

Europe's longest core-drilled borehole

Zinkgruvan Mining can now boast that they have drilled Sweden's, if not Europe's, longest exploration hole. It was 2,752.3 meters long and 1,800 meters deep. And you should know that it is much harder to drill a long distance in a particular direction than it is to just drill a hole straight down.

Author and photos: Camilla Törnquist

"We drilled at an oblique angle and deeply, towards a predetermined target. We started with a 68 degree gradient and later changed to 25 degrees. In other words, the borehole didn't go down vertically. It was more like the shape of a banana," says Johan Bro, diamond driller with the drilling company Rockma.

Johan tells us that the deepest hole previously drilled in Sweden was drilled for research purposes in Åre. "There they drilled almost straight down to 2,495.8 meters. Just to put that into perspective, 1,000 meters is normally regarded as a fairly deep standard hole in Sweden. We drilled a 1,500 meter borehole in Zinkgruvan two years ago which was a unique

project in Sweden at that time. And when drilling underground, 600 meters is considered to be a long hole."

"Naturally, when we drill an exploration hole, the purpose is to find mineralization," says Louise Lindskog, head of the exploration department. "But we also want to get answers to a number of geological questions, such as, where is the fault zone? Is the structure folded? Is it a repetition of the currently mined deposit."

The borehole, located in adjacent to the ongoing operation in Zinkgruvan, was initially planned for 2,500 meters but when we meet Johan in early September they had drilled 2,676.2 meters.

"We are now close to the limit of what is possible with this equipment," Johan tells us. "Our standard equipment can drill to a depth of 3,000 meters, but we have inserted wedges and a stabilizing core barrel during the drilling which affects the depth we can achieve."

Special solutions

The drilling has called for a number of special solutions and extra equipment. The deeper you drill, the slower the rods turn.

As Johan says, "It's not simply a question of just drilling when you have drilled this far and this deep. What is normally regarded as a minor problem takes much longer to solve. The drilling has required a number of special solutions and extra equipment in the form of inserted wedges and a stabilizing core barrel. The further down you get, the heavier the rotational pressure becomes and the rods turn more heavily and more slowly."

"For instance, we had a core break that snapped off a drill rod. Drill rods can break sometimes, but at this depth it took a week to fix. On a regular borehole, it might only have taken one shift," says Johan.



Rig operator Simon Frenberg climbs up the rig's fourteen-metre-high derrick.



"Finding mineralisation at a depth of 1,800 meters has opened up even larger areas to us where we can continue our exploration drilling," says Louise Lindskog.

Not to mention all the rods that have to be inserted. A total of 916 rods were used, and it takes time at these depths.

The drilling at Isåsen, Zinkgruvan was planned well in advance. The exploration department and Rockma had a plan, but it was not without its problems and there were only two earlier boreholes upon which to base their calculations.

"It was difficult to predict how the hole would turn, lift and move," says Johan.

Interesting ore-bearing rock

After drilling 2,600 meters they finally broke into interesting ore-bearing rock in the Zinkgruvan formation and they continued to drill despite ever greater risks of getting stuck. After drilling 2,752.3 meters, drilling was completed on 14 September.



An operator from Rockma shows the diameter of a drill core barrel.

ZINKGRUVAN MINING

in south-central Sweden is an underground mine with a long history, having been in continuous production since 1857. Operations include an underground mine, a processing plant and associated infrastructure, producing zinc, lead and copper concentrates. In 2004 Lundin Mining acquired the mine.

"I'm very happy that we broke through where we did. Finding mineralisation at a depth of 1,800 meters is really exciting. This has opened up even larger areas to us where we can continue our exploration drilling," says Louise. "The collaboration between the exploration department and Rockma has been crucial to the success of this project."

The challenge, according to Louise, is that the right knowledge for deep-hole drilling and the equipment needed cannot be found in Sweden. Much of the special equipment required in the project had to be ordered from other countries.

"The collaboration with Rockma and Johan has really worked well. They have been willing and open to listen, and to learn from other drillers in the world and find solutions based on their findings."

"It has been exciting to be part of this project," says Johan. "We have learned a lot, and with more experience, deep-hole drilling in Sweden will improve. ■



Rockma's Johan Bro inspects a core barrel with geotechnical engineer Emmelie Johansson, at Zinkgruvan Mining.