



Copper and nickel smelting and sulphuric acid production are all part of Boliden Harjavalta's daily operations.

Heating up Harjavalta

Recovered heat keeps the Finns warm

Boliden Harjavalta Oy in Finland is generating warmth and goodwill in the community of Harjavalta by recovering heat from its production of sulphuric acid and channelling it into the district heating network. The heat recovery has also lowered energy costs for Boliden's own copper- and nickel-processing facilities nearby.

In Harjavalta, a town in western Finland, residents can thank a local sulphuric acid plant for helping to keep them warm. The plant, owned by Swedish metals company Boliden, recovers so much heat from its production of sulphuric acid that it channels part of the heat to the Harjavalta district heating network and uses the rest in its other factories on site, including copper- and nickel-processing facilities.

Sustainable cost savings generate benefits for the community

If this 20 MW of total recovered heat had been generated from oil (priced at USD 70 per barrel), it would have cost around USD 9.5 million per year

and generated about 40,000 tonnes of CO₂ emissions – assuming typical values of boiler efficiency and heat of combustion and 350 days of operation per year. To simplify this estimate, every 1 MW of recovered heat saves about 2,000 tonnes of CO₂ emissions and a half million dollars in fuel costs annually at today's rates

"It's one way we can benefit – by selling the energy," says Jyrki Makkonen, production manager, Boliden Harjavalta Oy. "And then of course the community benefits too. They can avoid burning fuel or investing in new equipment for their district heating plant. Instead, they can buy the energy from us."



Cost savings
Lowered energy costs by 9.5 million USD a year



Emissions savings
40,000 tonnes of CO₂ emissions savings per year



Energy savings
20 MW



Pioneering popular flash smelting for metal recovery

Harjavalta is a historic landmark in the mineral-processing industry. It's a town of about 8,000 people on the southwest coast of Finland, about 50 kilometres from the sea. It was here that the process of flash smelting was developed for metal recovery in 1949, first for copper ore and then for nickel and lead.

“The beauty of flash smelting is that you use the energy contained in the metal concentrate itself for separating the mineral from the ore,” says Makkonen. The dried and powdered ore ignites when mixed with oxygen, leaving the metal to melt and drop to the floor of a settling chamber. “You are burning the sulphur and the iron from the concentrate instead of using external energy,”

Jyrki Makkonen, production manager, Boliden Harjavalta Oy

The popularity of this technique caught on, and today it is one of the most widely used smelting methods of copper concentrates in the world, Makkonen says.

Because flash smelting generates polluting sulphuric dioxide (SO₂) emissions, mineral processing plants commonly build a sulphuric acid plant nearby to turn that dangerous gas into something useful. Sulphuric acid is in fact “one of the most important of all chemicals,” according to Encyclopædia Britannica.

From annoyances to money and climate-saving heroes

It is here that the advances in heat recovery over the past few decades have changed the sulphur burning acid factories from local and environmental irritations – emitting hot water directly into oceans or rivers – to money and climate-saving heroes.

“When you make sulphuric acid, you produce a lot of heat,” Makkonen says. “You have to remove that heat somehow.”

Part of this is used to make high-pressure steam, which can be used to generate electrical energy or other purposes on-site. The rest is removed in the form of hot water. Until 1995, Boliden Harjavalta emitted this hot water directly into the nearby Kokemäenjoki River, heating it up and altering the marine environment. But then it reconstructed its plant's cooling system to include plate heat exchangers in a closed-loop cooling circuit, says Makkonen.

District heating with out of the box thinking

The demineralised water circuit heats the district heating water from 60 to 90 degrees Celsius in the Alfa Laval plate heat exchangers. The temperature in the district heating circuit can be raised to up to 115 degrees Celsius by other equipment at the sulphuric acid plant. Boliden Harjavalta is the Nordic region's largest sulphuric acid plant, producing about 600,000 tonnes of sulphuric acid a year.

The closed-loop circuit recovers 10 MW for heating Boliden's nickel and copper production plants in the area and recovers another 10 MW for the municipal district-heating network.

“It's a nice side product,” Makkonen says. “You must get rid of the energy somehow, and if you can receive some money for it, it's even better. Plus, it's wiser from an environmental and emissions point of view.”

In the winter, Boliden Harjavalta supplies about two thirds of the heat for Harjavalta's district heating network, and in the milder summer months it supplies all the heat needed for the city's domestic water.

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Jyrki Makkonen, production manager, Boliden Harjavalta Oy

“It's straightforward,” Makkonen says. “You turn the energy you have into hot water. Using this hot water is just pure engineering. The tricky part is to figure out the customer and what needs to be heated. Flats, houses, greenhouses, swimming pools, whatever. Just get your thinking ‘out of the box’ and widen your scope. Whatever needs to be heated, just heat it.”

