

Coil Wound End Flash Exchangers for Liquefaction End Flash Systems

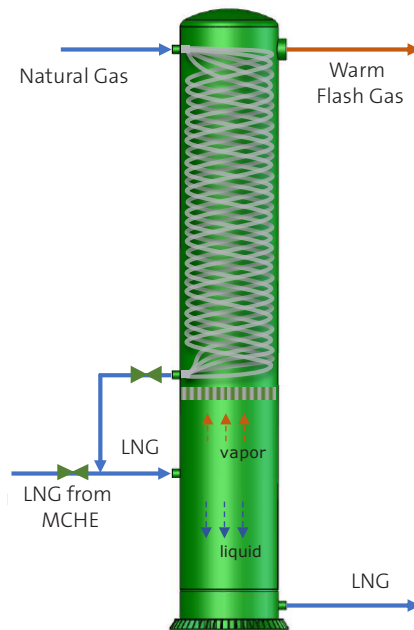


Modularized Coil Wound End Flash Unit

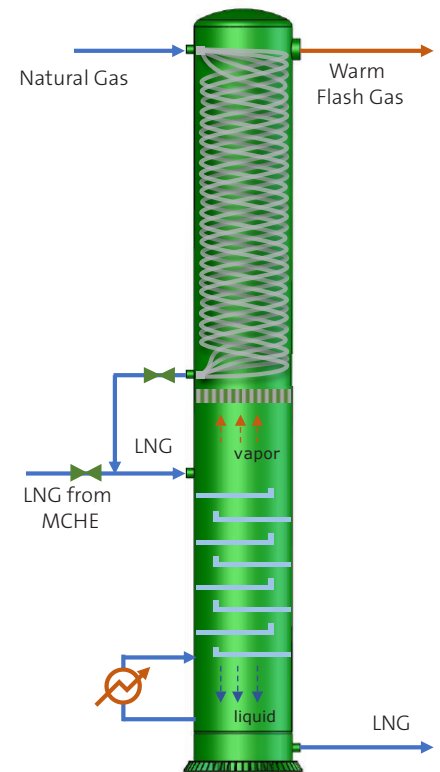
Based on proven plant operating experience and through technological innovations, Air Products has developed a unique equipment offering that combines the end flash drum with a coil wound heat exchanger (CWHE) into a single piece of equipment to recover the flash gas refrigeration and produce additional LNG. Since CWHEs are manufactured within cylindrical pressure vessels, simply extending the vessel shell at the bottom section creates a natural separator vessel.

Coil Wound End Flash Units offer several benefits

- Smaller footprint
- Simpler piping arrangement
- Simpler mechanical support structure
- Inherent robustness of CWHEs
- Lower pressure drops in the end flash system
- Works with any Air Products liquefaction processes
- Bottom section can accommodate additional separation stages for nitrogen rejection



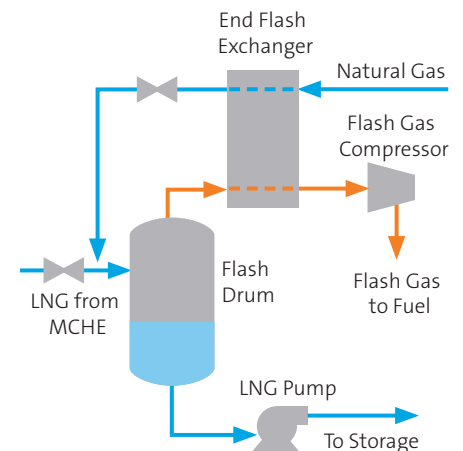
Coil Wound End Flash Unit



Coil Wound End Flash Unit

Generic End Flash Systems

Many LNG plants have end flash systems, which typically consist of a flash drum (or a nitrogen stripping column), an end flash exchanger and a flash gas compressor. Subcooled LNG product from the liquefier's main cryogenic heat exchanger (MCHE) is sent to the end flash system, where its pressure is reduced, creating cold flash gas that further helps liquefy additional feed gas before being used as fuel. The end flash system is a more efficient way to generate fuel gas for refrigeration compressor drivers (gas turbines) as compared to taking fuel gas from the warm end of a liquefaction process. The end flash system also provides a convenient mechanism to reject nitrogen from the LNG product.

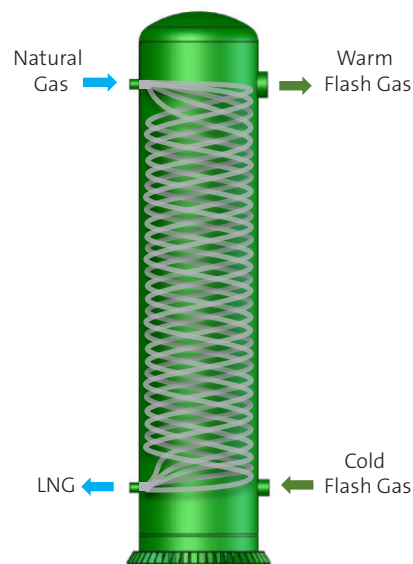


The design of end flash systems and the selection of the type of equipment requires careful consideration for the flash gas conditions the system will experience during day-to-day operation. Due to variations in process conditions (e.g. feed gas composition, pressure, cooling medium temperature and production capacity), the flow rate and composition of the flash gas will experience fluctuations. If the duties in the flash gas heat exchanger are not balanced, it could cause thermal stress to the exchanger, potentially reducing the life of the equipment and causing exchanger failure and leakage.

Air Products' CWHEs: Proven and More Robust for End Flash Systems

There are documented failure instances in end flash systems where less robust heat exchangers (e.g. brazed aluminum plate fin heat exchangers) have been damaged from excessive thermal cycles. When a flammable gas leakage develops due to the failure of the brazed aluminum heat exchanger, the plant may have to shutdown and the exchanger will have to be repaired or replaced, which can cause significant downtime.

CWHEs have a long history of exceptional performance in high thermal stress applications and have been used to process natural gas in over 120 LNG trains located in 20 countries around the world, some of which have been in operation for more than 50 years. Air Products has provided 12 CWHEs for end flash exchanger service since 1982. The inherently robust mechanical and structural design of CWHEs can withstand the thermal stresses typically experienced in an end flash system including upset and transient conditions. Thanks to the robust design of the CWHEs, tube leaks are very rare. Even in the unlikely event of a tube leak, the hydrocarbons are still contained within the pressure shell with little impact on efficiency. Typically, no imminent shutdowns are required for inspection or repairs during the life of the CWHEs..



Coil Wound End Flash Exchanger

About Air Products

Air Products is a world-leading industrial gases company celebrating over 80 years of operation. The company's core industrial gases business provides atmospheric and process gases and related equipment to manufacturing markets, including refining and petrochemical, metals, electronics, and food and beverage. Air Products is also the world's leading supplier of liquefied natural gas process technology and equipment.

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