

How To Tackle The Challenges Of LNG, NGL Sampling

Kevin Warner, Ph.D.,

Mustang Sampling

The modern natural gas industry in the U.S. has existed since 1836, when the city of Pittsburgh created a natural gas distribution system for lighting. In the U.S. today, natural gas is quickly becoming the leading fossil fuel energy choice, consumed domestically and exported globally as liquefied natural gas (LNG). Additionally, natural gas provides a critical chemical feedstock in the production of plastics, organic chemicals, ammonia and several other petroleum products. Shale gas regions in Texas, the Rocky Mountains and the Northeast have changed projections of the country from net import to net export within a decade. The associated wet gas, or natural gas with higher ethane, propane and butane components than conventional dry gas, in shale regions has led to a steady supply of natural gas liquids (NGLs). As a leading supplier of sample conditioning products and services in the natural gas and NGL markets, Mustang Sampling is prepared to tackle the challenges of sampling associated with the processing of these difficult but valuable gas mixtures.

Natural gas processing is a complex and diverse field. But for the purposes of this article, it may be considered the extraction of ethane, propane, butane and natural gasoline from raw natural gas. Other common byproducts of natural gas processing, helium and nitrogen in particular, will not be addressed. NGL products are different from methane (or dry natural gas mixtures of mainly methane) because they are normally handled as liquids rather than in the vapor state. Mustang Sampling has developed products that accurately deliver a sample of the process stream for analysis across a wide range of compositions and conditions throughout the process.

The most important property of the process stream to control is its physical state or phase (liquid or gas). If not controlled properly, liquids and gases can coexist within the process and sampling systems, each moving with a different velocity through the system, making it impossible to deliver a representative sample to the analyzer. The process is further complicated by changes in gas temperature from either ambient conditions or Joule-Thomson cooling when reducing the pressure of the gas. Natural gas analyzers operate at relatively low pressure, about 20 psi for typical field instrumentation, but the process pressure ranges up to 1,500 psi. Mustang Sampling has pioneered heated delivery systems in the field to avoid hydrocarbon condensation in sample lines to gas chromatographs. By employing precisely controlled heated elements within the sample conditioning system, especially at the point of pressure regulation, Mustang Sampling ensures the gas remains in a homogeneous gaseous state from the pipeline to the analyzer. It should be noted in gas mixtures a problematic pseudo-state exists at some combinations of pressure and temperature, referred to as "two phase." For the purposes of this article, it is assumed the two-phase region should be avoided for accurate measurement to take place.

NGL sampling involves an additional step for proper measurement. The process sample enters the sample conditioning system as a liquid and must be maintained as such until it reaches a specialty vaporizer, which quickly flash-vaporizes the liquid sample as it moves through the system. This vaporized sample can then be handled as other gaseous vapor-phase samples, where it moves through filtering and heated regulation stages prior to arriving at the natural gas analyzer. In general, the temperature required to maintain the vapor state of an NGL is significantly higher than a dry natural gas sample since the boiling points of heavier components are higher.

Mustang Sampling has successfully deployed sampling systems to determine NGL compositions within dozens of processing plants from coast to coast. Typical cryogenic plant applications include gas inlet sampling (before and after dehydration), de-ethanization, de-propanization, nitrogen and helium extraction, and butane production. Additionally, Mustang Sampling provides a full range of products dedicated to LNG export, transportation and peak shaving.

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