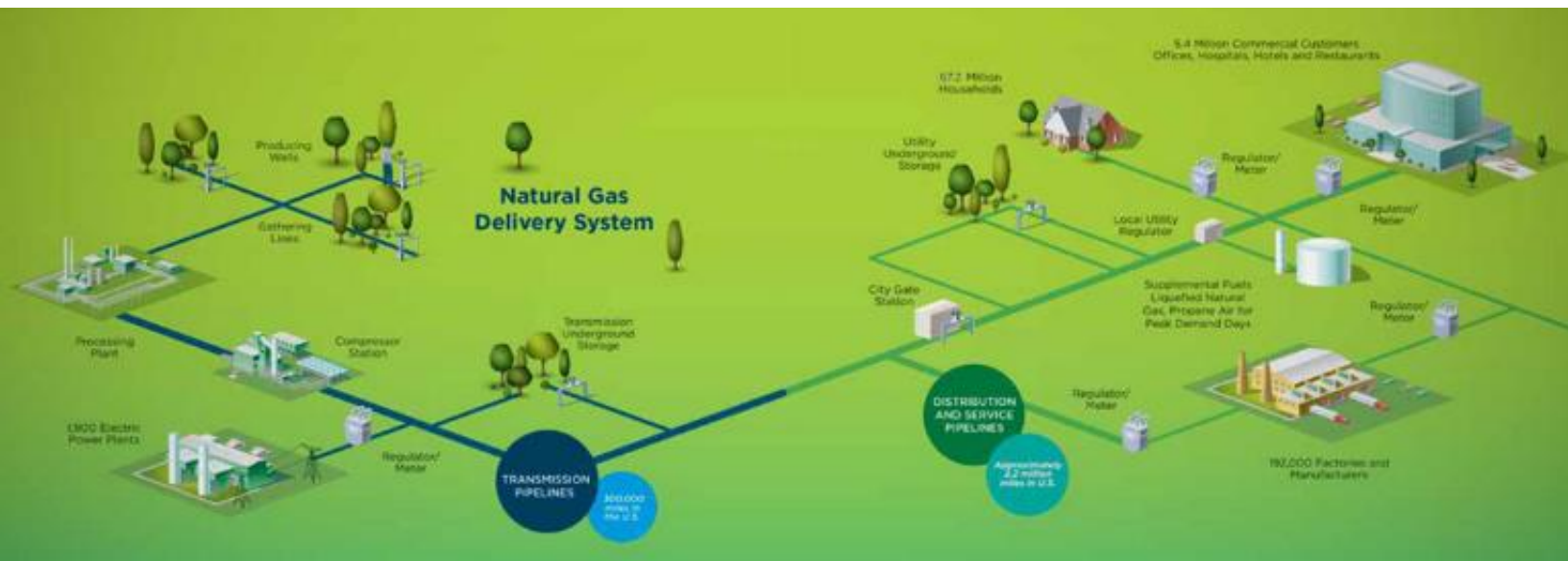




# CASE STUDY

## 10-Flow Control Applications at a Natural Gas Compressor Station

Whether it's measuring natural gas to fuel the compressor at a compressor station, or to measure carrier gas to the gas chromatograph, the thermal mass flow meter provides cost-efficient and accurate measurement solutions.



## COMPRESSOR STATION

The compressor station is an essential component for transportation of natural gas within the delivery system. They are strategically located along the pipeline every 50-60 miles, where the gas is compressed to a particular pressure, allowing the gas to flow through the pipe towards the final destination. The number of compressor stations in a pipeline will vary depending on the conditions and region. In the U.S. there are 1367 mainline compressor stations feeding 1452 gas distribution companies through city gate stations or directly to

large volume FT customers. As of September 2019, 1900+ Electric Power Plants receive natural gas directly from compressor stations. With 192,000+ Factories / Manufacturers, 5.4 Million Commercial Customers, Offices, Hospitals, Hotels and Restaurants, and 67.2 Million Households, it's imperative that Compressor Stations operate at peak efficiency. There is no more compelling reason to implement thermal mass flowmeters for the following 10-Applications to achieve desired efficiencies.



## Fuel Gas to the Compressors

The engines used with the compressors are fueled by natural gas from the pipeline, and the natural gas distribution company needs to account for the fuel used to power the compressor. In this application, thermal mass flow meters are ideal for measuring the natural gas flow to the engine as the devices measure mass flow and do not require the added expense of pressure or temperature sensors, as well as a flow computer to determine flow correction. A two-inch pipe is a typical size for this application where the thermal mass flow meter can be installed as an insertion device or as a flanged flow body. The flow meter is easy to install and has no moving parts in the gas stream.



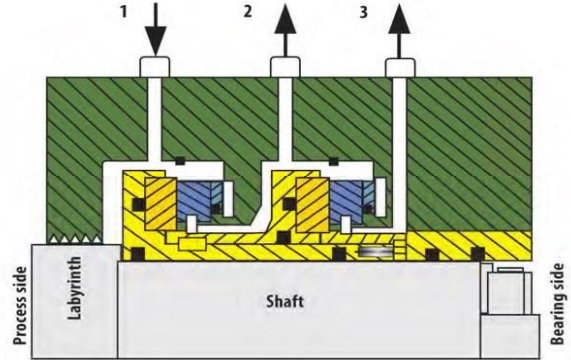
## Fuel Gas to Gas Heaters

During normal operation of the compressor station, there are times when the system pressure on the compressor must be dropped for distribution. For every 100 PSIG pressure drop, there is a 7-8°F drop in gas temperature. To avoid gas lines from freezing up, gas heaters are installed to maintain 60°F gas supply temperature. Natural Gas is used to fuel these heaters typically in 2" lines to keep a continuous heat source on the natural gas. Measuring the fuel gas to the heaters becomes a critical measurement to determine efficiency of the heater as well as operational costs of the heater. A thermal dispersion flowmeter with datalogging is an ideal choice especially when totalized flow is necessary.



## Odorant Gas Metering

Natural gas by itself is odorless. In 1937 over 200 women, children and men died when un-odorized natural gas ignited in a London, Texas school. This disaster was the impetus for the regulations to add odor to natural gas so that any person would detect it when having a "normal" sense of smell. Mercaptans, which are a class of organosulfur compounds, are the ideal chemicals to odorize natural gas. Given that the odorant injection rate of the odorizer is proportional to the gas flow rate of the pipeline, a thermal mass flow meter with excellent low-flow sensitivity and high rangeability assures accurate, optimal and repeatable odorization with low-flow and intermittent-flow systems.



**1 = Primary seal gas supply, 2 = Primary vent, 3 = Secondary vent.**

## Dry Gas Seals

Tandem style dry seals consist of a primary seal and a secondary seal contained in a single cartridge. It is desirable to measure the continuous flow of gas from the seals to the flare to determine how much gas vents to the flare. As the seals wear, the amount of gas flow will increase, therefore monitoring the seal gas flow is effective preventive maintenance. The flow of vent gas to the flare is relatively low, often in the range of 5 to 20 SCFM depending on compressor size. A typical pipe size here is 1 inch where a thermal flowmeter with an inline flow body is recommended. The measurement of the seal vent line to the flare may be required for reporting of greenhouse gas emissions to meet EPA requirements.



## Blowdown

During normal operation of the compressor station, there are times when the compressor may have to startup or shutdown. Pressurized natural gas remains in the compressor and adjoining pipeline during this stage. In some instances, it may be necessary to release or blowdown this gas; often this may be accomplished by venting the gas to an adjacent compressor. On other occasions, it may be needed to vent this gas to the flare. During the blowdown period, the pressure and flow rate in the blowdown piping will vary considerably. The wide turndown of thermal mass flowmeters provides excellent rangeability and gives accurate, repeatable measurement through the whole operational range.



## Vent Gas to Flares

With a flare, the flame or fixed gas is exposed and visible for miles and the sound of the burn off may be quite loud. Flares are in high demand by the Oil & Gas industry in order to satisfy the requirements of the EPA's 40 CFR Part 60 Subpart OOOO (also known as Quad O) and other regulations. Flares are used to burn off excess gases or during upset conditions in the process. Monitoring the fuel to these flares at the inlet is part of meeting these regulatory requirements as gases flared must be reported. A flowmeter used in this application must be ready to read accurately at both very low flow rates and at high velocity for upset conditions. The thermal mass flowmeters are uniquely suited for these applications.



## Station Check Metering

Often, in Oil & Gas production or transportation there is a shared investment, such as wells and storage fields. This requires consistent, accurate monitoring of the volume of product moved at each point in the system to allocate the net hydrocarbons between the entrants to the shared facilities. The flow meter readings will be used to calculate royalty payments to partners. Essentially, this turns the flow meter used in an allocation application into a cash register for invested partners. Therefore, the accuracy and reliability of the flow meter is paramount. Thermal flow meters have a proven track record for repeatable measurement, outstanding accuracy, and low maintenance costs. Inline versions are available from 3/4" to 6" with Modbus.



## Compressed Air Monitoring

Air leaks in compressed air systems can lead to inefficiencies that raise plant costs. By installing a thermal mass flow meter to monitor for leaks, increases in usage that could be caused by any leaks can be identified quickly. Anywhere from 7 to 10 times more costly than electrical energy, compressor systems require optimal efficiency and air flow control. Repairing leaks is critical to reducing plant operating and maintenance costs. Thermal Flow Meters use a high-accuracy sensor to provide an excellent method for evaluating compressor efficiency and locating these serious gas leaks. Available with a 150 psig retractor assembly, the meter may be removed under pressure and relocated to isolated areas within a plant with little effort.



## Gas Sampling

Gas Sampling is the first step in the collection of data that guards our process variables, monitors emissions and verifies that processes are running consistently. We see more and more demand for regular interval sampling that needs to be consistent and reliable. Sample specialists have discovered the simplicity and economics of the a compact mass flow controller (MFC) with optional integrated alarm module. This extraordinary gas measurement instrument offers true portability because of its long life on a single AA battery. All 50-plus variables can be adjusted through a built-in touchscreen. No need exists to connect the unit to a computer unless you want to update the firmware or power the unit through its USB connection.



## Gas Chromatographs

Gas Chromatography works by taking a mixture of gases and moving it through gas states in order to separate the gases. These different components are then processed through a device such as a mass spectrometer, which describes them. GC's serve a vital role in at a natural gas compressor station, giving daily reports that determine the BTU content and density for billing purposes. The more accurate the sample drawn, the better the chromatograph reading. Helium is the typical carrier gas used to stabilize their readings, however sight glass meters waste this valuable asset. By using a MFC with pressure and temperature compensation, clients receive higher accuracy on readings and reduce consumption and costs of this scarce gas.

Magnolia Compressor Station

