

# Technical Article

## Why Meter Choice Matters In Natural Gas Infrastructure

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The natural gas industry is in a challenging position. World-wide shortages in raw material and finished goods created a gap in supply that many companies struggle desperately to fill. Many projects were suddenly fast-tracked.

Given this intense demand for new product, producers of liquefied natural gas (LNG) and compressed natural gas (CNG) are under pressure to deliver every last gram of product. The best way to ensure that they are getting the most out of their production and transfer processes is to measure at every possible point. How the product is measured matters, which means choosing the right flow meter can have a significant impact on the bottom line.

### Understanding Meter Technologies

LNG/CNG producers understand that they cannot control what they do not measure. Every gram of product must be accounted for throughout production and during non-custodial transfer. While Coriolis meters are known for their accuracy, they are also notoriously expensive and are limited to line sizes <14". Many LNG metering points are much larger than 14". It is simply too cost prohibitive to use them for the majority of applications where metering is required or recommended.

Instead, differential pressure (DP) meters should be the go-to technologies for anything beyond custody transfer. There are several well-known DP meters. While each has their benefits, some are better than others.



*A 28" V-Cone undergoing hydrostatic, non-destructive testing (NDT) at McCrometer's Southern California headquarters. Many customers elect to have hydrostatic testing conducted on their V-Cone to ensure no leaks are present. McCrometer conducts hydrostatic testing in accordance with ASME B31.3.*

**Orifice plate.** These meters are among the most cost-effective. They use a flat plate with an opening in the center that creates a pressure differential which is used to calculate the flow rate. Orifice plate meters require a straight run of about 20 times the diameter of pipe. If installed properly, they offer decent accuracy in high flow rates ( $\pm 1\%$ ) but struggle in low flow rates and only offer a turn down ratio of up to 4:1.

Orifice plate meters are easy to maintain. That said, they do require a greater deal of maintenance than other metering technologies. Maintaining a meter requires shutting down the system, draining the lines and unbolting the orifice plate, a costly and time-consuming process. Even with regular maintenance, orifice plate meters have a limited lifespan of about five years since they can wear down from corrosive or abrasive flow.

**Ultrasonic.** Clamp-on ultrasonic meters offer decent accuracies ( $\pm 0.5$  to 2%) depending on the type and the application, but their measurements come at a cost. While the clamp-on versions are attached to the outside of the pipe, there are several ways to install them incorrectly. Clamp-on ultrasonics have been touted by some as the most misapplied technology on the market. They too require massive straight runs, typically a minimum of 20 pipe diameters. In addition to the massive straight runs, one must also ensure the transducers are installed in a precise position and must be oriented properly.

Another factor to consider is that the transducers must have a solid connection to the pipe. As such, some sort of coupling gel must be used to couple the transducer to the pipe. Sound travels much differently through air and if the gel dissipates enough to the point that there is no longer solid contact with the pipe, signal quality can degrade, which may result in a loss of flow. Additionally, if the inner pipe wall starts to rust and flake apart, the signals can degrade enough that readings are lost.

These measurements are too critical to be lost or degraded so care must be taken to ensure the transducers are coupled properly. Depending on location and installation parameters, ultrasonic meters may have to be visited frequently to ensure they are operating properly. On one hand the non-intrusive nature of a meter being clamped on the outside of the pipe is very attractive. On the other hand the long straight run requirements, frequent verification that the transducers are installed properly, and the high likelihood of incorrect installation make clamp on ultrasonics a less than ideal measurement technology.

**V-Cone.** This DP meter technology uses a cone shape to gently push fluid or gas to the outside of the pipe. As a result, they cause significantly less pressure loss than other DP meters. In addition, they are resistant to turbulence in the pipe. This means that they do not require as much straight-run pipe as other meter technologies and can be installed almost anywhere in the system, including near valves and bends.

V-Cone meters have higher accuracy ( $\pm 0.5\%$ ) than other DP technology and can produce reliable readings even in low-flow applications resulting in

up to 50:1 turn down ratios. They require almost no maintenance. By virtue of their design, they endure a lot less friction and thus last far longer as well; their average lifespan is over 30 years.

### Other advantages of V-Cone DP meters include:

- **Sustainability.** Many LNG/CNG producers are adopting carbon sequestration technology to offset their environmental impact. But compressed carbon dioxide has non-Newtonian properties, which makes measurement a challenge. McCrometer has developed an algorithm that has been laboratory validated for its V-Cone meters that can account for supercritical and dense phase CO<sub>2</sub>'s unusual behavior and measure it accurately.
- **Energy savings.** Because V-Cone meters don't generate as much pressure loss as other meter technologies, the pumps or plants that move product do not have to work as hard and the compression driven applications need less pressure to move from one area to another. This reduces energy consumption, which both furthers sustainability goals and also saves money.
- **Customizable.** One of the biggest benefits of V-Cones is that they can be custom-manufactured to fit a given application based on the flow data, temperature, pipe size and material, and more. While some meters don't come in sizes larger than 4", V-Cones can be made for piping as large as 120".

As LNG and CNG producers expand their capacity to meet the current market demand, it is critical that they account for every gram of product. By installing V-Cone DP meters throughout new and existing infrastructure, they can keep the most accurate measurement of product flow possible at the lowest possible price point.