Development of key projects for the future of Prosper-Haniel colliery

As well as carrying out a number of small-scale operations at the RAG Deutsche Steinkohle-operated Prosper-Haniel colliery in 2013, the THYSSEN SCHACHTBAU GMBH on-site team was also commissioned to undertake two major, future-oriented projects at the mine: The drivage of main seam road E 566 to develop hard coal panels in seam G2/F and the excavation of stone drift D 348 to mine level 7, with a connecting roadway in the Zollverein 1/2 seam, will open up future extraction fields that will secure coal production at the colliery until 2018.

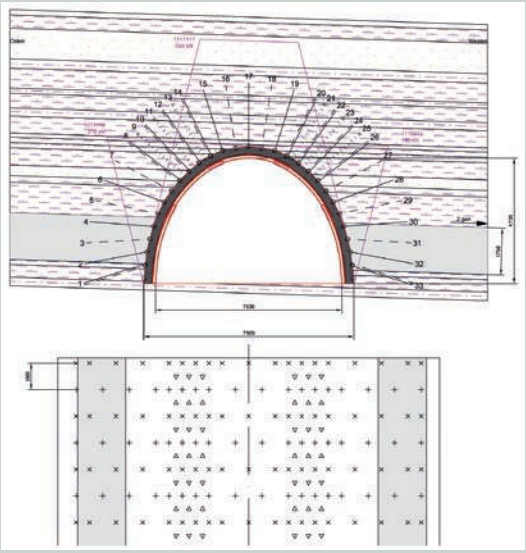
Main seam road E 566

The first project comprised the excavation of the new main seam road E 566 in the Haniel West section. The work commenced in 2012 and was completed in June 2013 with the roadway breaking through to the southern connection. This roadway will be needed for working a number of hard coal panels in seam G2/F and therefore has a huge infrastructural significance for the colliery. The mine planning engineers opted to use a Voest Alpine AM 105 roadheading machine for the excavation of seam road E 566.

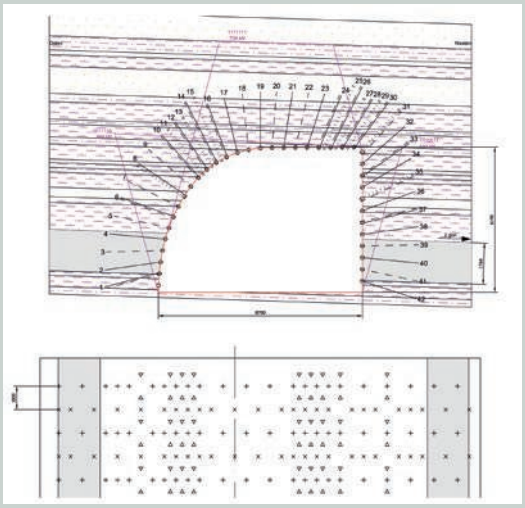
In November 2011 THYSSEN SCHACHTBAU was also commissioned to excavate a new turnout in gate road 192.1 that will later be used for driving the new seam roadway. After completing the start-pipe for the roadheader system and commissioning the machine itself the 250 m-long inclined stone drift was then excavated as far as the seam G2/F horizon. A 1,500 m-long section of roadway was then to be constructed along with several enlargement zones and five turnouts for future gate roads.

In order to counteract the anticipated convergence movements it was decided to install ‚type A' combination supports throughout. This meant that after the roadheader had excavated the roadway profile the rockbolts were systematically installed, followed by standing steel arch supports and concrete backfill. The bolting grid varied from 24.5 to 28 bolts per metre of roadway, depending on the local cross section.

While the roadway widening work and five turnouts certainly posed a challenge for the skills and craftsmanship of the tunneling crew, the problems that arose when cutting through several fault zones called for real mining expertise and a high level of physical fitness. Cutting a passage through the coal seams with the 120-tonne roadheading machine proved to be a real challenge here too and the heading performance rates varied from 2 m/d to more than 10 m/d depending on the particular geological conditions.



Rock bolting scheme in theory and practice



Rock bolting scheme at the roadway junction

Branching –
rock support with bolts and lagging mats

One special feature of the project is given by the high number of roadway junctions. While a tunnel cross section is normally only created at the beginning or end of a roadway heading, this project called for five such structures to be constructed of varying size. The support concept for the roadwy junctions also involved the use of ‚type A' combination supports, this time with a higher rockbolting grid and using 3 m-long rock bolts.
After the rock cavity had been created and the temporarily support system installed, this comprising rockbolts and weldmesh lagging, the steel arch supports were set in place right along the roadway and immediately backfilled with concrete.
Due to the hard geological and tectonic rock conditions, intensive floor convergencies, esspecially floor heave has been occured in the course of the drivage operation. This was only made possible by using a sinking loader to guarantee an contineously road heading work.
The E 566 seam road project was brought to a successful conclusion in early June 2013 with the breakthrough to counter-heading D 389. The roadheading installation has now been dismantled and already set up in another drivage.

Abzweig-Polygonträger mit Ausbaubögen

Inclined stone drift D 348 and drivage in Zollverein 1/2 seam

The second of the two projects involved the excavation of inclined stone drift D 348 in the direction of mine level 7 and its continuation in the Zollverein 1/2 seam horizon. The roadheading operation started in 2013 and continued into the following year. The creation of these roadways will provide access to future hard coal longwalls for development in the years ahead and therefore constitute an important basis for ensuring stable production from Prosper-Haniel colliery up to the year 2018.
In early 2012 THYSSEN SCHACHTBAU was awarded the contract to construct inclined stone drift D 348 to connect with Zollverein 1/2 seam horizon. Due to the infrastructural significance of the drift for ventilation, transport, compressed air and water supply the planners also opted for a ‚type A' combination support system that would ensure the long-term stability of the roadway. After about 1,000 m of drivage at a

Break through

dipping gradient of 9 degrees the heading reached the Zollverein 1/2 seam. The project was then completed with the construction of a large roadway intersection, also featuring ‚type A' combination supports that would create sufficient space for the infrastructure requirements of the mine.

After about 400 m of drivage in gate road 123.2 THYSSEN SCHACHTBAU was also awarded the contract to excavate rise heading no. 123.8. In view of the exceptional thickness of seam ZV 1/2 (currently > 4.5 m) the technical planners decided to use a category C shield support system. This is the first time that Prosper-Haniel mine has opted to employ this type of shield support, which has a maximum extension height of about 5.2 m and weighs about 40 tonnes per unit. In order to allow the complete shield units to be installed during the equipping phase without the need for further assembly work the roadway cross section had to be opened out to an appropriate size. After comparing alternative designs and undertaking technical calculations and feasibility studies it was decided that the heading would be driven using an asymmetrical profile and would be fitted with ‚type A' combination supports.

The size of the excavated profile meant that the drivage work had to be undertaken in two phases. In phase one the forward zone was excavated to 6.8 m of floor width and fitted with steel profile arch supports. Phase two then started some 100 m back and the roadway was excavated to its final 10-m width. Excavation work on the enlarged profile commenced in mid-October 2013. This exceptional and highly challenging drivage project was successfully completed in 2014.

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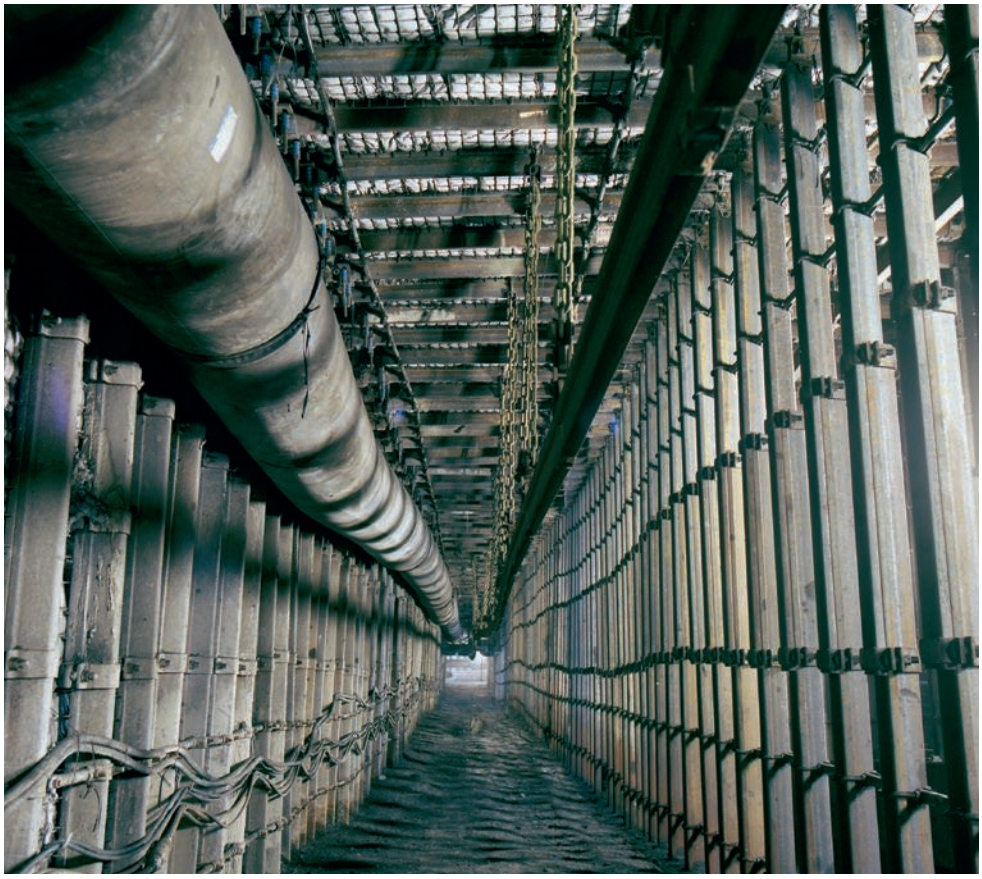
Source: Planning documents supplied by Prosper-Haniel colliery, RAG Deutsche Steinkohle AG



Middle branch of raise