Optimizing LNG Production with Advanced Flare Control

Panametrics
a Baker Hughes business

Executive Summary

No country aspires to be the leader in gas flare, but by 2019 a handful of countries accounted for nearly half the gas flaring worldwide. Optimizing liquid natural gas (LNG) production through the use of flare flow meters can stem the flare problem and limit methane slip emissions. Applying effective technology can help companies determine the appropriate molecular weight and mass flow rate of flares and ensure refineries meet flow measurement and burn efficiency provisions.

Panametrics' flare.IQ offers a plug-and-play answer to companies' needs, from meeting regulatory standards to helping harvest LNG to achieving maximum efficiency from flares.

In 2019, an average of nearly 1.5 billion cubic feet of natural gas wafted into the atmosphere each day in the United States. That amounts to nearly twice the natural gas consumption in North Dakota. Coincidentally, the state, along with Montana, houses the Bakken Formation, one of the country's largest shale plays and the site of dramatically increased flaring and venting.

What media outlet Bloomberg described as "America's hottest oil patch," the Permian Basin, straddling Texas and New Mexico, burned off natural gas at a higher rate than residential demand in all of Texas – the country's leading consumer of natural gas.

These developments were the product of a decade-long shale gas boom that helped make the United States one of the world's top-five flaring nations, according to the World Bank Group, with the figures from 2019 reaching record highs. After flaring rose by nearly one-fourth from 2018 to 2019, the United States, along with Russia, Iran, and Iraq, was among four countries contributing nearly half the gas flaring worldwide, according to the World Bank Group.

Challenges of Responsible Production

No country aspires to such distinctions. Flare pumps carbon dioxide into the air and contributes to global warming. Gas flared in the Delaware Basin in 2019 was the equivalent of burning 19,000 railcars of coal, according to petroleum engineer Ian Palmer, writing for Forbes magazine. Unburned methane, released through venting, carries 86 times the warming effect of carbon dioxide, meaning that methane slip emissions from incomplete flaring are 86 times more potent than CO_2 over a 20-year span.

Among the stages of natural gas production, regasification (where liquified gas is converted back to a gaseous form) can be the Achilles heel. Regasification plants can use different methods for conversion. Heat exchangers rely on seawater as a heat medium to raise the temperature of natural gas to change it from a liquid to a gaseous state. Air vaporizers work similarly, but use fans to push air through heat exchangers to vaporize the LNG. The variability of these heat exchange methods, coupled with changes in pressure and volume, dictate the need for one flare per every three storage tanks. If a flare is out of order or not working properly, the company is unable to regasify on that line since the flare remains a safety device.

Incentives for Better Flare Solutions

Despite some efficiencies in managing excess gas, LNG production companies face a quandary. According to the United States Department of Energy, it is unlikely that flaring and venting of natural gas during production, transport, and regasification can ever be entirely eliminated. However, both industry leaders and regulators agree that there is value in developing and applying technologies and practices to economically recover and limit both practices. So keeping the gas flowing, so to speak, requires flaring the gas, but not without consideration of definitive economic and environmental costs.

Incentives to consider LNG options and how to reduce flaring are growing both within the industry and because of increased scrutiny from regulators. Flares burning improperly pose not only environmental hazards but also an array of other harmful effects from emissions, which can include such volatile organic compounds as benzene, which causes cancer, polycyclic aromatic hydrocarbons, carbon monoxide, and black carbon.

Some companies turn to assisted flares, which refers to the practice of introducing dioxygen present in the air and sometimes steam into the combustion zone to increase the amount of oxygen and avoid black smoke, which is sure to draw regulatory attention. This practice, however, can lead to overaerating and damage to the flare tip , which can reduce its life span to 2 years or less. Investigating the tip frequently requires a careful inspection using sophisticated drones. In the event that a tip requires replacement, the costs, which can skyrocket, are punctuated by the need to also shut down production.

Flare.IQ Provides a Plug-and-Play Solution

Boosting flare efficiency from the current norm of 70% to 98% at refineries producing 500,000 barrels of oil or more a day would have the effect of getting 34,000 automobiles off American roads.

Applying effective technology can help companies determine the appropriate molecular weight, net heating value, and mass flow rate of flares and ensure refineries meet flow measurement and burn efficiency provisions in federal rules. Accurate and efficient meters help spot leaks, reduce loss, and conserve energy.

Precise data delivered on the production floor in real time allows operators to act in the moment to optimize combustion, cut emissions, and get the correct mix of vent gas, fuel, steam, or air at the flare tip.

Made by Baker Hughes, Panametrics' flare.IQ offers a plug-and-play answer to companies' needs, from meeting regulatory standards to helping harvest LNG to achieving maximum efficiency from flares. Flare.IQ is housed in a Windows-based industrial controller that seamlessly interfaces with existing distribution control systems.

The company's flare gas flow meters use a proprietary algorithm that immediately determines the molecular weight and mass flow rate of the flare and sweep gas. These accurate and efficient meters conserve energy and reduce product loss by identifying sources of leaks in the flare system.

By using flare.IQ and its patented algorithm, operators can pull critical information about their flare system, including temperature, pressure, vent gas velocities, and net heating value, to calculate the optimum levels of flare performance and ensure 98%+ high-efficiency flare combustion. When operators are given accurate, real-time, production-floor data, they are empowered to intervene quickly to achieve optimal combustion, thus reducing emissions by mixing the right amount of vent gas and steam at the flare.

The groundbreaking technology drives down methane slip emissions and operational costs, prolongs flare tip life spans, boosts safety, allows for remote validation without need to interrupt operations, reduces carbon footprint, and prevents flares from smoking and drawing unwanted attention from outside the site. Flare.IQ delivers a constant stream of data and feedback that slashes downtime, as well as capital investments needed after breakdowns.

Companies across the industry are scrambling to improve flare operations in response to the pressures brought by the shale oil boom, interrupted in 2020 by the COVID-19 pandemic but on the rebound now with demand and prices soaring. Smart management of flare systems puts operators more firmly in control of the process, allows them to maximize profitability, keeps them in line with regulations, and allows them to be stronger environmental stewards.

About Panametrics

Panametrics, a Baker Hughes business, develops solutions for measuring and analyzing moisture, oxygen, liquid, steam, and gas flow with proven technologies that are well-known and widely deployed across many industries, including oil and gas.

For more than 50 years, we've been constantly evolving our product line to deliver the most effective moisture and gas measurement systems on the planet. Today, the culmination of decades of expertise, insight, and innovation is expressed in our Sentinel portfolio of high-accuracy liquid flow meters that cover a range of operating temperatures and applications.

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