



Freeze Protection

- › LNG tank foundation protection against frost heave
- › Temperature maintenance on pipelines, drums and pumps

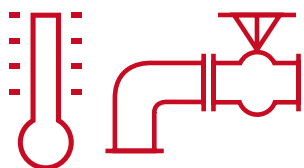
LNG Foundation Freeze Protection



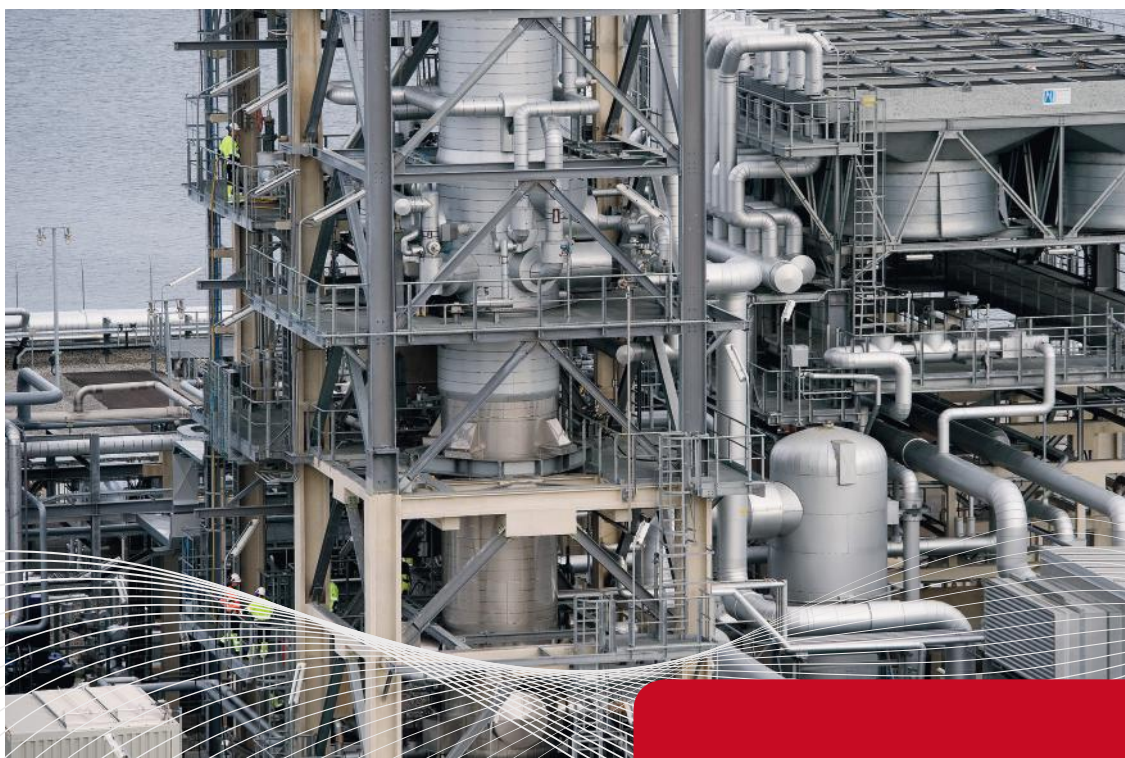
Liquefied Natural Gas (LNG) is gas in its liquid form. To achieve liquification, the gas must be cooled down to -160°C . LNG occupies only 1/600th of the volume of natural gas. So liquifying is an economic option for storage and transport. Linde was assigned by the Norwegian Skangass AS to build a LNG plant at Stavanger in Norway, including a LNG storage tank with a diameter of approximately 50 m.

Because of the -160°C inside the storage tank, frost can occur around and under the tank and in the foundation of the plant, causing frost heave cracking. This can pose a serious risk to safe operation. An electrical heat tracing system prevents this by keeping the structure's at 5°C . Reliability is the key requirement, so eltherm engineers developed a redundant system with was chosen. 50 heating circuits

in normal operations and 40 circuits in essential generator mode allow one system to be repaired in the case of unexpected failure, while the other maintains normal function. In addition to the foundation heating a ring-heater beneath the ring wall was installed to prevent freezing. The scope of supply included engineering and design, installation and commissioning as well as power and control systems.



The pipeline network of the LNG plant with all drums and pumps is heated to $+10^{\circ}\text{C}$ for freeze protection. Also, process temperatures between 15°C and 140°C are maintained to ensure that the gas liquefaction process runs smoothly and safely.



Freeze Protection & Process Temperatures

Linde AG is a global leader in natural gas liquefaction plants and consulted eltherm engineering to develop a custom-build solution for the Stavanger LNG plant in Norway.

Frost protection on the foundation slab required 16 heating circuits, 12 in the foundation and 4 under the ring wall. To take account of the highly corrosive ambient conditions, the ELKM-AG-N trace heater with its robust fluoropolymer

insulation was employed. It is chemically resistant even at high temperatures and is certified for hazardous areas (Ex area). Additionally to the heating system, eltherm provided the complete control room for power and control. Strong emphasis is placed on energy efficiency and running cost reduction. An under-run alarm with 2 °C and an excess alarm at 15 °C ensures that the liquefaction process is never disturbed.



Technical eltherm advantages:

- › Exact temperature maintenance during the entire gas liquefaction process
- › Reliable function thanks to redundant design
- › Simple, safe operation with power and control system
- › Trace heating systems for hazardous areas covered by ATEX approval
- › Repair and easy maintenance of PTFE insulated trace heaters
- › Turnkey service including complete engineering, design, installation and commissioning
- › Economical, energy efficient heating solution



- › Fluoropolymer-insulated trace heaters ELKM-AG-N
- › Mineral-insulated trace heaters ELK-MI-VA
- › Self-regulating trace heaters ELSR-N
- › Self-regulating high temperature trace heaters ELSR-H / ELSR-SH
- › Junction box Ex-It-R approved for hazardous areas

