case study

Estonian energy plant chooses durable BorSafe HE3490-LS pipes

Eesti Energia (Estonian Energy) is the leading electrical energy producer in Estonia, one of the largest providers in the Baltic region and an exporter of electricity to the Nordic power market. The company's production facilities at Narva, close to Estonia's north-east border with Russia, comprise the two biggest oil shale-fired thermal power plants in the world, with a power generating capacity in excess of 2,300MW.

As part of the company's ongoing Narva facility development and upgrading programme, in 2010 attention was focused on the plant's cooling water circulation system. In continuous operation since commissioning in the early 1970s, examination of the 1600mm steel pipes had uncovered extensive corrosion, penetrating the pipes to a depth of approximately 4mm and, consequently, leakages.

In addition, it revealed some horizontal and vertical deformation of the pipeline, including longitudinal displacement of up to 20% in the straight sections, further reinforcing the need for the system's renovation.

Reliable and durable solution

In seeking a renewal solution, Estonian Energy defined a number of key influencers. The cooling system, being a crucial part of the plant, system safety and efficiency were of obvious importance. And, within those boundaries, cost, ease of installation and longevity – a minimum of a 30-year service life was demanded – were determining factors. Speed and flexibility of installation were particularly important to avoid significant power generating downtime and major cost penalties.

To overcome the challenges and satisfy mechanical demands, a range of pipe renovation options were considered. These included solutions based on steel, GRP, relining and chemical treatment. Ultimately it was decided that high density polyethylene (HDPE) spiral wound piping would provide the optimum solution in terms of technical in-service performance and installation flexibility. Estonian Energy in conjunction with Krah Pipes OÜ, a leading independent Estonia-based specialist plastic pipe producer appointed to lead this project and supply the pipes, identified Borealis' bimodal HDPE, BorSafe™ HE3490-LS, as the pipe material offering the optimum balance of properties required to meet the project's criteria. BorSafe HE3490-LS, a high performance PE100 classified MRS 10 and on the positive list of the PE100+ Association, exceeds the requirements of EN13476, the reference standard for the production of these pipes. BorSafe HE3490-LS has a long successful track record; its advanced properties, consistent quality and easy processability have made it the reference material for many industrial pipe and pipe relining projects globally.

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The original metal pipes had an inside diameter (ID) of 1580mm and wall thickness of 10mm. However, due to the smoother inner surface offered by BorSafe HE3490-LS, and therefore lower roughness coefficient than metal, calculations made by Tallinn Technical University determined that the corroded pipe could be replaced by pipe with a reduced ID of 1400mm with the same flow but with a reduced head-loss. Additionally, a wall thickness of 20mm would deliver the necessary ring stiffness to ensure pipe integrity at the weld lines, relative to the working pressure of 0.5 bar and spikes up to 1.0 bar.

Flexible renovation and a more robust system

The renovation involved two parallel cooling water pipelines running from a pumping station to the plants' turbine room. They comprised straight sections to a maximum length of 60m, connected through a series of 16 horizontal and vertical 15° to 60° bends. Each pipeline had an integrated inspection manhole. Because of the complexity of the system, which also included a 30m section beneath a concrete platform supporting transformers weighing around 120 tonnes, three installation techniques were employed:

- Open trench – for bends and manholes. All pipes connected by electro-fusion.
- Relining – electro-fusion welded pipes, pulled through and positioned in the pre-existing metal pipeline.
- Prefabricated segments of 1.25m lengths for horizontal and vertical bends under the transformers' platform, connected by extrusion welding.

For bends and manholes, pipes were extruded with a smooth outer surface for ease of welding. However, profiled pipes were used for the open trench-laid and relining sections. For the relining pipes, the height of the profile approximated the inside diameter of the existing pipe in order to achieve a good fit.

The Estonian Energy, Narva plant pipe system renovation project commenced in September 2010 and was completed, system-tested and reactivated in November 2010.

According to Peeter Kirtsi, CEO of Krah Pipes OÜ: *"Choosing a material such as BorSafe HE3490-LS with a long track record was essential for the success of the project. Also, the very good processability of the product contributed to the trouble free production of the pipes."*

Borealis and Borouge are leading providers of innovative, value creating plastics solutions. With more than 40 years of experience in polyolefins and using our unique Borstar® technology, we focus on the infrastructure, automotive and advanced packaging markets across Europe, the Middle East and Asia. Our production facilities, innovation centres and service centres work with customers in more than 170 countries to provide materials that make an essential contribution to society and sustainable development. We are committed to the principles of Responsible Care® and to leading the way in 'Shaping the Future with Plastics'™.

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