

At the brink of the open pit of the Aitik mine in northern Sweden, you feel very small indeed. The trucks that are hardly visible at the bottom of the 400-metre-deep pit prove to be gigantic when they come up loaded with ore. A full-grown person is only half the height of the wheels on these monsters.

Aitik, owned by Boliden, is already one of the biggest copper mines in Europe, but this is not enough. The demand for copper is insatiable, and the mine will be expanded to double its current annual 18 million tonnes to 36 million tonnes ore processed. The old concentrator plant, which is now on the brink of the pit, will be replaced and a new plant will be built several kilometres away.

The concentrator plant grinds the crushed raw ore into fines and separates the valuable metal concentrate from worthless tailings in a flotation process. After dewatering, the copper concentrate is transported in bulk to the Rönnskär smelter and the waste material is pumped to the tailings pond.

“The flow capacity of the reclaimed process water pipelines, for instance, is 10,500 cubic metres per hour,” says **Bengt Flyckt**, who is in charge of the project.

Flyckt and his consulting firm PRiMAB have a great deal of experience in consultation concerning demanding mine operations for companies such as Boliden and LKAB, and he knows how important it is to find a reliable comprehensive solution. KWH Pipe is one of the few poly-

ethylene pipe producers who can offer comprehensive system solutions from pipe dimensioning and material deliveries to welding and installation. In the Aitik project, KWH Pipe delivers pressure-tested piping ready for use by the client. The total length of the pipelines is 37 kilometres: 25 kilometres of water pipes and 12 kilometres of pipes transporting slurry. KWH Pipe has manufacturing plants in Finland and Sweden with the capacity to match a project of this size.

The process water system is a closed loop constantly reclaiming water from the tailings and clarification ponds. Acid leach water from the mine and waste rock stockpiles are collected and PH-adjusted by lime addition before it is pumped to the tailings pond. Raw water from the nearby Lina and Vassara rivers is added only on demand at the end of the winter season. Last winter no raw water at all was needed.

A highly challenging project

The Project Services unit of KWH Pipe are experts in major, highly challenging projects requiring more than the mere delivery of pipes. They can offer a complete service according to customer needs, including design, welding, installation and project management.

In this particular project, the pipes have been dimensioned for the most economical pump cross section, and the special dimensioning of the pipes minimizes the need for raw material.



Double capacity

FOR AITIK COPPER MINE IN SWEDEN

The Aitik copper mine will double its capacity and for that, it needs 37 kilometres of new piping. The polyethylene piping supplied by KWH Pipe will be able to withstand acid water and aggressive slurry flows in tough Arctic conditions.



The external conditions are tough, and the water flowing in the pipes is partly acidic and corrosive. The pipes are laid on the ground or inside embankments and have to withstand tough climactic conditions, potential depression of the ground and pressures up to 16 bar caused by great height differences. Considering all these conditions, polyethylene pipes stand out as the optimal choice.

A resemblance with the Talvivaara project

Similar conditions can be found at a mine located in Talvivaara, northern Finland, where KWH Pipe is also responsible for a similar comprehensive solution using polyethylene piping. The experience gained there was of great help in the selection process. The capacity to withstand corrosion and mechanical resistance were the determining factors when the final choice was made.

“We compared it with other materials such as stainless steel and glass reinforced plastic (GRP), and the final choice was made between GRP and polyethylene. GRP pipes are joined with sockets with or without locking aids. Each socket joint allows only a small angle deviation and this involves a leakage risk under mechanical stress”

The water pipes are laid on the ground and joined by welding them into a continuous pipeline. When the pipeline is complete, earth is piled up around it so that it is surrounded by an embankment. This protects the pipeline and reduces the risk of freezing during down periods potentially occurring during the cold winters of the north.

There is also the risk of depression of the ground, since a major part of the earthwork is done during the winter months. According to Flyckt, polyethylene pipes are extremely durable. They can even withstand a vacuum inside without collapsing, which gives an additional safety margin in case of unexpected pressure surges.

The welding work began in May 2008 and will continue up to the end of 2009 with a break during the coldest period. KWH Pipe is responsible for laying the pipes and cooperates with YIT, which provides electricity installations and PEAB, which provides ground excavation and backfill. Bengt Flyckt praises their smooth cooperation.

“All parties work together as a team and see the big picture, not only their own role in it,” he says.

Boliden has successfully used polyethylene pipes for demanding mine applications before. The Tara zinc mine in Ireland had a similar polyethylene pipe system installed in 1976 by KWH Pipe, and it has not been worn out yet, says Flyckt.

LONG LIFE WITH ABRASION-RESISTANCE

The slurry pipes transport tailings mixed with water to the tailings pond. It is a challenging mixture and the pipes must withstand enormous stress. It resembles sand-blasting, where grains of sand are blown with compressed air at, for instance, a rusty metal surface to clean it before painting.

Paint, rust and even metal can be removed through sandblasting if there is a hard, unyielding surface underneath. If the surface is soft and pliable, the sand grains bounce off without doing damage.

Slurry pipes have to withstand wear in the same way. If the pipe wall is not soft when the sand grains hit it, a hole is quickly worn through it.

Steel pipes are often lined with a rubber layer to create a soft, abrasion-resistant inner surface. Such a layer protects the pipe but may come loose on the inside and wear away from large parts of the pipe wall.

Aitik opted for polyethylene pipes delivered by KWH Pipe. Polyethylene has excellent abrasion-resistance properties, which give it a long life in slurry pipelines.

