Trace Moisture Measurement in LNG and LPG Bulk Carriers

Application Note

SHAW MOISTURE METERS

Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG) are transported globally in bulk as cryogenic or pressurised liquids. Liquefying natural gas is a convenient way to transport it over long distances since it represents 600 times less volume than gas.

Maintaining product integrity during transport is critical for safety, efficiency and compliance. One key parameter is dewpoint measurement, which ensures that moisture and heavy hydrocarbons do not condense, preventing operational hazards such as hydrate formation, corrosion and blockages.

LNG and LPG Transport Overview

LNG Transport

LNG is natural gas cooled to approximately -162 °C at near atmospheric pressure. It is transported in cryogenic tanks on specialised carriers or insulated road trailers and requires boil-off gas management and strict temperature control.

LNG Transport

LPG (propane, butane) is transported under moderate pressure or refrigerated conditions. Carried in pressurised tanks, semi-refrigerated vessels or fully refrigerated carriers with typical boiling points of -42°C for Propane and-0.6°C for Butane.





Inert Gas Operations and Cargo Tank Preparation

Before loading LNG or LPG

- Drying: Remove all moisture to prevent ice formation during cooldown.
- Inerting: Replace oxygen with inert gas (nitrogen or inert gas generator output) to create a non-explosive atmosphere.
- Gassing-up: Displace inert gas with cargo vapour.
- Cool-down: Gradually reduce tank temperature to cargo carriage conditions.

Moisture Problems in LNG / LPG Transport

Dewpoint monitoring is essential for several reasons:

Ice and Hydrate Formation

LNG is transported at extremely low temperatures (around -161 °C). If moisture is present in the cargo tanks or associated pipelines, it will freeze, leading to dangerous blockages (hydrates) and potential damage to equipment and instrumentation.

Cargo Quality

The presence of excessive moisture or condensed hydrocarbons can affect the quality and energy content (BTU value) of the natural gas, which is a critical parameter for custody transfer and commercial agreements.

Monitoring Inert Gas Systems

During tank preparation, inert gas (typically nitrogen) is used to purge and blanket the cargo tanks. The dewpoint of this inert gas must be continuously monitored to ensure it is sufficiently dry (e.g., a dewpoint of -45 °C or lower is a common requirement) and prevent any moisture from entering the cold cryogenic system.



Solutions

Dewpoint meters are used on LNG and LPG vessels primarily during inert gas operations and cargo tank preparation to prevent the formation of ice or liquid condensation, which can cause severe damage, blockages and safety hazards.

Key Uses

Inerting and Purging Systems

The primary application is to monitor the quality and dryness of the inert gas (often nitrogen) used to blanket or purge cargo tanks and pipework. The dewpoint of this gas is typically required to be very low (e.g., -45 °C) to ensure all moisture is removed.

Cargo Tank Preparation

Before loading the liquified gas, cargo tanks must be completely dry and inert. A portable dewpoint meter on the purge outlet verifies the dryness of the tank atmosphere, ensuring that any residual moisture will not freeze and damage the insulation or form ice blockages when exposed to the extremely low cargo temperatures.

Spot Checks and Verification

Portable dewpoint meters are often used for spot checking moisture levels at various points in the system or to verify the readings of online analysers as part of routine maintenance. Often used during tank warm up or cool down cycles to ensure safe conditions.

In essence, the dewpoint meter is a critical safety and maintenance tool to ensure that no liquid water or ice forms within the cryogenic systems and associated pipework of the vessel.



References

- ISO 23306:2020 – LNG as marine fuel specification
- ASTM D1142 – Water vapor in natural gas
- ASEE-gas Common Business Practice 2005-001/01
- API MPMS – Manual of Petroleum Measurement Standards

Suitable Products



Dewpoint Sensor



SADP Intrinsically Safe Hygrometer



Portable Sample System

We design and manufacture dewpoint instruments for many different applications.

For advice, choosing the right product for your application, please contact us:

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