



Tech Talk: Working Thin Coal - the Coal Plow and Hydrominer

Posted by [Heading Out](#) on August 29, 2010 - 10:50am

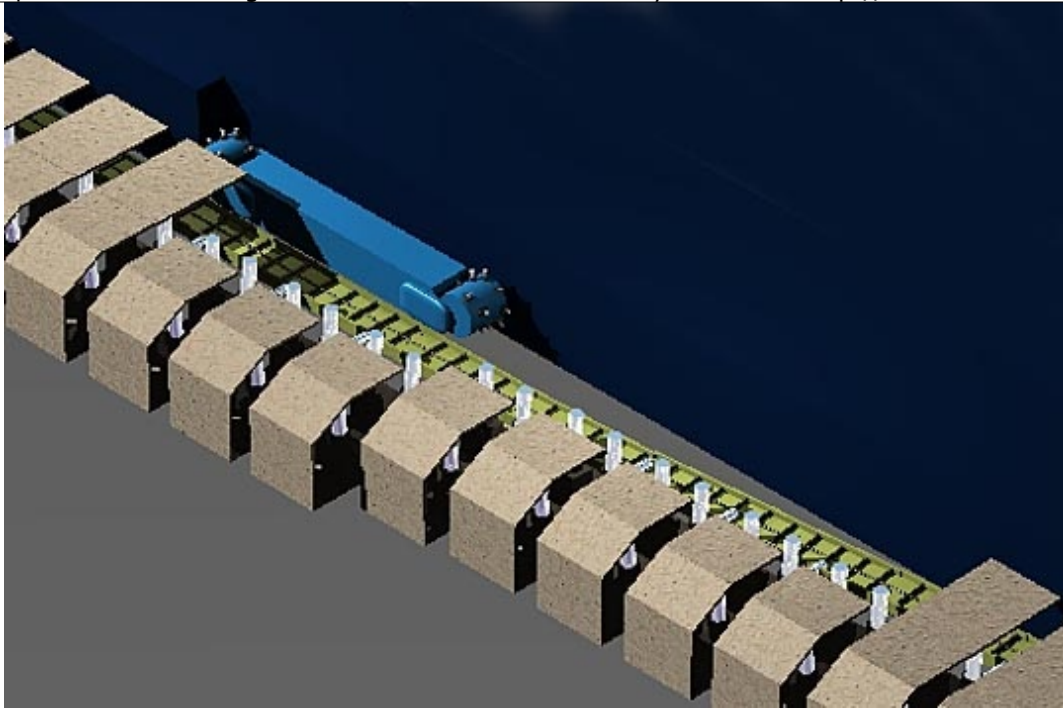
Topic: [Supply/Production](#)

Tags: [coal mining](#), [coal mining machinery](#), [coal plow](#), [hydrominer](#), [tech talk](#), [underground coal mining](#) [[list all tags](#)]

In the last couple of years, there has been a growing concern about the amount of coal that remains [in the productive reserve](#) for the world. At the same time, the incoming British Government, which had been somewhat antagonistic to coal while in opposition, may be giving large coal-fired power plants [a reprieve](#). Questions might therefore arise as to how long this fuel source is going to last, if use increases more than projected. While I am not going to answer that specific question today, I will address a part of the issue. Namely, what do you use to mine coal when the seams get too thin for modern equipment?

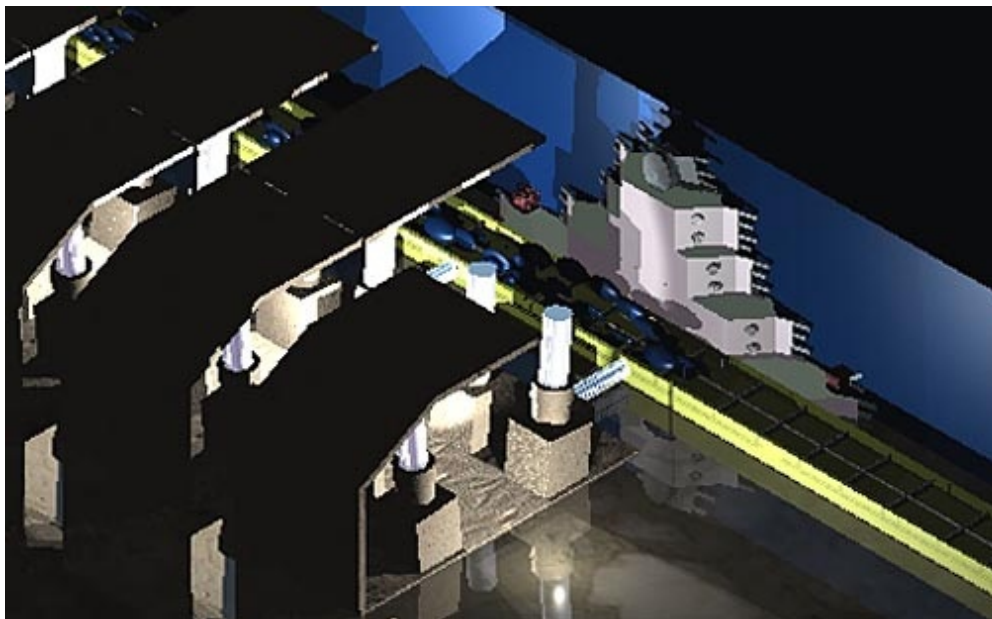
The lowest coal which I personally have mined was about 1 ft 8 inches high. The low coal was caused by a roll in the middle of the face (the floor got closer to the roof) which was normally about 3 ft high (the Beaumont seam at Seghill Colliery in the spring of 1962). In that height you lie on your back, put a pit prop under your shoulder to give you some leverage, and shovel across your chest. In more advanced mining countries it is unlikely that we will return to such manual labor, which is not very productive. So what do you use?

The most productive machine in most longwall operations is the shearer, which I described in the [last tech post](#). The problem is that it most effectively runs on top of the armored face conveyor (AFC) and the power pack that drives the cutting head, and the haulage unit takes up quite a bit of space. One idea was to take the shearer off the conveyor and have it slide along the ground on special shoes, with the cutting head mounted ahead of it on the longwall. My father had rather strong opinions on this, since two of the mines he worked with had such machines. Remember that the coal conveyor must snake over behind the machine in order to allow the supports to also advance.



To hold the machine together, the gear boxes at each end and the power pack in the middle, there are through-bolts down the machine. Now it breaks down in low coal. The roof is say 2 ft 6 inches above the floor, the machine is 22 ft long, and the conveyor is 7 inches high. How are you going to take the machine apart to fix it? (The answer involves explosives, and is not a “quick fix.”)*

So if the shearer is not an ideal machine, what is? The answer is known as a coal plow (or Hobel in Germany where they were developed by a company then called Westfalia Lunen.) Very simply in some coal types, particularly those that are brittle, the coal at the front of the face is weakened and cracked by the pressure of the overlying ground. Thus if you take a narrow pick and drag it across the coal it will peel off some coal. Put a number of these picks together and the coal between them will also chip off – perhaps to a depth of a couple of inches. Make the machine move down the face rapidly, with the rams pushing through the AFC to keep the plow pressed against the coal, and you have a simple but effective mining machine.



Plow on face – note the picks in the different elements that can be removed to adjust for varying seam heights. (Shield parts removed to show the plow)

The coal in which this is most effective does not necessarily have to be mined over its full height, since often, when undercut, it will fall under its own weight. Depending on the coal strength, the depth of cut of the machine can be adjusted. As a result the coal produced can be quite large, sometimes bigger than the average size of the fragment coming from a longwall shearer face. It is, however, an "interesting" experience, to see one working under a sandstone roof, where the face rolls a bit.

There were a variety of plows built, depending on coal height, coal type, and the speed at which the plow could be moved down the face. It is a fast moving operation, but one that is not that popular at the moment, since, in most higher coal a shearer may be more effective and produce more coal. However in the years to come the plow may make a comeback.

By then, however, it is possible that the picks on the machine, that generate dust, will be replaced by high pressure (10,000 psi) water jets which cut into the coal perhaps a foot ahead of the machine, and allow mining without the generation of the dust and sparks that make current operations so dangerous. It has been done before, and is a relatively simple technology to adapt to future conditions.



Waterjet plow operating underground in Germany (from Gluckauf)

We called it the Hydrominer, and as I learn how, I'll put up some video on Youtube of it operating. There are better ways of using the jets than those shown, so that the plow can actually mine coal to a web depth of over 3 ft 9 inches (we have) at shearer speeds.

Incidentally longwall mining was not a part of the Modern Marvels review of Coal Mining, though in [Part 3](#) they do show the development of the continuous miner, and shuttle car. (H/t to [Pasttense](#) who gives a list of some Youtube films), though there are a number more than I had thought there would be.

* At least in those days they excavated a chamber ahead of the machine by blasting it out with

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explosive and removing the coal by hand. This allowed them space to pull off the head, remove the bolts, fix the machine, and put it back together again.



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