Oil and Gas Production Measurement

From Wellhead to Pipeline
Peace of Mind—
We’ve Got You Covered

We know it’s tough out there – not enough manpower, harsh weather, harsh environments and even tougher timelines – we can help. We’re FMC Technologies, a well-established name in the oil and gas industry, and we can offer unparalleled industry knowledge, technology, field experience and support. FMC Technologies’ products and supporting services will keep your wells producing and help automate quickly, and on budget.

With over 80 years of experience in hydrocarbon measurement, FMC Technologies brings true measurement expertise to demanding custody transfer and allocation measurement applications. The suite of products from FMC Technologies and our preferred suppliers allow us to offer a truly complete solution for precision measurement, automation and data management. From design assistance and complete, fabricated solutions, to start-up and commissioning support, FMC Technologies can deliver the right solution to meet your application needs.

Also, FMC Technologies’ direct offices are conveniently located near you, providing easy access to sales support, support services and inventory, minimizing our response time and maximizing your uptime and production.

FMC Technologies delivers the expertise and quality that allow you to focus on production. Through creative thinking and innovation, we can meet the growing needs of operators in the oil and gas industry.

Find out more about our U.S. manufacturing locations and our service and support locations. We are close by to offer support when you need it.

FMC Technologies also has a full portfolio of services to support you through your entire process.

Contact us
www.fmctechnologies.com/MS_ContactUs
<table>
<thead>
<tr>
<th>Application</th>
<th>Flow Metering Technology</th>
<th>Other Instrumentation and Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Testing</td>
<td>Coriolis, Vortex, Electromagnetic, Turbine, Positive Displacement and Ultrasonic Flowmeters</td>
<td>Continuous Level and Interface, Level Switch, Temperature, Pressure and Water Cut Monitor</td>
</tr>
<tr>
<td>Wellhead</td>
<td>DP Flow</td>
<td>Wireless Options: Pressure and Temperature</td>
</tr>
<tr>
<td>Enhanced Oil Recovery</td>
<td>Coriolis, Vortex, Electromagnetic, Turbine and Ultrasonic Flowmeters</td>
<td>Wireless Options: Level, Temperature and Pressure</td>
</tr>
<tr>
<td>Waterflood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steam Flood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscible Flood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Flood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing</td>
<td>Coriolis, Vortex, Electromagnetic, Turbine and Ultrasonic Flowmeters</td>
<td>Wireless Options: Continuous Level and Interface, Level Switch, Temperature, Pressure, Electronic dP and pH</td>
</tr>
<tr>
<td>Separation</td>
<td></td>
<td>Water treatment specific analyzers: pH Conductivity, Chlorine, ORP and Turbidity</td>
</tr>
<tr>
<td>Crude Oil Desalting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude Oil Dehydration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude Oil Stabilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condensate Stabilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Dehydration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Sweetening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock Tank Vapor Recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>Coriolis, Positive Displacement and Turbine Flowmeters</td>
<td>Wireless Options: Continuous Level, Level Switch, Temperature, Pressure, Water Monitors and Ultrasonic</td>
</tr>
<tr>
<td>LACT Units</td>
<td></td>
<td>Other: Valves, Strainers, Air Eliminators, Complete Skids, Presets and Flow Computers</td>
</tr>
<tr>
<td>Gathering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck and Rail Car Loading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck and Rail Car Unloading</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Produced wellhead fluids such as crude oil, natural gas and brine must be processed before sale, transport, reinjection or disposal. Oil and gas production involves a number of surface unit operations between the wellhead and the point of custody transfer. Collectively, these operations are called “field processing.”

Field processing of crude oil from storage, transportation and sale involves three process objectives:

» Separating the crude oil from any entrained solids, emulsified water or brine
» Stabilizing the crude oil by removing dissolved gas so that it is safe to be transported and stored
» Removing impurities and any separated or free gas from the crude oil

Field processing natural gas for sale or reinjection into a pipeline or storage vessel for natural gas liquids involves the following process objectives:

» Cleaning by removing liquids
» “Sweetening,” or treating, by removal of acidic gases (H₂S and/or CO₂)
» Dehydrating by removing water vapor and controlling H₂O dew point

Your Complete Solution
Your complex process requires you to minimize capital expenditure while maximizing efficiency. FMC Technologies understands the challenges you face, and can provide the system solution for your unique application needs.
Instrumentation for Process Control

How do you know which technology is the best fit for your application? The experts at FMC Technologies can help guide you through. Here are just a few things we take into consideration when helping you select the right device:

First, you must decide if you need to measure continuous overall level, point level or interface level. Is it a separator or tank? Is the vessel vertical or horizontal?

Second, you need to determine if you need to measure tank height, mechanical fixtures in tank and so on. Dielectric constant. We would also need to consider your accuracy needs, ensuring technologies tailored to meet your specific application needs.

We offer many different technologies to measure level:

- Conductive
- Ultrasonic
- Vibronic
- Capacitive
- Hydrostatic
- Gamma
- Multiparameter (capacitance and guided radar combined)
- Remote Dead-End Test Interface
- Level transmitters
- Interface transmitters
- Pressure transmitters
- Temperature transmitters
- High and low level switches

Note: Vessel instrumentation, tank vessels and separation equipment may include instrumentation such as level, interface, pressure, temperature transmitters, and high and low level switches. See individual line cards for more information.

With this information, we help find the best fit technology tailored to meet your specific needs.
FMC Technologies’ BMP (best measurement practices) workshops. A selection of training according to your needs – including premium training at our offices, right here in the UK. This is followed by the hands-on experience and support needed. We offer more than 100 years of skill and experience in instrumentation design and installation. FMC Technologies’ instrumentation design team and training schools so that your employees are well-trained staff and the ever-increasing demands for higher accuracy. We understand the daunting task of finding and retaining high-quality staff. TRAINING

SUSTAINABLE OPERATIONS

Our certified service technicians provide quick and dependable start-up and commissioning services. Measurements and instrumentation expertise ensure that project milestones are met. Start-up and commissioning services. Measurement and instrumentation expertise ensure that project milestones are met. Measurement and instrumentation expertise ensure that project milestones are met.

SUPPORT

Your instrumentation is vital to the safe operation of your processes and the quality of the products you produce. FMC Technologies’ customer support engineers are ready to provide you with support 24/7. This is followed by the hands-on experience and support needed. We offer more than 100 years of skill and experience in instrumentation design and installation. FMC Technologies’ instrumentation design team and training schools so that your employees are well-trained staff and the ever-increasing demands for higher accuracy. We understand the daunting task of finding and retaining high-quality staff. TRAINING

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TRADEMARKS

Service and Support

When selecting a meter technology, the following criteria should be considered.

MEASUREMENT, DATA AND ACCURACY

The kind of metering system and technology you need depends on the type of measurement you need to perform and the kind of data you need to analyze. From custody transfer or the monitoring of the efficiency of critical processes to the measurement of product composition – including density, viscosity or BS&W – your applications require unique data output and accuracy goals for that data. The following are the ways the accuracy of instrument products are measured:

- repeatability: accuracy of measurements for a given flow rate
- linearity: accuracy of measurements over a range of flow rates
- Stability: accuracy of measurements over time (ability to maintain repeatability and linearity)
- Quality: the accuracy of combined output data from multiple devices in a measurement system

PRODUCT CHARACTERISTICS

The characteristics of your product determines the kind of measurement technology you need for accurate measurement. Some common product characteristics include:

- viscosity range
- API gravity range
- Density
- Recirculate water range
- Temperature and pressure
- Pressure range
- Type and amount of contaminants and deposits

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- Temperature and pressure
- Pressure range
- Type and amount of contaminants and deposits

Flow Metering Technologies

Cardiac meters have a very wide turn-down flow range and, unlike volumetric, bulk rate is not affected by changing process conditions such as temperature, pressure and viscosity. Besides offering high accuracy, archetypical electrical flow, Coriolis meters have the ability to measure several process variables at the same time. Mass flow, density and temperature are the primary variables that can be used to derive other values such as volumetric flow, density content, concentrations and complex density functions.

Turbine meters are offered in several ranges and offer low maintenance, no wear, no pressure drop to maximize delivery rates. Other features include the resilience to parallel build-up and static flow operation.

Electromagnetic flow meters measure the volume flow rate of electrically conductive fluids (greater than 1 µS/cm) with or with out solids. These measuring devices offer you cost-effective flow measurement with a high degree of accuracy for a wide range of process conditions. The low and constant flowing tensions have to pressure loss and are not sensitive to vibration.

Flow computers are designed to monitor continuous or batch flow operations for liquid or gas. Microprocessor-based units, such as the Promass™ Flow Computer, can be operated either stand-alone or as part of a supervisory control and data acquisition (SCADA) system.
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When selecting a meter technology, the following criteria should be considered:

**MEASUREMENT, DATA AND ACCURACY**

The kind of metering system and technology you need depends on the type of measurement you need to perform and the kind of data and accuracy the measurement provides. From custody transfer to the monitoring of the efficiency of critical processes to the measurement of product components – including density, viscosity or BS&W – your applications require unique data output and accuracy goals for that data. The following are the ways the accuracy of metering products are measured:

- **Repeatability**: accuracy of measurements for a given flow rate
- **Linearity**: accuracy of measurements over a range of flow rates
- **Stability**: accuracy of measurements over time (ability to maintain repeatability and linearity)
- **Quality**: the accuracy of combined output data from multiple devices in a measurement system

**PRODUCT CHARACTERISTICS**

The characteristics of your product determine the kind of measurement technology you need for accurate measurement. Some common product characteristics include:

- **Viscosity range**
- **API gravity range**
- **Density**
- **Recoverable water range**
- **Temperature and pressure**
- **Recoverable plus-range**
- **Type and amount of contaminants and deposits**

When a complete range of products, FMC Technologies has the right solution for your application needs. We suggest the right fit based on our consultation with you.

Cardiac meters have a very wide turndown (ratio range) and, unlike volume, rail hold is not altered by changing process conditions such as temperature, pressure and viscosity. Cardiac meters also offer high accuracy, arcuate directional flow. Coriolis meters have the ability to measure several process variables at the same time. Mass flow, density and temperature are the primary variables that can be used to derive other values such as volume flow, total energy, concentrations and complex density functions.

Turbine meters are offered in several applications and After-Run construction for long service life. High accuracy in the lower and medium viscosity range. Fast response to media input and low maintenance in close service applications for maximum cost-effectiveness.

Electromagnetic flow meters measure the volume flow rate of electrically conductive fluids (greater than 1 µS/cm) with or without solids. These measuring devices offer cost-effective flow measurement with a high degree of accuracy for a wide range of process conditions. The level and density sensing sensors have no pressure loss and are not sensitive to vibrations.

Flow computers are designed to monitor continuous or batch flow operations for liquid or gas. Microprocessor-based units, such as the inlet MicroFlow™ microcomputer, can be operated either stand-alone or as part of a supervisory control and data acquisition (SCADA) system.

<table>
<thead>
<tr>
<th>Smith Meter® F4 PD Meter</th>
<th>Proline® Promass Coriolis Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith Meter® F8 PD Meter</td>
<td>Proline® Provas Coriolis Meters</td>
</tr>
</tbody>
</table>

**Training**

We understand the daunting task of finding and retaining well-trained and experienced staff. With our years of experience and applied that to training schools that are staffed by experienced and trained instructors that they are trained to train the person responsible and supported. We offer training according to your needs – including free training at FMC Technologies’ training measurement workshops workshops.

**Support and Service**

Customer Support and Services

FMC Technologies’ direct offices are located near your operations, installation, commissioning and troubleshooting. 24/7, 365 days a year, assisting you over the phone with on-site service and support. We have the hands-on experience and support needed. We offer a variety of service options and solutions.

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When selecting a meter technology, the following criteria should be considered:

**MEASUREMENT, DATA AND ACCURACY**

The kind of metering system and technology you need depends on the type of measurement you need to perform and the kind of data you wish to collect. From custody transfer to the monitoring of the efficiency of critical processes to the measurement of product composition – including density, viscosity or BS&W – your applications require unique data output and accuracy goals for that data. The following are the ways the accuracy of metering products is measured:

- **Repeatability:** accuracy of measurements for a given flow rate
- **Uniformity:** accuracy of measurements over a range of flow rates
- **Stability:** accuracy of measurements over time (to maintain repeatability and linearity)
- **Quality:** the accuracy of combined output data from multiple devices in a measurement system

**PRODUCT CHARACTERISTICS**

The characteristics of your product determine the kind of measurement technology you need for accurate measurement. Some common product characteristics include:

- **Wetted range**
- **Air gap range**
- **Density**
- **Recess water range**
- **Temperature and pressure**
- **Precise parallel range**
- **Type and amount of contaminants and deposits**

With a complete range of products, FMC Technologies has the right solution for your application needs. We suggest the right fit based on our consultation with you.

**SUPPORT**

Your instrumentation is vital to the safe operation of your processes and the quality of the products you produce. FMC Technologies customer support engineers are ready to provide you with support 24/7, 365 days a year, adding you over the phone with our state-of-the-art installation, commissioning and troubleshooting.

FMC Technologies’ direct offices are located near your operations, with local inventory and measurement experts for quick responses to service needs, helping your operations up and profitable.

Stock is available for many of our products. More than 80 percent of all FMC Technologies’ instrumentation shipped to our U.S. customers is built in the U.S., offering you maximum flexibility in shipping options and schedules.

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**Training**

We understand the daunting task of finding and retaining well-trained staff and the ever-increasing demands for higher productivity. This is why we have taken years of experience and applied it to our training schools so that your employees receive the hands-on experience and support needed. We offer comprehensive expertise ensure that project milestones are met.

**Start-Up Services**

Our certified service technicians provide quick and dependable start-up and commissioning services. Measurements and instrumentation expertise ensure that project milestones are met.

**Service and Support**

Our certified service technicians provide quick and dependable start-up and commissioning services. Measurements and instrumentation expertise ensure that project milestones are met.

**Cardiac meters** have very wide turndown flow range and, unlike valve, don’t move is not affected by changing process conditions such as temperature, pressure and viscosity. Besides offering high accuracy, cardiac and direction-flow, cardiac meters have the ability to measure several process variables at the same time. Mass flow, density and temperature are the primary variables that can be used to derive other values such as volume flow, dollars per unit and complex density functions.

**Turbine meters** are offered in several options to suit specific construction for long service life. High accuracy, in the lower and medium viscosity range. FMC Technologies has several styles that offer rugged construction for long service life, high accuracy, in the lower and medium viscosity range. High accuracy, in the lower and medium viscosity range. High accuracy, in the lower and medium viscosity range. High accuracy, in the lower and medium viscosity range. High accuracy, in the lower and medium viscosity range. High accuracy, in the lower and medium viscosity range. High accuracy, in the lower and medium viscosity range.
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- First, you must decide if you need to measure continuous overall level, point level or interface level. Is it a separator or tank? Is the application? The experts at FMC Technologies can help guide you through.

- Next, there are several process parameters to consider: Is your application? The experts at FMC Technologies can help guide you through.

- We would need to consider the density range, pressure and temperature, as well as factors like viscosity, conductivity and dielectric constant. We would also need to consider your accuracy needs. Finally, the installation requirements. Your process lines, connections, tank height, mechanical fixtures in tank and so on must also be taken into consideration.

With this information, we help find the best fit technology tailored to your specific needs.
PRESSURE MEASUREMENT SELECTION
When measuring pressure, we first need to determine whether you need to measure gauge pressure, absolute pressure, differential pressure or hydrostatic pressure. No single instrument is suited for all applications areas – we find the right one for your application. If you have corrosive or abrasive materials in your process, this could be a good fit for our ceramic cell that we offer for pressure transmitters. If you have high temperatures or pressures in your process, we offer metal cells, with or without diaphragm seals, which are ideal under these extreme conditions.

TEMPERATURE MEASUREMENT SELECTION
While temperature measurement may seem like a simple measurement, there are still several things to consider. Will you want or need a transmitter for your application? Field transmitter, head mounted or DIN rail? There are many mechanical variations, to fit your tank or process perfectly, available from FMC Technologies and our preferred suppliers, even for extreme conditions. Will you measure with thermocouples or RTDs? Our products are designed with your specific application in mind.

ANALYSIS MEASUREMENT SELECTION
We offer a complete line of analytical systems that measure a variety of parameters:
» pH
» ORP
» Conductivity
» Chlorine
» Dissolved oxygen
» Turbidity
» Chemical analysis (iron, hardness, nitrates, phosphates, ammonium, aluminum, chromate, copper, hydrazine, manganese and silicate)
WORLD-CLASS TEST CENTER GUARANTEES OPTIMUM PERFORMANCE VERIFICATION

FMC Technologies’ hydrocarbon flow research and test facilities, located in Erie, Pennsylvania, is an ISO 17025:2005-accredited lab capable of testing meters against the industry’s widest range of fluid flow conditions, from laminar to turbulent flow on hydrocarbon fluids. FMC Technologies’ meters can measure a wide range of viscosities, the accuracy of which is proven in our testing facilities. Our experienced technicians perform dynamic testing of flow rates to 6,670 m³/h (42,000 bph) and viscosities to 250 cSt – the most wide-ranging test capabilities in the world. The FMC Technologies Flow Research and Test Center is the only petroleum test laboratory that can ensure true calibration over a dynamic Reynolds Number range of 100 to 1,000,000.

FMC Technologies Flow Research and Test Center is accredited through NVLAP Lab Code 200939-0.