



eBook

Measuring the LNG process with confidence

A measurement guide for every
stage of the process

Now, measurement matters more

Liquefied natural gas (LNG) is a critical part of the global energy supply chain. It is a clean, efficient, and affordable source of energy that can be used to generate electricity, heat homes and businesses, and power ships and other vehicles.

The global LNG market is expected to grow significantly in the coming years, driven by increasing demand from emerging economies. In fact, the International Energy Agency (IEA) predicted that LNG demand will grow by more than 50% between 2019 and 2040.

This growth in demand will put a strain on the global LNG supply chain, making it essential for LNG suppliers to have accurate and reliable flow and analyzer measurement systems in place to ensure that they can meet the needs of their customers, accurately track supply, and ensure safety throughout the LNG process.



The International Energy Agency (IEA) predicted that LNG demand will grow by more than 50% between 2019 and 2040.

Panametrics is well-positioned to help

Panametrics is a leading provider of flow measurement and process analyzer solutions for the LNG industry. The company has a long history of providing innovative solutions that help customers improve the efficiency, safety, and profitability of their operations.



Some of the benefits of using Panametrics flow measurement and analyzer solutions for LNG include:

Accuracy

Industry-leading technologies provide the desired confidence by providing the required analyzer and flow measurements throughout the LNG process

Durability

Flowmeters and analyzers that are built to last—some are in the field delivering value to operators for more than 20 years

Reliability

Flowmeters designed to deliver accurate measurements in the coldest and hottest environments—ranging from 73K up to 873K

Customer support

World-class customer support that provides the help you need when you need it

Measurements matter at every stage in the process

LNG is a highly valuable and widely traded commodity, making measurement and control throughout the LNG supply chain critical to the success of the industry. At every stage of the LNG process—from pretreatment to transportation—accurate and reliable measurements are essential for optimizing production, maintaining safety, and ensuring profitability.



Pretreatment/Dehydration

The first step in the liquefaction process chain, the pretreatment and dehydration stage, is critical for removing water and other contaminants from the feed gas.

Excess moisture can cause ice formation and blockages in the cryogenic section of the plant. Moisture sensors are used to monitor the water content of the feed gas at the outlet of the desiccant beds and at the outlet header, informing operators that dryers are working properly. Sensors that can operate at these process pressures and that provide process dew points are ideal at this stage of the LNG process.

Flowmeters are also critical at this stage for measuring feed gas before and after the dryer processes.



Liquefaction

The liquefaction stage is where the dehydrated feed gas is converted into LNG. This is done by cooling the gas to 111 Kelvin. The energy-intensive process requires accurate and reliable flow measurement to ensure that the LNG produced is fully liquefied and of the highest quality.

Flowmeters are used to monitor the flow rate of the feed gas and the LNG. They must be able to operate in cryogenic conditions and compensate for thermal retraction.

A critical factor at this stage is the monitoring of the boil-off gas generated during the liquefaction process. Fortunately, sensors using advanced technology enable operators to optimize the process and minimize safety and environmental risks.

Advancing eco-friendly liquefaction

Liquefaction is the most energy-intensive step in the LNG production process. Estimates show that as much as 850 kWh of energy are required for liquefying 1 kg of LNG.¹ The process can also be a major source of greenhouse gas emissions. Careful monitoring ensures efficiency and minimizes environmental hazards.



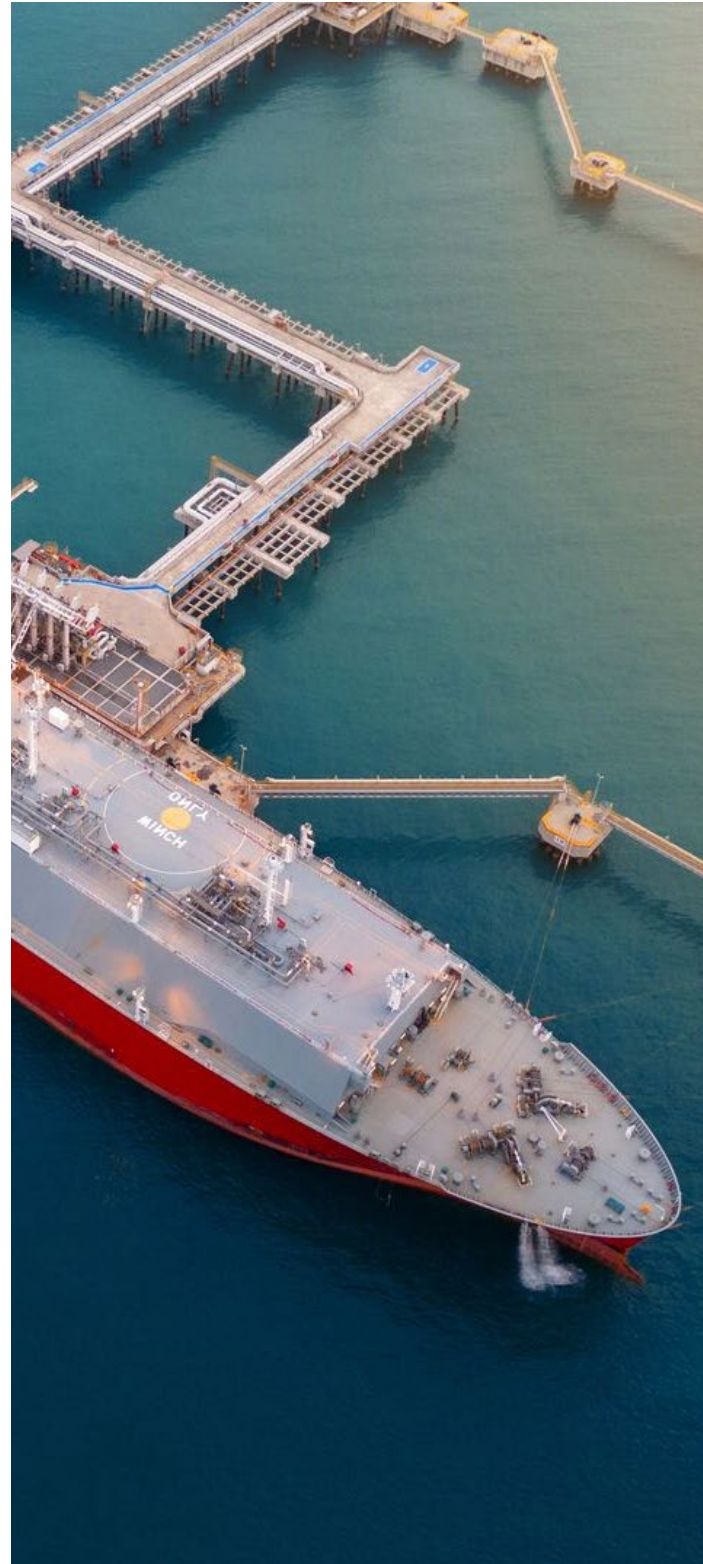
Loading and off-loading

During this stage, it is necessary to transfer the LNG between storage tanks and transport vessels, often through pipelines. Accurate and reliable flow measurement is crucial to ensure proper custody transfer, optimize the transfer process, and minimize the risk of accidents and spills.

To make sure the LNG transfer is done safely and efficiently, operators have some essential considerations:

- Accurately accounting for every cubic meter of LNG and gas to ensure reliable energy balance and data reconciliation for custody transfer purposes
- Managing changes in flow rates and conditions, which can make accurate flow measurement challenging
- Optimizing the transfer process to minimize the risk of accidents and spills
- Ensuring accurate and reliable measurement to maintain safe transfer of the LNG from one location to another
- Adhering to safety and environmental regulations to protect workers, vessels, and the environment
- Accounting for the energy being transferred to accurately bill for LNG, including monitoring the gas density, calorific value, and deducting the energy returned through the boil-off gas

To meet these demands, process and custody transfer flowmeters must be capable of handling a wide range of flow rates, maintaining accuracy at both high and low flow rates, and withstanding extreme environments and sudden changes in flow conditions.



Regasification

Liquefying natural gas is a convenient way to transport it over long distances since it represents 600 times less volume than gas. However, once the LNG arrives at its destination, it needs to be converted back into a gaseous form, making it suitable for distribution and consumption.

The complex process involves heating LNG above its boiling point of 111 Kelvin at

atmospheric pressure. During this process, it is imperative to maintain strict control over temperature and pressure to ensure efficiency and safety in handling the volatile substance. Technologies, including flowmeters and process analyzers, are employed to monitor and optimize the regasification procedure closely, further enhancing its reliability and effectiveness in meeting energy demands.



Transportation

There are two main methods of transporting LNG: by pipeline and by vessel.

The choice of transportation method depends on several factors, including the distance that the LNG needs to be transported, the cost of transportation, and the availability of infrastructure.

A variety of technologies can be used to ensure the safe and efficient transportation of the LNG. Ultrasonic flowmeters are well-suited for monitoring during this stage of the LNG process. This technology provides accurate and reliable flow measurements even under harsh conditions and does not generate any pressure drop that could generate local flashing (volume changes).

In addition to flow measurement, it is also important to monitor oxygen levels at this stage. Oxygen analyzers that are unaffected by contaminants, and are robust enough to handle varying operating conditions, provide an early indication of potential hazards.



Moisture and oxygen analyzers

The gold standard for accuracy and reliability

Accuracy and reliability are two of the most important factors to consider when choosing a moisture or oxygen analyzer. Panametrics' moisture and electrochemical oxygen analyzers are designed with these factors in mind. They use no moving parts, ensuring reliable measurement even in the most difficult environments.



Panametrics' HygroPro[®] moisture transmitter is an intrinsically safe, compact, loop-powered display transmitter with HART digital communication capability. It uses the latest aluminum oxide moisture sensor, the -FX sensor, to provide moisture readout in lbs/mm scf, dew point temperature, and parts per million by volume (PPMv).



The oxy.IQ oxygen transmitter and O2.IQ measurement system are designed for stability and longevity in hazardous locations, providing high-accuracy, ppm-level measurements.

Best-in-class flowmeters and flare management

With over 50 years of experience, Panametrics is an industry leader, providing ultrasonic gas and liquid flowmeters—both inline and clamp-on type—to handle the toughest applications in harsh environments.

The company's ultrasonic flowmeters are particularly well-suited for use throughout the LNG process. These flowmeters use sound waves to accurately measure the flow rate of liquids and gases in pipelines, tanks, and other equipment.

In addition to its ultrasonic flowmeters, Panametrics offers emissions management solutions for superior flare gas flow measurement and control. The company's flare.IQ technology increases flare destruction and removal efficiency, reducing methane emissions and helping companies comply with tighter environmental regulations around the world. flare.IQ also monitors destruction

and removal efficiency 24/7/365 and reports CO₂ equivalent for all types of flares.

On the other hand, the use of assisted flares (often with air) can lead to overaerating, causing damage to the flare tip and cutting its lifespan short. If regasification is not carefully monitored, it can also lead to a number of problems, including:

Safety hazards: equipment failure, leaks, or explosions

Environmental damage: the release of greenhouse gases and other pollutants into the environment

Economic losses: equipment repairs or replacements, increased downtime, lost production opportunities, and potential legal or regulatory penalties

Panametrics

A leader for
over 60 years

- Flowmeters and analyzers for use throughout the LNG process
- flare.IQ technology that reduces methane emissions and helps with environmental compliance with 24/7/365 monitoring
- flare.IQ technology that provides companies with the data they need to make informed decisions
- Products designed for the harshest environments
- Commitment to innovation and excellence

Panametrics' focus on providing accurate flow rate measurements and helping companies achieve greater efficiency and compliance with environmental regulations has made it a go-to choice for engineers and technicians in the LNG

industry. The company's products are designed to meet the needs of customers in challenging applications and harsh environments, making them an excellent choice for companies looking to improve their operations.



Panametrics offers a wide range of flow measurement and process analyzer solutions that are designed to meet the unique needs of the LNG industry. Whether you need accurate moisture or oxygen measurement, reliable flowmeters, or efficient flare management, Panametrics has you covered.

With over 60 years of experience, you can trust Panametrics to deliver high-accuracy, reliable measurements for every stage in the LNG process.

References

i <https://iopscience.iop.org/article/10.1088/1755-1315/214/1/012138/pdf>

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