

## Introduction

Centrifugal gas/liquid separators, sometimes referred to as vortex separators, are used throughout the natural gas manufacturing process. This is due to their simple and efficient design, which separates entrained droplets and particles >10 microns with 99% efficiency and never requires maintenance.

The reason why gas/liquid separators are required at several points between extraction from the ground to consumption by the customer is because water and other impurities precipitate from the natural gas stream as it undergoes changes in pressure and temperature. Pipeline length, ID, material of construction and all the fittings/components it encounters along its pathway contributes to changes in pressure. Temperature fluctuations can be minimized with insulation, but ultimately also contribute to these impurities that must be removed.

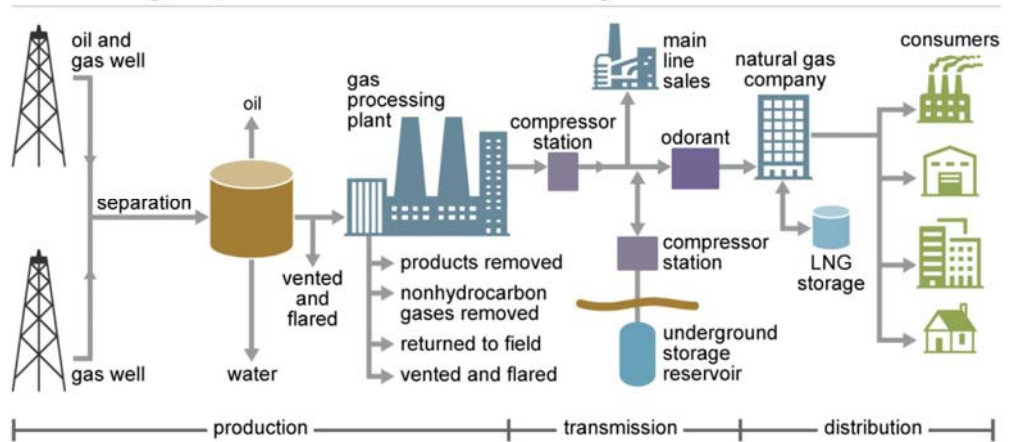
Following are fourteen examples of how maintenance-free centrifugal gas/liquid separators are used for processing natural gas.

**Wellhead Separation:** Gas/Liquid Separators are used at wellheads to remove liquid and solid contaminants from the raw natural gas, ensuring the gas quality meets transportation and processing standards.

**Pipeline Transmission:** In gas transmission pipelines, these separators are used to remove liquid carryover from the gas stream, preventing damage to downstream equipment and reducing the risk of hydrate formation. Water precipitates from vapor to liquid due to pressure and temperature fluctuations. The water vapor within natural gas coalesces into liquid water quicker at high altitudes and when the environment is cooler.

**Gas Compression Stations:** Separators can be installed at gas compression stations to protect compressors from liquid carryover, which can cause erosion and damage to the equipment. Compressor stations are required to maintain pressure over long distances, changing elevations, and for injection into storage and processing facilities. A type T separator separates a large volume and "slugs" of liquid, much more efficiently than a knock-out drum or "slug catcher" with a smaller footprint and cost as described in our article

## Natural gas production and delivery



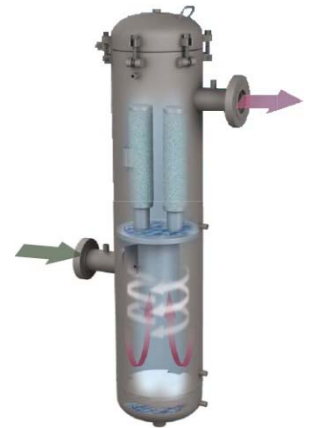
### ["Difference Between Knock-Out Drum and Centrifugal Gas-Liquid Separator"](#)

**Gas Processing Plants:** Separators play a crucial role in gas processing plants to ensure the gas stream is free from liquid contaminants, protecting downstream equipment and improving the quality of the processed gas.

**Amine Treating Units:** Is an example of a gas process plant application where the gas undergoes a "sweetening" process. This refers to removing hydrogen sulfide and carbon dioxide to make it less acidic; gas/liquid separators remove excess solvents and liquid hydrocarbons which are used and formed during this process.

**Condensate Stabilization Units:** Vortex separators can be used to separate condensed hydrocarbons from the gas stream, allowing for the collection of valuable condensate products, referred to as Natural Gas Liquids (NGLs). Examples of NGLs include ethane, propane, butane, isobutane, pentane and hexane and they are used as ingredients for petrochemical, plastics and fuel manufacturing as well as a cleaner source of fossil fuel energy.

**Liquefied Natural Gas (LNG) Plants:** To liquefy natural gas requires cooling it to very low temperatures and just like previous application examples, significant changes of temperature and pressure result in precipitation of water vapor and condensable hydrocarbons. These impurities are removed by gas/liquid separators.



# Efficient Centrifugal Gas/Liquid Separators for Natural Gas Processing

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## Fractionation Towers:

This refers to the next step in the natural gas refinement process, where the NGL mixture are distilled into specific NGLs and purified. This is accomplished by controlling temperature and pressure and separators are used at each NGL stage to remove the liquid to prevent carryover to the next stage.



**Gas Storage Facilities:** Long term storage of natural gas and LNG often contain water vapor which accumulates over time, thus separators are utilized in gas storage facilities prior to being sent to a compressor station or used by customers.



**Regulator and Metering Stations:** These are located strategically throughout the natural gas distribution pipeline to control flow rate and pressure. Gas/liquid separators ensure that the gas entering these stations are free from liquid contaminants, protecting expensive flow meters and improving accuracy of their measurements by separating entrained contaminants.

**Fuel Gas Systems:** When natural gas is transferred to the actual points of use for a gas turbine, industrial burner, gas engines, refinery or petrochemical manufacturer, gas/liquid separators protect the process equipment from impurities which present themselves due to fluctuations in flowrate/pressure and temperature.

**Well Testing:** Wells are tested for quality control and production strategies related to well performance (production potential). During well testing operations, gas/liquid separators are used to protect and improve the performance of valves, flow meters and pressure/temperature transducers from liquid and particle contaminants resulting from the subtle changes in pressure and temperature involved with such testing.

**Offshore Platforms:** Have the same type of applications previously described and due to the complexity of supply chain issues, they benefit significantly from a separator design without internal vanes and demisting pads which foul and need replacement.



**Environmental Control:** Water and liquid hydrocarbon aerosols contribute to environmental pollution when the natural gas is vented and flared (burning natural gas for safety, maintenance and upset related conditions). Gas/liquid separators are used to remove entrained droplets as fine as 0.3 microns with 99% efficiency in support of cleaner burning with the added benefit of reducing the outlet noise.



The reoccurring theme is that changes in pressure and temperature result in water and other contaminants OR a desirable NGL product to collect for further processing.

This is why you will also find gas/liquid separators applied throughout compressed air, steam and other compressed gaseous systems. Most centrifugal gas/liquid separators have a fully welded design without any serviceable components and they are considered self-cleaning in nature due to the constant swirling vortex within. Materials of construction include steel, 304SS, 316SS, Duplex SS, Alloy 20, Hastelloy-C and Titanium.

Visit <https://fdpp.com/Filtration-Articles.htm> to read similar articles and to learn more about the maintenance free centrifugal separator design!