequently, TDI with its partners, Foundation Coal and Concrete Construction Materials (CCM), developed a polymer gel to plug and effectively seal in-mine and surface CBM well horizontal methane drainage boreholes prior to mine-through by the continuous miner or longwall face.

TDI and gel manufacturer CCM have pumped 378,777 gallons of the polymer gel successfully sealing 62 in-mine boreholes and one surface vertical-to-horizontal borehole, totaling 358,652ft (including sidetracks). Fifty-one of the 61 in-mine boreholes and the vertical-to-horizontal CBM wells sealed with polymer gel have been mined into safely, without incident, in four coal mines.

TDI and CCM recently improved mix ability and pump ability of the gel mix by replacing the VMA-007 water-soluble, partially hydrated, polyacrylamide polymer product with VMA-003. CCM has the exclusive rights to the polymer gel and with or without TDI's assistance will provide the polymer gel, including if desired the mixing and pumping service, to any company.

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