



Case Study

LNG Storage Tank Inerting and Pipeline Pre-Cooldown

Introduction

Intero supported the pre-commissioning of an expanded European LNG terminal, where a new LNG storage tank and a second unloading jetty had been constructed. The work combined storage tank purging and drying with pipeline inerting and controlled nitrogen pre-cooldown.

The objective was to reduce the storage-tank oxygen level and cool the new transfer piping so LNG could be introduced without rapid-cooling damage.

Asset Details

- Application: LNG terminal expansion and pre-commissioning
- Services: Storage tank purging and drying; pipeline inerting and pre-cooldown
- Assets: New LNG storage tank and transfer piping to a new unloading jetty
- Pipeline scale: Approx. 1.5 km of 8-in piping and 1.5 km of 42-in piping
- Targets: Storage tank below 8% oxygen; piping extremities below -100°C
- Nitrogen supply: Approx. 1,150,000 Nm³ in total

Scope of Work

For the LNG storage tank, Intero provided a consistent nitrogen flow to reduce the oxygen concentration to below 8%. The operation used a steam vaporizer and multiple nitrogen storage tanks, with a flow rate of up to 2,000 Nm³/h over 10 days. Approximately 360,000 Nm³ of nitrogen was consumed.

For the piping system, Intero carried out inerting and controlled pre-cooldown. Two steam vaporizers supplied nitrogen at flow rates of up to 10,000 Nm³/h.

A vapor/liquid mixing chamber reduced the inlet temperature to approximately -160°C while keeping the nitrogen in its gaseous phase and avoiding direct liquid-nitrogen injection into the piping.

The four-day pipeline operation consumed approximately 790,000 Nm³ of nitrogen. The target was to achieve temperatures below -100°C at the extremities of the system.



Real-time monitoring supported precise control of inlet temperature and flow.

The Challenge

The tank-inerting operation depended on maintaining a stable nitrogen flow. A reliable delivery schedule was therefore essential throughout the 10-day operation.

Pipeline pre-cooldown required a careful balance between flow and temperature. The nitrogen had to be cold enough to cool the full piping length, but liquid nitrogen could not be injected directly because it could damage the customer's system. The available inlet connection was also smaller than ideal.

In the 42-inches piping, Intero needed to avoid excessive temperature differences between the top and bottom of the pipe. Uneven cooling could cause warping or other damage. Because a high volume of nitrogen was required within a short period, any interruption in supply could also reduce the cooling effect once the operation had started.

The Solution

Intero used a vapor/liquid mixing chamber to introduce liquid nitrogen into the gaseous nitrogen leaving the steam vaporizers. The resulting low-temperature gas was continuously controlled by experienced personnel, while data-logging equipment monitored the temperature and flow entering the system.

Continuous communication between Intero's site team and the customer's control room supported linear

cooling. Temperature probes installed throughout the system provided ongoing feedback, allowing flow and inlet temperature to be adjusted as the piping cooled.

A detailed nitrogen-delivery schedule was prepared in advance. Multiple on-site storage tanks were filled before cooldown began and stock levels were maintained to protect the operation against road delays, loading constraints, or other unforeseen events. Toward completion, inventory was reduced so the tanks could be emptied as the cooldown ended.

The Result

Storage tank inerting was completed within the required timeframe, achieving an oxygen concentration below 8%.

Pipeline pre-cooldown also achieved the required result, with temperatures below -100°C at the system extremities. This allowed LNG to be introduced without the risk of rapid-cooling damage to the piping.

Highlights

- **Controlled cooling:** Nitrogen entered the customer system at temperatures down to approximately -160°C while remaining in the gaseous phase.
- **Asset protection:** Temperature and flow were continuously monitored to reduce the risk of thermal differential, warping, and rapid-cooling damage.
- **Supply resilience:** Pre-planned deliveries and substantial on-site nitrogen storage supported an uninterrupted cooldown operation.
- **Specialist capability:** The work required equipment and operational experience available from only a limited number of service providers
- **Pipe movement:** Piping and pipe supports were monitored during cooldown so support positions could be adjusted where necessary near operating temperature.