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SUCCESS STORY | LKAB

An impressive iron ore mine invests in efficiency deep down

BRIEF FACTS ABOUT

Malmberget

Malmberget is a town (and a mountain) in the municipality of Gällivare that is well known for its mines. The mountain was first mined for iron ore in 1741. The ore was originally transported by reindeer carts, and the first ore freight train was loaded in 1888. This marked the start of a massive mining operation that continues today. In 1890 a mining company was set up – Luossavaara-Kiirunavaara Aktiebolag (LKAB) – and it has continued to run the mine since that decade.

Ore is currently mined from main level M1250, which is 1250 metres below ground. The ore, which is blasted at night, is crushed, transported, graded, refined and pelletized before it leaves the mine site. The annual production output is roughly 17 million tons of unrefined ore, out of a total of 50 million tons extracted by LKAB.

LKAB Malmberget invests in efficiency deep down

As the mine in Malmberget reaches depths below 1250 metres it becomes increasingly important to maintain an efficient flow of ore and high availability. There is simply no room for breakdowns.

"We know that we have to maintain cost-effectiveness at depth. This is something we are continually working to improve," says maintenance engineer Pär Sundqvist.

LKAB Malmberget is an impressive iron ore mine in more ways than one. First, it is a high-tech facility that houses an entire undergrou nd community, including roads, mining operations, offices and canteens. And second, the mine has several ore bodies that are spread across the site. It is a full eight kilometres from one end of the mine to the other, which naturally places big demands on logistics and cost-effectiveness.

The fact that the mine is doing well, despite tough competition from open-cast mines around the world, is attributed to the high level of efficiency together with a high-quality product, good environmental awareness and highly skilled personnel.

One essential improvement in availability involved a 338-metre-long conveyor belt. This was not living up to its task as the "main line" for carrying 80 percent of all the ore from the mine. A new drive was installed during a scheduled shutdown in May 2016, with Pär Sundqvist as project manager. By that time LKAB Malmberget had been looking at alternatives for a couple of years.

Plenty of challenges in a harsh environment

Pär and his colleagues looked at everything from the latest electric drives without gearboxes to hydraulic drives, at other plants where these were in use. The only thing they knew for sure was that they did not want any gearboxes. This was partly for reasons of space, and partly to reduce the risk of breakdown.

"We already had some dual gearboxes and it was difficult to find spares for them. The old conveyor belt was like a patchwork quilt after all the hard starts and stops, and after a small fire. On average we had one breakdown each year that led to an unscheduled shutdown of three to five days. This usually happened in the week after New Year, when it is coldest of all," says Håkan Hansson, who is a field mechanic.

This loss of production was naturally unsustainable in the long term. A visit to LKAB in Kiruna gave very positive feedback on Hägglunds' direct hydraulic drives.

Håkan Hansson and Pär Sundqvist.

A solution with multiple benefits

The choice fell on two Hägglunds' CBp motors with an installed power output of 2 x 630 kW and a maximum capacity of 3000 tons per hour. The reason for choosing Hägglunds' CBp motors was a requirement for compact design and maximum efficiency.

They have not regretted the decision. The biggest benefit of all, according to Pär Sundqvist, is the built-in redundancy and high operational reliability. The belt is driven by four Drive Units, and a standby pump now makes it possible to maintain operation even if one of the units stops.

"We have not had a single incident, everything has just worked the way it should," he says.

"There was no need for any construction changes to install the new drive, so we completed everything during the May shutdown.

Most of our other contact with Hägglunds' specialists was for support with programming the control system. "They have been very helpful in every way. Without the support we got from them we would never have achieved such an effective system. We visited their factory in Mellansel and they have visited us. We also had electrical planning meetings by Skype once a fortnight throughout the project. It has all worked perfectly," says Pär.

A trouble-free system

Automatic load sharing is another benefit, which leads to reduced vibration and

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wear in the drive chain compared to before, when there was a much higher load and demand on the single gearbox.

"The drive system works so well that you almost forget it is there. It just keeps on running. The only thing we have had to do is replace filters," says field mechanic Håkan Hansson.

The hydraulic drive is specially designed for dusty environments, and all the hydraulic components are isolated from the electric motor. The system is now easy to service, lightweight and easy to keep clean, according to Håkan.

"With the old 6000 V motors and gearboxes it was not possible to wash off the ore dust with water, so we had to vacuum-clean them regularly," he says.

The soft start of the hydraulic drive is gentler on the mechanical components when you start up. But the best feature of all, according to Håkan, is the creep drive.

"It's very useful when we need to inspect the belt for damage from reinforcing bar and other scrap that sometimes gets caught up from rock reinforcement. Now we can gradually advance the belt to the point of damage and check it," he says

The emergency stop function is also appreciated, as it enables the Hägglunds' CBp motors to stop the belt in less than one metre from full speed.

"The process was analyzed in detail and we carried out a thorough risk analysis. Naturally we want to be able to stop the belt as quickly as possible to prevent any injury to employees," says Pär Sundqvist.

In July 2018 the conveyor belt had an availability figure of 99.5 percent and ran for 23–24 hours per day.

"The few stoppages we had were just caused by iron scrap along the belt. Now it is important that we carry out routine maintenance so that there are no problems in the future either. The big problems always arise after a breakdown, so we need to eliminate them completely," concludes Pär.