

BorSafe LS-H pipe provides tough fire main solution for production site in Porvoo, Finland

Porvoo, Finland is the location of a fully integrated chemical complex comprising five plants, two of which produce PE and one PP. The site has its own railway terminal and as part of a recent expansion, the terminal's capacity for unloading Liquefied Petroleum Gas and loading butadiene was increased. To ensure the high safety standards in respect of these highly flammable materials, the expansion included the installation of a fire main to serve a water curtain and sprinklers for the new loading stations.



Significant project challenges

In developing the new fire main the pipeline planner, engineering company Neste Jacobs Oy, faced three significant challenges. Firstly, the terrain was comprised mostly of rock, which would be difficult to trench. Secondly, part of the pipeline had to pass under a section of railway line, the services of which could not be disrupted. Thirdly, the pipe would have to be sufficiently tough and durable to resist abrasion and cuts from the rocky terrain. It would also have to be unaffected by wide temperature change: during Finland's winter temperature can fall below -15°C and in summer rise as high as 30°C . Moreover, the laid pipe would have to withstand ground vibration caused by heavy traffic traversing the railway yard. The most important requirement was that the pipeline

be capable of delivering water to the fire fighting installations at all times and under all conditions.

In consultation with the installer for the project, it was determined that it would be necessary to lay the fire main at a depth of at least two meters to avoid the possibility of it freezing during the winter months. To achieve this, some of the terrain would need to be blasted in order to cut a trench through the rock. However, blasting was not an option for a 25-meter section passing under the railway line. To eliminate the risk of either damage to the line or disruption to rail traffic it was decided to use the no-dig horizontal drilling technique to create an underground pathway for the pipeline, thereby excluding the need for any surface work.

Speed and economy without compromises

The next step was to identify the type of pipe that would best meet the fire main's in-service performance demands as well as those of the tough laying conditions. Also to consider was a tight time schedule to install and bring the system online. The project's start date was November and its completion date February – unavoidably coinciding with the coldest time of the year in Porvoo. Resistance to impacts and abrasions from the rocky ground, particularly in the drilled section, made steel pipe the first pipe proposal. However,

the installation time, cost and relatively short life of steel in a corrosive environment led to the consideration of more durable alternatives.

Chief among these was PE100 because of its durability and non-corrodibility. But, following evaluations involving Neste Jacobs, Destia, pipe manufacturer KWH Pipe and the end-user, BorSafe HE3490-LS-H was selected. This advanced "PE100-RC" material was specifically developed by Borealis to complement faster more economical

pipe laying techniques especially in tough conditions where installations are subject to high environmental stresses.

The pipe was specified with a pressure rating of PN16 in two dimensions: OD 500mm for the trench-laid section and OD 300mm for the under-railway drilled section. Classified MRS 10, BorSafe HE3490-LS-H is characterised by its

low notch sensitivity which provides very high resistance to cuts and abrasions and outstanding resistance to slow crack growth (SCG), as well as excellent resistance to rapid crack propagation (RCP). Consequently, it offers the highest level of reliability of any PE material currently available in the marketplace, over an anticipated service life in excess of 100 years.

On time, on budget, on-line

Uncompromising in its performance, the material also delivered important economies. Its robust profile meant that some of the rough excavated rocky soil could be used as trench backfilling. Thereby reducing the amount of excavated material to be removed from site and the volume of finer material to be brought on-site for pipe bedding, thus reducing time, cost, and environmental impact.

"This made a useful contribution to time saving," said Ville Lilja, Borealis' project manager for the company's Porvoo terminal expansion. *"Our work schedule was tight and this advantage helped ease the pressure."* Using PE provided a major reduction in installation time compared with traditional steel piping. It allowed the pipes to be joined by butt fusion welding which offers a 50 % time saving on steel welds, as well as a 40 % cost saving.



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