

Natural Gas Industry Natural Gas Liquids (NGL) Plant

Process Gas Chromatograph Application Note

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A Natural Gas Liquids (NGL) plant consists of a series of fractionators whose purpose is to separate a mixture of light hydrocarbons into various pure products. The NGL Plant typically consists of a demethanizer, a deethanizer, a depropanizer, a debutanizer, and a butane splitter. Other arrangements of columns are possible for NGL Plants and also parallel columns may be present for higher plant processing capacity.

The feed to a NGL Plant consists of a mixture of light hydrocarbons (methane, ethane, propane, isobutane, n-butane and C₅+ or gasoline components) from the Natural Gas Plant. The NGL is fed to the demethanizer where methane is removed (by fractionation) as an overhead product. The bottoms product, consisting of ethane and heavier compounds, is the feed to the deethanizer. In the deethanizer, ethane is removed as an overhead product. Propane and heavier components leaves the deethanizer as a bottoms product and fed to the depropanizer. In the depropanizer, propane is removed as an overhead product and butane and heavier compounds leaves the product and fed to a debutanizer. In the debutanizer, isobutane and normal butane are removed as an overhead product and fed to a C₄ splitter. C₅+ material leaves the debutanizer bottoms product. In the C₄ splitter, isobutane is separated (overhead product) from the normal butane (bottoms product).

The methane stream from an NGL Plant is normally used as fuel (i.e. used for its heating value) or as feedstock to a methane reformer for the production of synthesis gas (a mixture of

carbon monoxide and hydrogen). The ethane stream from an NGL Plant is used as either fuel or as feedstock for chemical production (for chemical production, the chemical desired is usually ethylene). The isobutane product of an NGL Plant is usually used as feedstock for an alkylation unit. The normal butane stream is used as feedstock to a butamer unit (to make isobutane) or as fuel. The C₅+ product stream is used as a gasoline blending component.

The operating objectives of an NGL Plant are typically a balance of two objectives:

1. To maximize through-put while maintaining product quality.
2. To optimize product specifications versus utilities to maximize economic return.

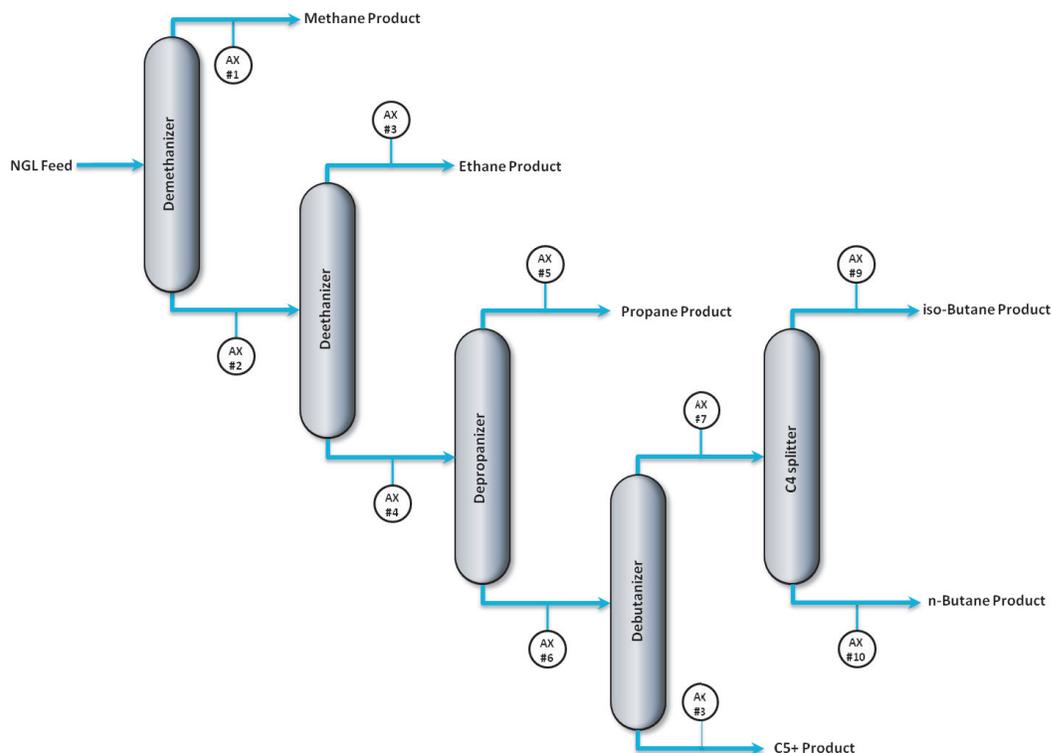
Process gas chromatographs provide the compositional information needed for the plant control system to meet these objectives.

Typical GC measurements

The number of gas chromatographs required varies on how many products the plant wants to extract from the natural gas liquid feed stream.

As mentioned above, the analyzers used in the NGL plant fall into two categories. The first are those analyzers used for monitoring the purity of the overhead product streams. The second type of analyzers used is the column-to-column analyzers that monitor the efficiency of each tower.

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Analyzer No.	Stream	Components Measured	Measurement Objective
1	Methane Product	C ₂	Minimize losses of C ₂ in Methane Product stream
2	DeMethanizer Bottoms	C ₁ , C ₂	Control C ₁ impurity in the Ethane Product stream
3	Ethane Product	C ₃	Minimize losses of C ₃ in the Ethane Product stream
4	DeEthanizer Bottoms	C ₂ , C ₃	Control C ₂ impurity in the Propane Product stream
5	Propane Product	iC ₄	Minimize losses of iC ₄ in the Propane Product stream
6	DePropanizer Bottoms	C ₃ , iC ₄	Control C ₃ impurity in the isoButane Product stream
7	DeButanizer Overhead	iC ₅ , nC ₄	Minimize losses of iC ₅ in the n-Butane Product Stream
8	DeButanizer Bottoms	nC ₄	Control nC ₄ impurity in the C ₅ + Product stream
9	C ₄ Splitter Overhead	nC ₄	Control nC ₄ impurity in the isoButane Product stream
10	C ₄ Splitter Bottoms	iC ₄	Control iC ₄ impurity in the n-Butane Product stream

For more information please contact:

5980 West Sam Houston Parkway North
Suite 500
Houston, TX 77041
713-939-7400
ProcessAnalyticsSales.industry@siemens.com

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Siemens Industry, Inc.
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100 Technology Drive,
Alpharetta, GA 30005
1-800-964-4114
info.us@siemens.com

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