uponor

References

Record-breaking pipes in Keljonlahti

Uponor involvement

- 1,714 metres of 3,000/3,300 mm Weholite pipes

Record-breaking pipes in Keljonlahti

Construction of the pipe network for cooling water at the Keljonlahti power plant began in December 2008. 3,000/3,300 mm Weholite pipes were selected for the network. The combined length of the entire intake and discharge pipe network for cooling water is 1,714 metres.
The largest plastic pipeline ever installed in Finland in terms of diameter has been manufactured to transfer cooling waters from the biofuel power plant in Keljonlahti. At the end of March 2009, 300-metre pipes were placed on the ice for installation at the bottom of the lake when spring arrives. In June 2009, everything was ready for underwater installation.

Project Facts:

Location

Jyväskylä, Finland

Completion

2009

Vrsta objekta

Industrial

Project Type

New building

Rauhalahti, the main power plant in Jyväskylä, Finland, was running low on capacity for the growing city.
"Some of the current power-generation equipment was decommissioned due to stricter EU regulations. The new power plant generates energy sustainably using peat and wood," says Pentti Huumo, Project Director from Jyväskylän Voima Oy.

The project had been planned for years. The energy company was established to manage the operations of the new power plant in May 2006 but plans had first been put on the table in 2003 and 2004. Construction work began in October 2007 when trees were felled on the power plant's plot on the shore of Lake Päijänne.

Unexpected fractured rock

The original plans called for the power plant's cooling water to be led away from Keljonlahti bay by pipe and discharged through a rock tunnel into the open waters of Lake Päijänne about one kilometre away. When the rock and the bottom of the lake were studied, the challenging conditions in the area soon became apparent. "We noticed that the rock contained a large number of fractures. It would have been necessary to build the rock tunnel 80 metres below the surface of the lake," says Pentti Huumo.

The job began to feel too large. The tunnel would have travelled beneath the power plant and the bay and finally surfaced at the tip of the neighbouring peninsula. "Additionally, there was a large fuel storage facility in the vicinity of the route and we did not want to disrupt its operations. We had to think of an alternative," Huumo recalls.

Solution found online

The energy company decided that the cooling water would be directed along pipes to be installed on the bottom of the lake over a distance of 1.3 kilometres into the open waters of Lake Päijänne. The temperature difference between the intake and discharge locations was up to ten degrees. As water travels along the line at a rate of 5–6 cubic metres per second, the pipe needed to be large. "The website of the company formerly known as KWH Pipe (now Uponor) quickly confirmed that it is possible to engineer such large pipes," Pentti Huumo says. One of the initial alternatives was a steel pipe. Following a public competitive tendering process, Weholite pipes were selected.

"A pipe with a smooth exterior is great for fishermen as nets will not get caught on it," Pentti Huumo says.

The regional manager responsible for the project says that the delivery to Keljonlahti includes designing, welding, pressurising and sinking the pipe networks for cooling water, as well as inspecting the parts and equipment.

A working group created the designs

In mid-December 2008, Uponor (formerly KWH) set up a working group to focus on engineering and installing the pipeline in Keljonlahti. This was the first time that a plastic pipeline with such a large diameter had been installed in Finland, so there were plenty of new aspects to the work. Previously, the largest pipes to have been used on Finnish sites were up to 2.4 metres in diameter.

"The site really was the first of its kind for a project of this size, so the work included several matters that needed to be taken into consideration. The working group considered every phase of the project in advance."

"This enabled us to combine know-how from several of the areas of technology that are part of a large organisation. How will the pipe behave? What needs to be taken into consideration when installing such a large pipe? Plans and instructions for the work site are affected by factors such as the size and weight of the pipe, as well as the welding line lengths and challenging nature of the submerging work."

Very little need for dredging

The route of the pipe on the bottom of the lake had been identified and it was found to be relatively easy. It was only necessary to dredge the bottom of the lake at the shoreline and for a distance of about 200 metres where the discharge pipe travels near a shipping fairway.

"Dredging was carried out on New Year's Eve 2008," Pentti Huumo says. A good location for prefabricating the three-metre pipe was identified in the vicinity of Keljonlahti. The area contains an old railway that had previously served log-driving traffic. Small cargo carriages were manufactured to enable the pipe elements to be transported efficiently.

Constant pipe supply on Lake Päijänne

In spring 2009, there were regular deliveries of pipes from Vaasa to Jyväskylä and onwards to the shore of Lake Päijänne.

"When we arrived at work in the morning, there were usually two lorry-loads of pipe material waiting to be transferred for prefabrication," says Pentti Huumo.

During the winter, 20-metre pipes were welded together to make 300-metre-long lines.

"The pipeline that became the intake pipe for the process was manufactured in January. The pipes were welded to create lines,
and bulkhead connectors were welded to the ends. After this, they were placed on the ice to await the pressurisation phase.

Hoisting plan for giant pipes

The finished 300-metre pipes weighed 150 tons. Work began in good time to prepare a plan to lift the pipes onto the ice. Seven mobile cranes transferred the line from the welding bed onto the ice.

The pipes were stored on the ice in five 300-metre lines and one 240-metre line. There were anchored to the timber pier to wait for the ice to finally melt. The lines remained afloat on the surface of the water when the spring finally melted the ice cover away. The pipe hoisting work was handled by Tikkanostot Oy, a company from Muurame, Finland that was also responsible for other hoisting work at the power plant.

"We had never hoisted such a long pipe before, so we worked in a team to prepare a hoisting plan," says Technical Director Seppo Leinonen from Tikkanostot Oy. He was the hoisting foreman on the challenging site. "It took an entire day's work to lift one finished pipe," Leinonen says.

The first pipes were lifted onto the ice during the second to last week of March 2009. In addition to the hoisting foreman and supervisor, several technicians were involved in the work. Seven mobile cranes were set up near the shore.

"It was an ideal location for the cranes as there was already a railway on-site. The cranes were set up without any difficulties when we spread the area out by placing crushed rock next to the railway," Leinonen says.

Monitoring loads

During combined hoisting operations, the supervisors were in constant radio contact with the cranes. Hoisting values needed to be monitored to ensure that none of the cranes were becoming overloaded. Everything went well when the first pipes were transferred, although the ice on the lake cracked beneath the weight of the pipes.

"We were prepared for the possibility of the ice giving way. We measured the thickness of the ice and it was only 400 mm. The ice could have been reinforced by freezing the area during very low temperatures," Leinonen says.

Fabric was placed beneath the enormous pipe to enable the pipe to be rolled onto the ice of the lake. Hoisting continued from May onwards when the pipes were submerged in the water. "At that point, the pipes were hoisted closer to the shore so the work was easier than it is now," Seppo Leinonen says.

The pipes were submerged to the bottom of Lake Päijänne between June and November. Special equipment was required to submerge the massive pipes, which were 300 metres in length and three metres in diameter. The submerging process was aided with the use of a special ferry, lightening sacks and a multipurpose tugboat equipped with hoists. The submerging direction was carefully planned in accordance with natural underwater currents. Divers made the last bulkhead connection at a depth of 10 metres.

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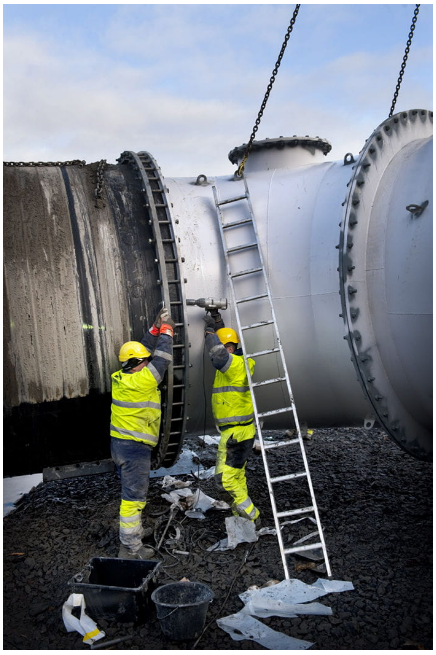

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