

FMC Technologies



Measurement Products and Systems
for the Oil and Gas Industry

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FMC Technologies delivers technical superiority with a complete range of liquid and gas custody transfer solutions. As a world leader in flow measurement and control products since 1926, FMC Technologies Measurement Solutions provides the broadest range of solutions complemented by global engineering, project management expertise and after-sales support for all segments of the oil and gas industry.

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Moving Forward

FMC Technologies is a market leader in the design, manufacture and supply of measurement products and systems for the oil and gas industry worldwide. From the wellhead to the final consumer, FMC Technologies equipment can be found at each stage of the production, processing and delivery chain for both liquid and gas petroleum products.

Since 1926

our commitment to accurate and reliable
measurement solutions
continues to drive our customers' success

FMC Technologies Measurement Solutions traces its heritage to 1926 when Erie Meter Systems introduced the world's first electric service station gasoline dispenser. When the company was bought by A.O. Smith, this measurement expertise formed the foundation to such technology innovations as the Positive Displacement meter, and later, the turbine meter. Both products are known throughout the oil and gas industry as the global standards for custody transfer measurement.

In 1963, Smith Meter Systems built its first skid-mounted integrated metering station; now there are more than 2,000 installations in over 100 countries. Today, FMC Technologies Measurement Solutions offerings include liquid custody transfer metering products, tank truck metering packages, flow computers, as well as complete gas and liquid metering systems.

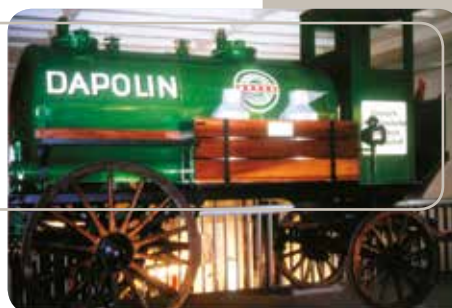
FMC Technologies' commitment to quality is unrelenting. Its products deliver accurate performance in some of the world's most harsh environments. To ensure high-quality standards and prompt delivery, all supply phases of Measurement Solutions' products and packaged systems are controlled by a comprehensive quality program. The program meets ISO 9001-2008 compliance requirements for design, service and manufacture of measuring systems and products used throughout the petroleum and gas energy sectors.

Through continued focus on the development and delivery of cost-effective products and systems, FMC Technologies is meeting customers' needs for integrated measurement solutions on a global basis.



The technology of the petroleum industry has changed since its early origins in 1859 at the Drake Well in NW Pennsylvania.

German-American Petroleum Corporation tank truck incorporating a Sening double-control metering device, circa 1910.



A man with grey hair and glasses, wearing a blue work shirt, is focused on working on a metal component in a factory setting. He is using a tool to adjust or inspect the part. The background is slightly blurred, showing industrial equipment and structures.

Served Markets

FMC Technologies Measurement Solutions engineers systems and manufactures products the oil and gas industry relies on to ensure processes operate efficiently while reducing operational costs and minimizing the risk associated with custody transfer. Through FMC Technologies' comprehensive understanding of the industry and its relentless obsession with performance, FMC develops innovative, real-world solutions helping its customers overcome even the most daunting challenges.

FMC Technologies Measurement Solutions is a trusted partner that provides experience and technical know-how to identify the right product or system solution to solve any application challenge.

served markets

Crude Oil and Gas Production

As global energy demand continues to increase, the quest for new oil and gas discoveries will lead energy companies to greater depths and harsher environments with an ever-increasing emphasis on measurement equipment reliability and accuracy.

FMC Technologies' heritage dates back to the roots of oil and gas production. The company has pioneered virtually every significant advancement for measurement applications both at the wellhead and on the platform. Rapidly evolving production techniques have resulted in new and varied demands for measurement, reliability and accuracy; FMC Technologies has an unparalleled array of measurement solutions and can offer the right solution for any unique application found in oil and gas production.

Offshore

Offshore production of oil and gas is perhaps the most arduous and hazardous operating environment, demanding solutions that reliably meet high-volume and high-risk requirements. Since measurement products and systems must account for virtually every measurement variable, FMC Technologies is the ideal choice for unattended measurement applications with its broad range of trusted measurement technologies. Applications include:

- Crude oil
 - Wellhead
 - Gas-oil separation
 - Storage and transportation
- Gas recovery
 - Gas treatment
 - Storage and transportation

Onshore

FMC Technologies continues to develop measurement solutions that reliably perform in the harshest onshore landscapes. The potentially harmful effects of entrained

CRUDE OIL AND GAS PRODUCTION

Key Products	Page
Smith Meter® Positive Displacement Meters	18
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Smith Meter® microFlow.net™ Liquid	27
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Smith Meter® microFlow.net™ Gas	39
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Fmc2™ Flow Management Computers	49

gases, sediment, water and chemicals are all factors that must be effectively mitigated through proper operations and processes. Positive Displacement meters, turbine meters, gas and liquid ultrasonic flowmeters and advanced control systems allow measurement applications to run remotely and reliably across a wide range of application requirements. Applications include:

- Wellhead
- Flowline gas-oil separation
- Gathering line storage



served markets

Crude Oil and Gas Transportation

With the promise of new and greater oil and gas reserves pushing exploration and production to the farthest corners of the earth, reliable transportation and accurate measurement of petroleum products are increasingly critical.

FMC Technologies Measurement Solutions is the recognized leader in designing innovative and accurate measurement solutions for oil and gas transportation. Through its highly regarded Smith Meter® and Kongsberg heritage brands, FMC Technologies offers a complete range of liquid and gas metering products and systems for:

- FPSO
- Pipeline
- Gas transmission
- Gas processing
- Underground storage
- Gas distribution



CRUDE OIL AND GAS TRANSPORTATION

Key Products	Page
Smith Meter® Positive Displacement Meters	18
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Smith Meter® Ultra™ Series Ultrasonic Flowmeters	21
Smith Meter® microFlow.net™ Liquid	27
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With more than a century of experience dealing with petroleum product transport and delivery issues, FMC Technologies has an expert understanding of the best measurement practices, application know-how and product knowledge to meet the pressing challenges of transporting crude oil and gas. Since transporting petroleum products are affected by a myriad of variables including: temperature, viscosity, vapor pressure, entrained gases and contaminants, reliable and versatile measurement solutions are required. FMC Technologies' broad product range and highly experienced engineers ensure proper selection and sizing of meters for each application.

served markets

Petroleum Refining

Perhaps no other aspect of petroleum-related products entails the diversity of measurement applications as that found in petroleum refining. Oil companies continue to innovate to meet the demands for “boutique” fuels while maximizing output.

High temperatures and pressures characterize the operating environment for refining-process equipment, and the need for robust, reliable solutions extends to the equipment used to measure its products. FMC Technologies is recognized for accurate and versatile measurement solutions that span the measurement needs of the oil refinery. Whether handling heavier fractions, lighter liquid elements, automotive- or aviation-grade fuels, waxes or lubricants, the right selection of products can be found in the FMC family of solutions. Flowmeters from FMC Technologies exist in virtually every refining application where accurate measurement is required:

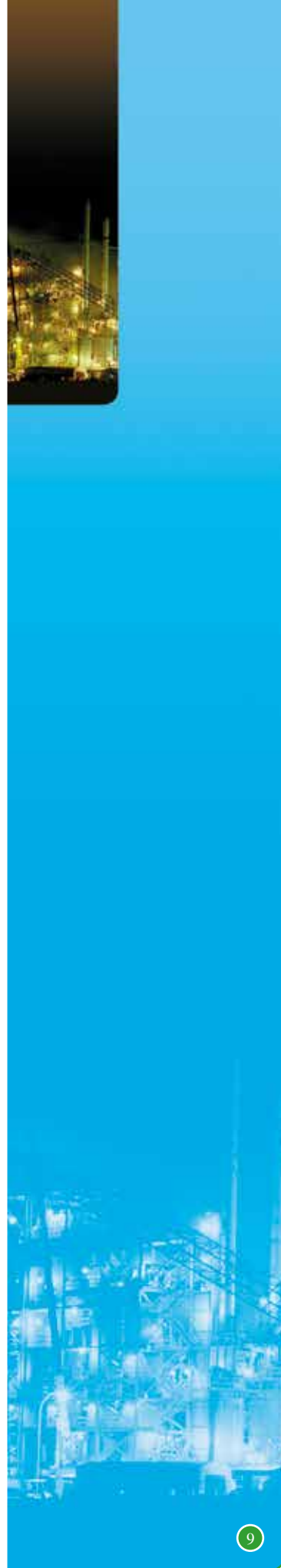
- Process control
- Storage
- Transfer to marketing terminal
- Truck and railcar loading

Large refineries may have dozens of hydrocarbon blending streams for the complex processes that produce today’s refined products; such process stream and application variables require accurate measurement solutions under a broad range of scenarios. FMC Technologies combines a deep understanding of measurement principles, applications know-how and

PETROLEUM REFINING

Key Products	Page
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Coriolis Meters	22
Smith Meter® AccuLoad® III Controller	23
Smith Meter® microFlow.net™ Liquid	27
Smith Meter® 200 Series Control Valves	29
Marketing Terminal Systems	31

product portfolio diversity necessary to meet complex measurement needs in petroleum blending, including newer requirements involving renewable fuels such as ethanol.



served markets

Refined-Product Transportation

Given their numerous types and widely varying characteristics, the task of safely transporting and accurately measuring refined petroleum products is no simple matter. Many factors impact measurement accuracy including, temperature, viscosity, density, vapor pressure and contaminants.



REFINED-PRODUCT TRANSPORTATION

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Smith Meter® Positive Displacement Meters	18
Smith Meter® Sentry Series Turbine Meters	19
Smith Meter® MV Series Turbine Meters	20
Smith Meter® Ultra™ Series Ultrasonic Flowmeters	21
Smith Meter® microFlow.net™ Liquid	27
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Fmc2™ Flow Management Computers	49

Through its extensive product lines, including its highly esteemed Smith Meter® and Sening® heritage brands, FMC Technologies sets the standard for petroleum supply chain management. FMC Technologies' accurate and reliable measurement solutions make the daily routine of petroleum product transportation and delivery faster, safer and more economical. Whether transporting automotive or aviation-grade fuels, distillates or LPGs, FMC has the array of products and depth of applications expertise to meet these diverse measurement requirements:

- Tank trucks
- Railcars
- Pipeline
- Marine

served markets

Petroleum Marketing, Distribution

Petroleum marketing terminal operators strive for maximum efficiency and throughput. To accomplish this, they depend on the most cost-effective loading equipment with unsurpassed accuracy, precision and safety. Equipment must be engineered for continuous trouble-free performance under severe operating conditions with predictable maintenance and minimal downtime; and, it must satisfy all legal accuracy requirements.

Proper system design is essential for accurate loading and unloading of straight and blended refined products at the marketing terminal. FMC Technologies' high-quality Smith Meter® and Sening® products and systems provide the ultimate metering solutions for terminal operations of all liquid products, including:

- Loading, unloading and batching for trucks, railcars and ships
- Blending capabilities and additive control
- Aircraft fueling operations
- Biofuels terminals

From individual product components to complete skid-mounted load rack packages, FMC Technologies provides the power, flexibility and configurability for today's highly efficient and regulated terminals.

PETROLEUM MARKETING AND DISTRIBUTION

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Sening® NoMix Cross Over Prevention System	35
Sening® MultiSeal Sealed Parcel Delivery System	35
Sening® MultiLevel Level Gauging System	35



Served Markets

Typical Market Applications



See next page for illustration's legend.



1 OFFSHORE PRODUCTION PLATFORM

Complete Measurement System
PD Meters
Sentry and MV Series Turbine Meters
Liquid Ultrasonic Flowmeters
Gas Ultrasonic Flowmeters
Fmc²™ Flow Computers

2 LIGHTERING PLATFORM

Complete Measurement System
PD Meters
Sentry and MV Series Turbine Meters
Liquid Ultrasonic Flowmeters
Fmc²™ Flow Computers

3 FPSO

Complete Measurement System
Gas Ultrasonic Flowmeters
Liquid Ultrasonic Flowmeters
PD Meters
Sentry and MV Series Turbine Meters
Fmc²™ Flow Computers

4 LNG LOADING/UNLOADING TERMINAL

Complete Measurement System
Gas Ultrasonic Flowmeters
microFlow.net™ and Fmc²™ Flow Computers
Coriolis Meters
AccuLoad® III Controller

5 TANKER LOADING TERMINAL

Complete Measurement System
PD Meters
MV and Sentry Series Turbine Meters
Liquid Ultrasonic Flowmeters
Strainers and Air Eliminators
microFlow.net™ and Fmc²™ Flow Computers
microLoad.net™

6 HUB TERMINAL

Complete Measurement System
PD Meters
MV and Sentry Series Turbine Meters
Liquid Ultrasonic Flowmeters
Coriolis Meters
Strainers and Air Eliminators
microFlow.net™ and Fmc²™ Flow Computers
AccuLoad® III Controller
microLoad.net™

7 AVIATION LOADING

Complete Measurement System
Aviation Non-Ferrous PD Meters
Truck Meter Packages
microLoad.net™
AccuLoad® III Controller

8 CITY GATE (NATURAL GAS)

Gas Ultrasonic Flowmeters
Fmc²™ Flow Computers
microFlow.net™ Gas

9 TANK TRUCK HOME DELIVERY

Truck Meter Packages
MultiFlow Electronic Meter Head
Product Return Systems
ADD Additive Injection Systems
MultiControl Remote Control
Bottom Loading Systems (APIs, footvalves and vapor recovery)
Beta or Delta Pumps

10 SERVICE STATION

Truck Meter Packages
MultiFlow Electronic Meter Head
Bottom Loading Systems (APIs, footvalves and vapor recovery)
MultiSeal Sealed Parcel Delivery System
NoMix Cross Over Prevention System
MultiLevel
Product Return Systems
Beta or Delta Pumps
EMIS Communication Interface

11 MARKETING TERMINAL

Complete Measurement System (skid based)
PD Meters
PRIME 4 PD Meter
GL Series Turbine Meters
Coriolis Meters
AccuLoad® III Controller and microLoad.net™
Set Stop Valves
Strainers and Air Eliminators Card Reader
Sening® Bottom Loading Systems (APIs, footvalves and vapor recovery)
Sening® NoMix Cross Over Prevention System

12 CRUDE OIL AND GAS PRODUCTION

PD Meters
Coriolis Meters
Turbine Meters
Automatic Temperature Compensators, Strainers and Air Eliminators
Fmc²™ Flow Computers

13 CRUDE TRANSPORTATION PIPELINE

Complete Measurement System and Prover
PD Meters
MV Series Turbine Meters
Sentry Series Turbine Meters
Liquid Ultrasonic Flowmeters
Strainers and Air Eliminators
microFlow.net™ and Fmc²™ Flow Computers

14 REFINED PRODUCTS PIPELINE

Complete Measurement System and Prover
PD Meters
MV Series Turbine Meters
Sentry Series Turbine Meters
Liquid Ultrasonic Flowmeters
Strainers and Air Eliminators
microFlow.net™ and Fmc²™ Flow Computers

15 GAS UNDERGROUND STORAGE

Complete Measurement System
Gas Ultrasonic Flowmeters
Fmc²™ Flow Computers

16 GAS PIPELINE

Complete Measurement System
Gas Ultrasonic Flowmeters
Fmc²™ Flow Computers

17 BULK TEST SEPARATION UNIT

Coriolis Meters
PD Meters
Turbine Meters

18 NATURAL GAS PRODUCTION

Gas Ultrasonic Flowmeters
Fmc²™ Flow Computers

19 GAS COMPRESSION

Gas Ultrasonic Flowmeters
Fmc²™ Flow Computers

20 LACT

Complete Measurement System and Provers
MV Series Turbine Meters
PD Meters
Coriolis Meters
Strainers and Air Eliminators
microFlow.net™

21 TEST SEPARATOR

Coriolis Meters
PD Meters
Turbine Meters

22 LIQUID CRUDE REFINERY

Complete Measurement System (skid based)
PD Meters
Turbine Meters
Coriolis Meters
Control Valves
microFlow.net™ and Fmc²™ Flow Computers

23 GAS REFINERY/PROCESSING PLANT

Complete Measurement System
Gas Ultrasonic Flowmeters
Fmc²™ Flow Computers

24 BULK PLANT/TERMINAL ENTRY

Card Reader

25 LPG LOADING

Complete Measurement System (skid based)
PD Meters
GL Series Turbine Meters
Coriolis Meters
PRIME 4 PD Meter
AccuLoad® III Controller and microLoad.net™
Set Stop Valves
Condensing Tanks and Strainers

26 BIOFUEL FUEL UNLOADING

Complete Measurement System (skid based)
PD Meters
GL Series Turbine Meters
Coriolis Meters
PRIME 4 PD Meters
AccuLoad® III Controller and microLoad.net™
Set Stop Valves
Strainers and Air Eliminators
Sening® Bottom Loading Systems (APIs, footvalves and vapor recovery)
Sening® NoMix Cross Over Prevention System

27 LUBE OIL PACKAGING

Complete Measurement System (skid based)
PD Meters
GL Series Turbine Meters
Coriolis Meters
PRIME 4 PD Meter
AccuLoad® III Controller and microLoad.net™
Set Stop Valves
Strainers and Air Eliminators

28 BARGE/TANKER FUELING/OFFLOADING TERMINAL

Complete Measurement System and Prover
PD Meters
MV Series Turbine Meters
Sentry Series Turbine Meters
Strainers and Air Eliminators
microFlow.net™ and Fmc²™ Flow Computers

29 RAILCAR LOADING

Complete Measurement System (skid based)
PD Meters
Turbine Meters
Coriolis Meters
AccuLoad® III Controller and microLoad.net™
Strainers and Air Eliminators
Set Stop Valves

PRODUCT APPLICATION GUIDE

MARKET						
Product/System		Crude Oil and Production	Crude Oil and Gas Transportation	Petroleum Refining	Refined Product	Petroleum Marketing and Distribution
SYSTEMS						
Liquid Measurement Systems		X	X	X	X	X
Gas Measurement Systems		X	X			
Floating Production Storage and Off-Loading Systems		X	X		X	
Liquid Control Systems		X	X		X	
Gas Control Systems		X	X			
LIQUID						
Meters	Smith Meter® Positive Displacement Meters	X	X	X	X	X
	Smith Meter® Sentry Series Turbine Meters			X	X	X
	Smith Meter® Guardsman Series Turbine Meters			X	X	X
	Smith Meter® Guardsman L Series Turbine Meters					X
	Smith Meter® MV Turbine Meters	X	X	X	X	X
	Turbine Meter Accessories	X	X	X	X	X
	Coriolis Meters	X	X	X	X	X
	Smith Meter® Ultra™ Series C Ultrasonic Flowmeters	X	X	X	X	
Truck Meter Packages	Sening® MultiSeal Sealed Parcel Delivery System					X
	Sening® NoMix Cross Over Prevention and Hose Supervision System					X
	Sening® MutiLevel Level Gauging System					X
	Sening® MultiFlow Truck Flow Computer					X
	Sening® MultiControl Remote Control and Overfill Protection Amplifier					X
	Sening® and Smith Meter® Truck Meter Packages					X
Line Accessories	Sening Bottom Loading Equipment					X
	Smith Meter® 200 Series Control Valves	X	X	X	X	X
	Smith Meter® Strainers, Air Purgers, Air Eliminators and Deaerators	X	X	X	X	X
Flow Computers and Electronics	Meter Provers and Pipeline Spheres	X	X		X	X
	Smith Meter® AccuLoad® III Controller					X
	Smith Meter® microLoad.net™					X
	Smith Meter® microFlow.net™ Liquid Flow Computer	X	X		X	
	Fmc ² ™ Flow Management Computer		X		X	
	Smith Meter® Proximity Card Reader					X
GAS						
MPU™ Series Ultrasonic Flowmeters (200, 600, 800 and 1200)		X	X			
Smith Meter® microFlow.net™ Gas Flow Computer		X	X			
Fmc ² ™ Flow Management Computer		X	X		X	



Liquid Products

FMC Technologies has the right solution for all petroleum liquids, custody transfer and control applications. Working in partnership with its customers, FMC Technologies assists with application know-how, as well as process and system design expertise through equipment specification, installation and start-up. Regardless of the application, FMC Technologies provides proven products with highly reliable and repeatable accuracy. In addition, FMC Technologies finds solutions for those unique special-purpose applications through its innovative, industry-leading measurement technologies.

Products utilized in liquid measurement

The Right Solution for Your Liquid Measurement Application

Superior design, a wide range of proprietary technologies and unsurpassed knowledge of liquid petroleum custody transfer and control set FMC Technologies Measurement Solutions' liquid measurement equipment apart from that of all competitors. From supply of individual meters and accessories to supply of complex, automated fully integrated measurement and product analysis systems, FMC Technologies offers technically superior liquid measurement products:

- **Metering Products**

- Smith Meter® Positive Displacement Meters
- Smith Meter® Guardsman, MVTM and Sentry Turbine Meters
- Smith Meter® Ultra™ Series Ultrasonic Flowmeters
- Coriolis Meters
- Smith Meter® and Sening® Tank Truck Meter Products and Packages

- **Automation and Controls**

- Smith Meter® AccuLoad®
- Smith Meter® microLoad.net™
- Smith Meter® microFlow.net™
- Fmc²™ Flow Management Computer
- SuperVisor Supervisory Computer

- **Line Accessories**

- Control Valves
- Strainers
- Air Eliminators
- Deaerators
- Air Purging Systems



- **Provers and Related Equipment**

- Bidirectional
- Unidirectional
- Spheres and Accessories
- Master Meters
- Proving Tank

- **Skid-Based Measurement Systems**

- Loading
- Unloading
- Blending

- **Sensors**

- Temperature
- Pressure
- Density

liquid metering products

Smith Meter® Positive Displacement

The Standard for Measurement Accuracy

The Smith Meter® Positive Displacement meter is the centerpiece of FMC Technologies Measurement Solutions' vast liquid measurement product line, performing with unsurpassed accuracy and durability. Boasting high measurement stability and a low pressure drop, Smith Meter PD meters offer unmatched service life and ease of maintenance. From petroleum production to marketing to transportation, Measurement Solutions is the most trusted supplier of accurate and reliable Positive Displacement metering equipment.

Applications

- Petroleum production
- Pipeline custody transfer
- Leak detection
- Loading and unloading
- Bulk plants
- Inventory control
- Batch control
- Blending

Benefits

- Superior accuracy and measurement stability
- Low pressure drop
- Low operating cost
- Long service life



DOUBLE CASE METERS

Model	Size Inches (mm)	Max. Flow Rate ⁺ GPM (L/min)
C2	2 (50)	150 (570)
E3	3 (75)	500 (1,900)
E4	4 (100)	600 (2,250)
F4	4 (100)	725 (2,750)
G6	6 (150)	1,200 (4,600)
BPH m³/h		
H8	8 (200)	2,285 (365)
JA10	10 (250)	3,500 (550)
JB10	10 (250)	4,700 (740)
K12	12 (300)	7,200 (1,140)
M16	16 (400)	12,500 (2,000)

⁺ Maximum flow rate on intermittent or continuous service. See product specification for exact flow rate.

Steel Double Case Meters

Smith Meter double case Positive Displacement meters, the most accurate meters for volume measurement, utilize a direct-flow measurement principle that is virtually unaffected by variations in velocity and viscosity. Furthermore, they are engineered to operate with low pressure drop and low slippage for superior accuracy and stability.

Single Case Meters

Smith Meter single case Positive Displacement meters have been the choice for terminal and bulk plant operators since 1926. The unique rotary vane design provides unmatched accuracy, long-term measurement stability and years of maintenance-free performance. The streamlined nozzle design minimizes pressure drop, thereby reducing slippage and maximizing accuracy.



SINGLE CASE METERS

Model	Size Inches (mm)	Max. Flow Rate ⁺ GPM (L/min)
ST40	2 (50)	105 (400)
SC-13	2 (50)	150 (570)
GSC-2	2 (50)	150 (570)
ST75	3 (75)	265 (1,000)
SD-30/SD3	3 (75)	400 (1,500)
ST160	3 (75)	420 (1,600)
GSC-3	3 (75)	500 (1,900)
SF-60/VF60	4 (100)	725 (2,750)
PRIME 4	4 (100)	900 (3,400)

⁺ Maximum flow rate on intermittent or continuous service. See product specification for flow rate.

liquid metering products

Conventional and Helical Turbine Meters

Conventional Turbine Meters

For pipelines, terminal load racks and crude oil service, the Smith Meter® turbine meter line provides the optimum solution.

Applications

- Crude oil and refined product pipelines
- Loading rack service
- Ship loading and unloading
- Inventory control
- Volume balance
- Leak detection

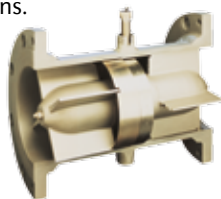
Benefits

- Rugged construction for long service life
- High accuracy over a wide viscosity range
- High-resolution pulse output
- Low maintenance for maximum cost-effectiveness
- Field-proven stability

Smith Meter® Sentry Series Turbine Meters

Designed for high accuracy in large crude oil and refined product pipelines and high flow rate applications.

These meters are rugged and feature a durable rimmed rotor and high-resolution pulse outputs.



SENTRY SERIES*	
Size Inches (mm)	Max. Flow Rate BPH (m³/h)
4 (100)	1,500 (240)
LF6	2,500 (400)
6 (150)	4,000 (635)
8 (200)	7,500 (1,195)
10 (250)	12,000 (1,910)
12 (300)	18,000 (2,860)
16 (400)	27,000 (4,295)
18 (450)	35,000 (5,565)
20 (500)	42,000 (6,680)

* Available with Class 150, 300, 600 and 900 ANSI flanges.

Smith Meter® Guardsman Series Turbine Meters

Specifically designed for smaller pipelines where repeatability is required, the Guardsman ensures accurate measurement of low-lubricity fluids ranging from natural gas liquids to light fuel oils.



GUARDSMAN SERIES*	
Size Inches	Max. Flow Rate BPH (m³/h)
1.5	200 (32)
2	400 (64)
LF3	600 (96)
3	930 (148)
4	1,700 (270)

* Available with Class 150, 300, 600 and 900 ANSI flanges.

Smith Meter® Guardsman L Series Turbine Meters

Engineered to precisely measure LPG, kerosene, ethanol or light fuel oils, Guardsman L meters provide the versatility of either horizontal or vertical installation for truck loading service.



GUARDSMAN L SERIES*	
Size Inches (mm)	Max. Flow Rate GPM (L/min)
1 (25)	80 (300)
1.5 (38)	130 (500)
2 (50)	250 (950)
3 (75)	700 (2,650)
4 (100)	1,200 (4,500)

* Available with Class 150 and 300 ANSI flanges.

(Continued on next page)

liquid metering products

Conventional and Helical Turbine Meters



Smith Meter® MV Series Helical Turbine Meters

With low pressure drop and a rugged bearing system, the MV Series is the preferred turbine meter for crude oil applications.



The unique helical rotor design of the Smith Meter MV Series Turbine Meters minimizes the effect of changes in viscosity for increased accuracy and repeatability. The sturdy rotor and mounting system are virtually immune to shock and pressure surges, translating into reduced maintenance requirements and long service life.

Applications

- Pipeline terminals
- LACT skids
- Marine terminals – loading/offloading
- Floating storage and offloading vessels (FSOs and FPSOs)
- Line balance
- Inventory control

Benefits

- Superior multi-viscosity test stand capabilities provide accuracy and performance verification
- Exclusive UPC Compensator delivers the highest accuracy over the widest flow and viscosity range
- Low pressure drop significantly reduces operating costs
- Rugged bearing system yields maximum reliability

MV SERIES TURBINE METERS*

Size Inches (mm)	Flow Range ⁺ BPH (m ³ /h)	Flange to Flange Inches (mm)
3 (75)	90-900 (14-140)	10.0 (254)
4 (100)	190-1,900 (30-300)	12.0 (305)
6 (150)	400-4,000 (64-640)	14.0 (356)
8 (200)	750-7,500 (119-1,190)	16.0 (406)
10 (250)	1,250-12,500 (199-1,990)	20.0 (508)
12 (300)	1,900-19,000 (302-3,020)	24.0 (610)
16 (400)	2,700-27,000 (429-4,290)	32.0 (813)

* Available with Class 150, 300 and 600 ASME flanges. Other types of end connection and flange ratings are available.

+ Minimum and maximum values indicated.

Available Turbine Meter Accessories

- Flow-straightening assemblies, sections and inserts
 - Conventional flow conditioners
 - High-performance flow conditioners
 - Strate plate
- Totalizer/rate meter
 - Model MMRT
 - Invalco 505 flow computer
- Preamplifiers
 - PA-6 preamplifier
 - AccuLert ID 2000 smart diagnostic pre-amp
- UPC compensators
- Presets
 - AccuLoad® III controller
 - microLoad.net™
- Flow computers
 - microFlow.net™ liquid
 - Fmc2™

liquid metering products

Liquid Ultrasonic Flowmeters Smith Meter® Ultra™ Series C

The Ultra Series meters utilize ultrasonic transit time detection to provide the highly accurate volumetric fluid flow measurement. With no moving parts, the non-intrusive design requires little maintenance while offering a wide dynamic flow range, wide viscosity application range and low pressure loss.



The **Smith Meter Ultra 8c Liquid Flowmeter** is an eight path ultrasonic flowmeter for the custody transfer of petroleum products. Eight measurement paths provide the most robust fluid profile diagnostic capability and the intrinsic cancellation of swirl on all paths for extremely accurate measurement and flexible installation options.

The **Smith Meter Ultra 6c Liquid Flowmeter** is a six path ultrasonic flowmeter for custody transfer flow measurement and a wide dynamic range applications. The path configuration provides for flow profile diagnostics and swirl cancellation capability using six measurement paths.

Both the Ultra 6c and 8c are compliant with the custody transfer standards of API MPMS Chapter 5.8 and OIML R-117-1.

Accuracy

- $\pm 0.12\%$ linearity over a 15:1 turndown with the Ultra 8c
- $\pm 0.15\%$ linearity over 10:1 turndown for the Ultra 6c

Service

- Heavy, high viscosity crude oil or other hydrocarbon liquids
- Floating storage and offloading vessels (FSOs and FPSOs)
- Pipelines
- Loading and unloading terminals
- Leak detection

Benefits

- Custody transfer accuracy with high-speed processing for excellent repeatability over a wide range of operating conditions including laminar, transition and turbulent flow regimes.
- Low pressure drop, full pipe bore installations with no flow conditioning required

The **Smith Meter Ultra 4c Liquid Flowmeter** is a four path ultrasonic flowmeter for accurate custody transfer and non-custody transfer applications such as allocation, inventory control and leak detection. The planar path configuration optimizes accuracy and minimized the effects of swirl in a four path meter configuration.

Accuracy

- $\pm 0.15\%$ linearity over 10:1 turndown ratio

Service

- Crude oils and refined products
- Line balance
- Inventory control
- Allocation
- Leak detection

Benefits

- High accuracy measurement lighter products or where the Reynolds number is greater than 10,000
- Low pressure drop, low maintenance with standard installation requirements



liquid metering products

Mass Flow and Density Coriolis Meters

Proline® Promass Coriolis Meters

High accuracy, low pressure drop and diverse interface capabilities make the Proline Promass Coriolis mass flow and density meters the perfect solution for many petroleum metering applications. From wellhead to refined-product distribution, any measurement requirement can be managed with efficiency and precision.

High sensitivity, zero stability and modest overall cost of ownership make Promass the first choice for applications that demand custody transfer accuracy and repeatability.



With a variety of outputs, the Promass can be interfaced to nearly any flow computer or control device. FMC Technologies presets offer additional data communications services to Promass meters, for optimum integration.

Applications

Applications for the petroleum market, from the wellhead to the refinery gate including the production field and crude pipeline include:

- LACT units
- Tank truck gas production
- Crude oil, LPG, asphalt and bitumen used at pipelines and terminals
- Marine terminals loading/unloading
- Railcar loading/unloading
- Floating storage and offloading vessels (FSO and FPSOs)
- Refining
- Terminals and distribution (tank truck loading, locomotive, marine and aircraft refueling)
- Lube plants

- Alternative fuels (ethanol and biodiesel production, distribution, blending and denaturing)



Benefits

- Wide operating ranges
- Increased immunity to common pipeline noise
- Immunity to pipeline loading stress
- Routine re-zeroing of the meters is not necessary
- Compact, self-draining design
- Smart electronics with digital display and interface
- Multivariable-flow, density and temperature measurement
- Temperature changes do not affect zero point stability
- Life cycle cost savings – maintenance free with no moving parts and no wear and tear



liquid metering products

Electronics

AccuLoad® III Controller

When operators select preset solutions for marketing terminals, the overwhelming choice is the Smith Meter® AccuLoad® III family of products. With the latest configurations, including the Split Architecture System and the AccuLoad II-to-III Upgrade package, terminal operators have even more options for maximum load control and flexibility.



AccuLoad III has ethernet and serial communications network compatibility for direct link to Terminal Automation Systems and the Smith Meter Card Reader. Ethernet connectivity complies with TCP/IP standards. Other communication features include modbus protocol, network printing and Promass meter communication.

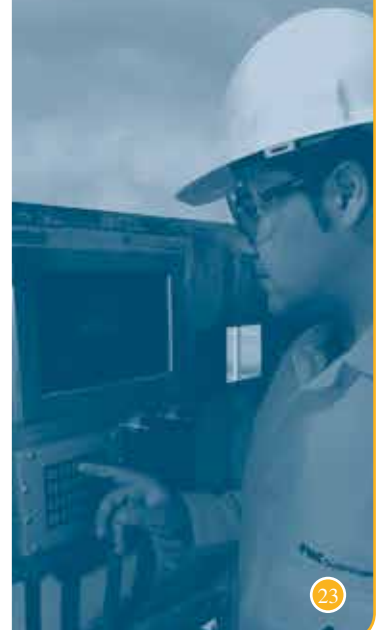
Applications

- Preset loading, unloading and batching for trucks, railcars and ships
- Blending capabilities, management of grounding, overfill and additive control

Smith Meter® AccuLoad® III Controller

The AccuLoad III product line provides the power, flexibility and configurability required for today's highly efficient and regulated terminals. By offering a wide variety of loading arm configurations – mixing blend arms with straight product – AccuLoad III maximizes efficiency and product throughput like never before.

AccuLoad III offers a host of product blending configurations. Up to six products can be blended via either sequential or ratio methods. Enhanced additive controls include piston, standard metered or smart, as well as higher-volume additive with flow control.



(Continued on next page)

liquid metering products

Electronics

AccuLoad® III Controller

AccuLoad® III-S or Q

AccuLoad III with ALX firmware is a micro-processor-based instrument that can be configured to control one to six loading arms, as either a blending or straight product device.



- AccuLoad III-S
 - Up to three single- or dual-pulse product meter inputs
 - Up to 14 additive meter inputs
- AccuLoad III-Q
 - Up to six single- or dual-pulse product meter inputs
 - Up to 24 additive meter inputs

AccuLoad® III-N4

AccuLoad III-N4 is a microprocessor-based instrument that is capable of handling up to two arms and three meters, and is approved for Class I, Division 2, Groups C&D locations.

- One- or two-arm simultaneous operation
- Up to three single- or dual-pulse product meter inputs
- Up to four additive meter inputs with local I/O and up to 24 additive meter inputs with remote I/O

AccuLoad® III-SA

The AccuLoad III Split Architecture System is a multiple-arm, multiple-meter measurement system allowing an entire lane or facility of up to 18 loading arms and 24 meters to be controlled and monitored with one system. Its components include a Man-Machine Interface (MMI) and Flow Control Module (FCM).



- Up to 24 single- or dual-pulse product meter inputs
- Up to 56 additive meter inputs with local I/O and up to 96 additive meter inputs with remote I/O
- Class 1, Division 2, Group C&D approved for general purpose rack mountable enclosure allows control room installation for any AccuLoad configuration

Upgrades

The AccuLoad Upgrade provides AccuLoad I and II users the latest technology with minimal installation costs.

liquid metering products

Electronics microLoad.net™

Smith Meter® microLoad.net™

This dynamic breakthrough for single product loading application, microLoad.net, is a microprocessor-based instrument designed to monitor and control single products in straight loading applications. The units can operate either as a stand-alone instrument or be part of a system where they communicate with an automation or SCADA system.



Applications

- Bulk plants
- Aircraft loading
- Marine terminals
- Processing installations
- Tank farms

The Smith Meter microLoad.net is a preset that is easy to use and configurable to any application.

Efficient System Monitoring and Easy Process Management

- Continuously monitors system-critical functions
- Automatic volume correction for temperature per the API and ISO tables and the expansion coefficients for chemicals

Flexible and Configurable Programming and Reporting

- Communicates with Promass Coriolis meters
- Ethernet and serial network compatible
- Multi-drop communication ports for maximum system expansion
- Smith Meter or modbus protocols for bi-directional communications or TCP/IP
- Boolean and algebraic programmable software for easy customization
- Customizable report formats to fit the needs of the application
- Options for multiple languages, customized messages, and text communication
- Customizable formats for inputs and outputs
- Event log and audit trail

Built for Safety and Reliability

- Multi-level security access
- Explosion-proof housing
- OIML-compliant display offers prolonged visibility during unplanned power outages



liquid metering products

Electronics Gate Entry

Smith Meter® Proximity Card Reader

The Smith Meter Proximity Card Reader offers terminal operators an alternative for maintaining control and security by providing a reliable method of identifying drivers and users by communicating directly with AccuLoad® III or the terminal's automation system.

Configured to operate as either a gate reader or an island reader, the card reader can be supplied in a general-purpose enclosure or in an explosion-proof enclosure that is designed and approved for Class I, Division I, Groups C&D locations. The cards for the reader have also been approved to be used in Class I, Division I, Groups C&D locations and may be the only cards on the market approved for use in this environment.



Smith Meter® GateMate Software

The Smith Meter GateMate is a companion software tool designed to work in conjunction with the Smith Meter Proximity Card Reader. The GateMate software will allow the Smith Meter Proximity Card Reader to work in a stand-alone application. The software can be installed on any PC and requires only a communications line to the Card Reader. GateMate allows a Smith Meter Proximity Card Reader to be installed at the gate (entry or exit) of a load rack and provide authentication for entry accessibility. The software can be configured to manage driver databases, manual opening and closing of the gate, time stamped logs and much more. The software is user friendly; setup takes only a few minutes, and provides the most efficient solution to terminal accessibility needs.

liquid metering products

Flow Computers microFlow.net™ Liquid

Smith Meter® microFlow.net™ Liquid Flow Computer

The Smith Meter microFlow.net Liquid is a flow computer for single product monitoring of continuous flow applications.

Applications

- Pipelines
- Marine terminals



Process Management

- Continuously monitors system-critical functions
- Automatic volume correction for temperature per the API tables and the expansion coefficients for chemicals
- Sampler support
- Batch recalculation based on density and S&W
- Communications with Ultra™ Series ultrasonic flowmeters

Flexible, Configurable Programming and Reporting

- Ethernet and serial network compatible
- Multi-drop communication ports for maximum system expansion
- Smith Meter or modbus protocols for bi-directional communications either through serial port, ethernet or TCP/IP
- Boolean and algebraic programmable software for easy customization
- Customizable report formats to fit the needs of the application
- Options for multiple languages, customized messages, and text communication
- Customizable formats for inputs and outputs
- Event log and audit trail

Built for Safety and Reliability

- Multi-level security access
- Explosion-proof housing
- OIML-compliant display offers prolonged visibility during unplanned power outages



liquid metering products

Line Accessories Control Valves, Strainers and Air Eliminators

Measurement Solutions offers a complete line of valves and line accessories that can be used with Smith Meter® products.

Smith Meter® 200 Series Control Valves

Smith 200 Series control valves feature hydraulically operated, diaphragm-actuated globe valves and high-performance wafer sphere valves. Flow control is accomplished by using fluid line pressure or an external pressure source to actuate the valve.



Set-Stop Valve Packages

- Model 210
 - Sizes: 2" to 6"
 - Diaphragm-globe valve, steel body
 - Digital electrohydraulic
 - Operating pressures up to 285 psig (1965 kPa)
 - Viscosities up to 40 cP
 - For use with electronic preset controllers
- Model 215
 - Wafer-type (3" to 12") or ball type (3" or less), steel body
 - Digital electrohydraulic
 - Externally activated air or hydraulic
 - Operating pressures up to 285 psig (1965 kPa)
 - High-viscosity liquids
 - For use with electronic preset controllers
 - Wide turn-down range
 - Optional hydraulic power unit

Valve Pilots

Valve pilots are available for block valves, flow limiting, pressure limiting, pressure sustaining, pressure relief, pressure reducing and thermal relief valves.

- Compact design and mechanical simplicity
- Low maintenance costs
- In-line serviceability
- No external packing gland

200 SERIES CONTROL VALVES

Size Inches (mm)	Nominal Flow Rate USGPM (L/min)
2 (50)	150 (550)
3 (75)	500 (1,900)
4 (100)	800 (3,000)
6 (150)	1,200 (4,600)

Smith Meter® Strainers

Metering system components require protection against the damage potential of dirt and debris. Smith Meter pipeline strainers provide this protection for 4" and larger turbine and Positive Displacement meter applications. Standard features include: 304 stainless steel perforated plate basket, blind flange-type cover with lifting lug, 1/2" NPT differential pressure taps, NPT vent and drain taps and a basket seal.

- Pipeline strainers designed and fabricated per ANSI B31.4. Available in sizes 4" to 16" (150 to 600 lb typical). Models GLS are specifically designed for European requirements (1.5" to 16").
- In-line carbon steel strainers with streamlined flow path for lower pressure drop (2" to 8" and 150 to 300 lb typical).
- E-Type strainers are typically used in loading and off-loading systems (U.S.: 3" to 4"; European: 2" to 4").



Smith Meter® Air Eliminators

Smith Meter Air Eliminators provide efficient air elimination that facilitates ultimate measurement accuracy and system protection. All Smith Meter Air Eliminators are engineered to meet industry standards and offer the widest flow range and minimal pressure loss. Smith Meter air eliminators effectively release gas for superior flow measurement.

The **Model VAR** vertical air eliminator is designed according to ASME Section VIII with the option of a "U" stamp. The vertical design is ideal for 3" and 4" skid applications requiring a minimized footprint. Optional air release heads allow for complete tank drainage and multi-stage shut down when used with the AccuLoad.



MODEL VAR		
Model AR	Max. Flow Rate GPM (L/min)	Flange Sizes
3	560 (2,120)	3"
4	880 (3,331)	4"

The **Model AR** horizontal air eliminator is designed according to ASME Section VIII with the option of a "U" stamp. The AR is available from 2" up to 16" and allows multiple air release heads for bulk air removal. Optional air release heads allow for complete tank drainage and multi-stage shut down when used with the AccuLoad.



MODEL AR		
Model AR	Max. Flow Rate at PSI Differential (API 40.6C / 60F) GPM (L/min)	Flange Sizes
1030	360 (1,363)	2", 3"
2040	610 (2,309)	4"
3050	850 (3,218)	6"
4565	1,450 (5,489)	6"
45100	1,800 (6,814)	8"
75200	4,000 (15,142)	8", 10"
150300	4,700 (17,791)	10", 12"
350700	5,200 (19,684)	16"



4" Unloading Skid with Model AR Air Eliminator





liquid metering products

Terminal Line Accessories Strainers, Air Purging Systems and Deaerators

FMC Technologies Measurement Solutions offers Strainers, Air Purging Systems and Deaerators for the European Market that can be used with Smith Meter® products.

Strainers

Strainers are necessary to protect the metering and the downstream equipment against dirt and contaminants.

They are available as a standard in-line design for loadrack applications or large flow rates with excessive filtration area to minimize pressure drops in the event of plugging risk.



STRAINERS

In-Line	Sizes	Pressure
50E-20 to 100E-20	DN50 to 100 2" to 4"	10 to 20 bar
GLS	Max. Flow	Pressure
10 to 350	60 to 2, 100 m³/h	10 to 100 bar

Air Purging Systems

Smith Meter air purging systems are a combination of a strainer and air eliminator. This provides excellent metering protection with less space requirements.

- Model APS – a compact vertical mounted filtration and air slug elimination system

Applications

- Ideal for truck and rail loading
- Ensures accurate measurement for all metering technologies
- Protects the metering system from dirt, contaminants and slugs of air



Benefits

- Low pressure drop to maintain flow rates
- Cost effective

AIR PURGING SYSTEMS

Type	Max. Flow	Pressure
APS25	150 m³/h	16 bar
APS35	210 m³/h	16 bar

Deaerators

Smith Meter deaerators release air from the metering system which is essential for accurate measurement.

- Model VDR – a compact vertical mounted centrifugal type air eliminator for effective air release and gas extraction

Benefits

- Ensures accurate measurement for all metering technologies
- Stabilizes operation for Coriolis and ultrasonic metering
- Protects the metering system from slugs of air
- Operates with a mechanical or electrical air release system
- Low pressure drop to maintain flow rates

DEAERATORS

VDR	Max. Flow	Pressure
10 to 350	60 to 2,100 m³/h	10 to 25 bar



liquid metering products

Marketing Terminal Systems Loading, Unloading and Blending Systems

One-Step Solutions

In the ever-expanding industry of biofuels production and distribution, a thorough knowledge of the special product characteristics and blending considerations associated with biofuel handling is required to meet industry standards for petroleum product distribution. FMC Technologies has the experience and petroleum industry expertise to properly blend biofuels with traditional fuels ensuring custody transfer accuracy requirements are met. From design to installation and throughout the life of your equipment, FMC Technologies ensures that your system runs at peak performance with the accuracy and performance you have come to expect from Smith Meter® products.

Because each installation's success is dependent on the seamless integration of new equipment and electronics with the automation and infrastructure that is currently on site, FMC Technologies provides cost effective system integration with a flexible approach and open architecture products such as Smith Meter AccuLoad.net.

FMC Technologies offers complete system fabrication that complies with all internal, logistical and Weights and Measures requirements, using only Smith Meter equipment and FMC Technologies electronics to ensure custody transfer accuracy and performance. FMC Technologies is the only supplier worldwide who can access, without bias, all required state-of-the-art technology components from its own product line. This technological spectrum coupled with reliable services makes FMC Technologies the preferred business partner for customers and end-users all around the world.



FMC Technologies has the capability to provide complete systems, skid mounted for loading, unloading and blending. Skids and related equipment comply with worldwide standards such as: API MPMS Chapter 6.2 (Loading Racks), NIST Handbook 44 Section 3.30, Pressure Equipment Directive 97/23/EC (PED), Directive 94/9/EC Equipment and Protective Systems intended for use in potentially explosive atmospheres (ATEX), National Weights and Measures Directives (W&M) and especially the New European Measurement Instrumentation Directive 2004/22/EG (MID) now statutory in the European Community.

(Continued on next page)





liquid metering products

Marketing Terminal Systems Loading, Unloading and Blending Systems

Whether you require loading, unloading or blending systems to complete your terminal's current functionality, FMC Technologies provides complete turnkey services:

- Marine, truck and rail facilities
- Design flexibility and wide capabilities for:
 - Blending systems: biodiesel and ethanol
 - Asphalt and additive systems
 - Loading and unloading systems
 - Complete product load systems/lanes
- Safety and access equipment integration
- In-house design, engineering support and testing facilities
- Project management
- Formalized and documented quality plan and process
- Qualified and certified welders
- Start-up and commissioning
- Outstanding customer service

FMC Technologies loading, unloading and blending system modules are based on the experience and quality of the Smith Meter® brand. The system modules have been designed to fulfill internal and logistical requirements and to comply with all Weights and Measures requirements.

The basic system includes the entire measuring section from the supply line inlet connection to the air purger systems required by Weights and Measures regulations, and ends at the control valve exit or, optionally, at the top or bottom loading arm coupling. For markets changing from top to bottom loading standard, both loading techniques can be combined into one system. Standard modules are designed for typical operating ranges of petroleum tank truck flow rates from 250 liters/min to 2,500 liters/min. Customized systems are available upon request.



liquid metering products

Sening® Bottom Loading

Sening® Bottom Loading and Truck Meter Equipment

Sening offers a complete range of proven mechanical products and systems for bottom loading and truck metering applications which can be combined with state-of-the-art electronic technology.

Conforming to API1004 and European CEN requirements, the Sening range of bottom loading and vapor recovery components brings safety and environmental protection to petroleum tank truck transportation.



Whether the application requires an individual component or a complete bottom loading system, FMC Technologies can supply the appropriate solution for any bottom-loading operation.

Overfill Protection

- Pneumatic level sensors
- Electronic overspill protection for delivery to customer tanks



Vapor Recovery

- Compartment vent valves
- Flame arrestor and vapor hood
- Vapor recovery adaptor and valves

Pneumatic Control Equipment

Includes individually designed switches and control components.

Valves, Sight Glasses, Flanges, Couplings and Fittings

Includes foot valves and discharge valves, API couplings and other line accessories and fittings.



liquid metering products

Smith Meter® and Sening® Truck Meter Packages

Truck Meter Packages

The Smith Meter® and Sening® truck meter packages are designed to satisfy all applicable legal accuracy requirements and maintain extended reliability under severe operating conditions. Packages are engineered to be manually operated or fully automated, based on the optional equipment selected, including combination air eliminators/strainers, mechanical counters, preset controllers and preset valves. Because of their modular component design and arrangement flexibility, Smith Meter and Sening truck meter packages can be fitted into nearly any installation.

- Sening GMVT and GMVZ series compact meters with gas extractor
- Stand-alone gas extractors
- Mechanically or pneumatically activated discharge valves
- Advanced product drain system



TRUCK METER PACKAGES

Model	Size Inches (mm)	Max. Flow Rate GPM (L/min)	Max. Working Pressure psig (kPa)
T11	2 (50)	100 (375)	150 (1,034)
T20	3 (75)	240 (900)	150 (1,034)
T40	4 (100)	500 (1,900)	75 (517)
GMVT 805*	3 (75)	213 (800)	150 (1,034)
GMVZ 1003**	4 (100)	265 (1,000)	150 (1,034)
GMVZ 1004*	4 (100)	265 (1,000)	150 (1,034)

* With MID system approval depending on configuration

** Available with mechanical counter and printer

Discharge Pumps

Centrifugal-type and self-priming truck pumps designed for the delivery of light petroleum products featuring low maintenance and long service operation.

Additive Injection System

Pneumatically operated piston pumps for on-truck fuel oil blending, controlled by MultiFlow flow computer or simply by meter pulses.

Aviation Meters

Smith Meter non-ferrous single case aircraft fueling meters operate under the same proven principle that minimizes pressure drop across the measuring chamber to maximize accuracy and service life. Available in both straight-through or right-angle flow paths, the Smith Meter PD meter is the ideal choice for aircraft fueling applications.



AVIATION METERS*

Model	Size Inches (mm)	Max. Flow Rate GPM (L/min)
T-11-NF (Angle Type)	2 (50)	100 (375)
T-20-NF (Angle Type)	3 (75)	250 (875)
SD or ASD-3-NF	3 (75)	420 (1,600)
SF or ASF-4-NF	4 (100)	800 (3,000)
ASG 100	4 (100)	1,200 (4,600)
SG or ASG-6-NF	6 (150)	1,200 (4,600)

* Maximum working pressure: 150 psig (1,034 kPa)

Available PD Meter Accessories

- Pulse transmitters
 - E pulse transmitter
 - UPT high-resolution transmitter
 - LNC pulse transmitter
- Counters, preset counters and printers
 - LNC (Large Numeral Counter)
 - LNC/TP (Large Numeral Counter and Ticket Printer)
 - Push-button set-stop counter
- Automatic temperature compensators
 - ATC and ATG (Mechanical-Type)
- Electronic presets
- MultiFlow – a flow computer for accurate volume registration of liquids, temperature compensation and invoicing

liquid metering products

Sening® Tank Truck Systems

Sening® tank truck products and systems offer state-of-the-art technology for mission-critical solutions to the highest industry standards. Over a century of experience has provided F.A. Sening with the know-how to design innovative, customized solutions for fuel oil distribution as well as service station, industrial and bulk delivery. A full range of electronic and mechanical components and systems, combined with quality Smith Meter® products, allow Sening's tank truck systems to deliver unsurpassed accuracy and safety.

Sening® Electronic Tank Truck Systems

Sening electronic products and systems have set the standard in petroleum supply-chain management. They offer customized solutions to many of the issues occurring in supply-chain management, such as product loss, product contamination, crossovers, safety and environmental issues, electronic monitoring, accountability, and data communication between truck and external electronic devices (depot – service station – office). At the same time they reduce loading and unloading times, providing fast turnaround, which allows for trucks to be on the road for 24-hour service.

All Sening systems are modular in design, enabling cost-effective solutions tailored to the changing needs of the market.



MultiSeal Electronic Product Security and Monitoring System

Sening's MultiSeal system provides product security with electronic monitoring of loading and discharge valves. Its flexible design allows custom configuration of standard components for Sealed Parcel Delivery (SPD) applications, which can be combined with the Sening NoMix cross over prevention technology.

NoMix Cross Over Prevention and Hose Supervision System

Fully featured system for petroleum product distribution utilizing NoMix hose communication technology to prevent cross overs when loading and unloading tank trucks. The system fulfills VOC directive and water protection legislation for hose supervision.



The system uses NoMix hose communication technology to prevent cross overs when loading and unloading tank trucks.

MultiFlow

A flow computer for accurate volume registration of liquids, temperature compensation and invoicing.

MultiControl

A remote control and overfill protection system used in conjunction with MultiFlow for fuel oil delivery.

MultiLevel

A level gauging system for volumetric measurement of liquid petroleum products.

EMIS

Interface to allow communication between tank truck systems and business management systems.



A close-up photograph of a man with curly brown hair, wearing clear safety glasses and a green t-shirt. He is focused on working with a piece of industrial machinery, which has red and silver components. The background is blurred, showing more of the industrial setting.

Gas Products

From supply of individual meters and accessories to the supply of complex, fully integrated measurement and product analysis systems, FMC Technologies offers technical expertise and superior gas measurement products.

Products utilized in gas measurement

With unequalled technical experience and expertise, FMC Technologies provides gas measurement solutions of the highest quality, accuracy and performance. If your application requires a simple, reliable orifice fitting or the most complex and customized integrated measurement system, FMC Technologies has the right products, complete project management capabilities, support and services to provide the most efficient and cost-effective solutions, including:

- MPU™ Series Ultrasonic Flowmeters
- Flow Computers





gas metering products

Gas Ultrasonic Flowmeters MPU™ Series

FMC Technologies' MPU™ Series Gas Ultrasonic Flowmeter is built for long-term accuracy and reliability. The meter electronics and communication options allow for easy system integration. Leading-edge technologies include self-diagnostic smart software and are designed and tested in accordance with AGA 9, NORSOK, NACE, CRN, PED, ASME B31-3 and B31-8. The MPU 1200 and 800 are suitable for fiscal metering of dry, high-pressure and non-condensing gases. The MPU 200 is ideal for applications with lower accuracy requirements.

The MPU series of ultrasonic flowmeters interfaces easily with field-mounted flow computers, distributed controls, SCADA systems or as integral components to a metering system.

Applications

- Onshore/offshore gas custody transfer metering
- Pipeline bidirectional measurements
- Gas terminals and mixing stations
- Gas power plants
- Pipeline junctions
- Compressor stations
- City gate facilities
- Ethernet

Benefits

- Profiles axial and transverse flows, providing higher accuracy and greater flow turndown ratios
- Zero stability, no drift or ΔT correction with reciprocity in the design
- Advanced signal processing to handle system noise (SNR 0.1:1)
- Winscreen advanced self-diagnostic software
- Titanium encapsulated transducers can be replaced without flow interruption or loss of reading measurement
- Up to 60% cost, space and weight savings compared to conventional metering devices



MPU 1200 Ultrasonic Gas Flowmeter

The MPU 1200 Series B Ultrasonic Gas Flowmeter is a six-path ultrasonic meter with non-intrusive and flush-mounted transducers providing undisturbed and accurate measurement of gas flow. Six paths give this meter unique functionality to measure transverse velocity components and compensate the axial velocity for more accurate measurement over the flow range. Accuracy with dry calibration: $\pm 0.5\%$ of measured value; with flow calibration: $\pm 0.1\%$ of measured value.

MPU 800 Ultrasonic Gas Flowmeter

The MPU 800 Series B Ultrasonic Gas Flowmeter is a four-path meter with the best repeatability. It is the most rugged and dependable meter on the market featuring the most advanced electronics package. Accuracy with dry calibration: $\pm 0.5\%$ of measured value; with flow calibration: $\pm 0.1\%$ of measured value.

MPU 600 Ultrasonic Gas Flowmeter

The MPU 600 Series B Ultrasonic Gas Flowmeter is a three-path meter and is best applied in more stable flow conditions where transverse velocity components are not present. Accuracy with dry calibration: $\pm 0.7\%$ of measured value; with flow calibration: $\pm 0.3\%$ of measured value.

MPU 200 Ultrasonic Gas Flowmeter

The MPU 200 Series B Ultrasonic Gas Flowmeter is a single-path meter. It is an excellent choice as a backup meter to the MPU 1200 or 600, as a check meter or in applications where reliability is of highest priority.

gas metering products

Flow Computers microFlow.net™ Gas

Smith Meter® microFlow.net™ Gas Flow Computer

The Smith Meter microFlow.net Gas is a flow computer for single product monitoring of continuous flow applications.



Applications

- Onshore/offshore gas custody transfer metering
- Pipeline bidirectional measurements
- Gas terminals and mixing stations
- Gas power plants
- Pipeline junctions
- Compressor stations
- City gate facilities

Process Management

- Continuously monitors system-critical functions
- Automatic volume correction for temperature per the AGA and ISO tables and the expansion coefficients for chemicals
- Sampler support

Flexible, Configurable Programming and Reporting

- Ethernet and serial network compatible
- Multi-drop serial and ethernet communications ports for maximum system expansion
- MPU™ Series ultrasonic flowmeter communications
- Smith Meter or modbus protocols for bi-directional communications
- GC interface
- Boolean and algebraic programmable software for easy customization
- Customizable report formats to fit the needs of the application
- Options for multiple languages, customized messages, and text communication
- Customizable formats for inputs and outputs
- Event log and audit trail

Built for Safety and Reliability

- Multi-level security access
- Explosion-proof housing
- OIML-compliant display offers prolonged visibility during unplanned power outages





System Technologies

With over 2,000 installed projects in over 100 countries worldwide, FMC Technologies has unparalleled experience in designing and constructing diverse liquid and gas systems that meet the needs of its customers.

Our engineers and project management staff are experts, many with decades of experience in the measurement industry, and offer complete support at every phase of the project's development. Whether a project necessitates language translations, compliance with non-standard regional practices or project commissioning in remote locations, FMC Technologies's project teams have the know-how to solve any measurement system challenge.

The world leader in designing liquid and gas measurement systems

Customers choose FMC Technologies Measurement Solutions because of its ability to provide turnkey solutions and systems that meet their critical needs:

- Seamless integration into the current upstream and downstream plan or operational requirements
- Designed to be built, installed, commissioned and maintained within the customer's fiscal limitations
- Capable of producing accurate, traceable data no matter how varied the product quality or how severe the operational environment
- Designed to provide the utmost safety and ease of operation
- Gas metering capabilities include systems for production wells, fuel gas metering for power generation, large-scale pipeline transportation, regasification terminals, border stations, gas supply grids, and city gate metering facilities
- FMC Technologies has designed and completed more FSO metering facilities than any other company in the world

Technical Services

FMC Technologies has acquired vast knowledge that can be applied to any liquid or gas measurement challenge. A thorough understanding of diverse operating conditions, local requirements and customer specifications enables FMC Technologies to design premium systems that provide reliable and accurate data through numerous years of operation.

Services Include:

- Front-end engineering and budget pricing
- System component specification
- Specialized man-machine interface packages
- Customized software modules for security and reporting of fiscal data
- Integration of product quality analysis equipment
- Integration and testing of completed system at the factory
- Documentation, training and specialized field support
- Facility surveys for upgrade recommendations
- Life-cycle management contracts for services, maintenance, parts and ongoing support

Experience Combined with Innovation

Taking a comprehensive approach to every project, FMC Technologies succeeds where many integrators fail. Through its significant industry experience and long-term customer relationships, FMC Technologies has learned the importance of minding the details, including environmental conditions, ease of operation and total life-cycle costs.

Although many of the systems FMC Technologies completes are already specified with equipment requirements, customers benefit from the in-depth technical expertise and experience acquired from the development of FMC Technologies' own robust line of metering products and accessories.

FMC Technologies has designed premium custody transfer systems for a variety of applications:

- Liquid metering systems range from relatively small liquid production LACT units to huge crude export facilities





systems technologies

Liquid Measurement Systems

Liquid custody transfer metering solutions from FMC Technologies are developed and applied reliably to a broad range of processes, from small LACT units and FSOs to huge crude export facilities.

We design to our customers' specifications and offer our experience and advice to customize systems specific to any application.

FMC Technologies is a complete systems provider offering the most comprehensive and trusted portfolio of measurement solutions in the oil and gas industry. Our products and our integrated systems are engineered to handle the diverse measurement, monitoring and sampling requirements required by the world's most prestigious companies.

FMC Technologies brings a dedicated project management team and single-source responsibility to every quality measurement system it builds by providing and integrating best-of-class equipment and all of the leading technologies in the market, including:

- Various metering technologies
- BS&W monitors
- Densitometers
- Viscometers
- Samplers
- Valves and pumps
- Supervisory control systems
- Data acquisition systems
- Custom software
- Instrumentation packages
- Analyzer Shelters
- Control Rooms
- Flow computers

HIGHLIGHTED LIQUID MEASUREMENT SYSTEMS

Global Market Location	Year
Kuwait Oil Company Sea Island and South Pier	2000
Surgutneftegas (Russia)	1993 2001 2005
Sonatrach (Algeria)	2004
Cameron Highway (USA)	2004
Sohar (Oman)	2005
Sinovensa (Venezuela)	2006
Piranema (Brazil)	2006
Chevron (Angola)	2007
NK Rosneft (Russia)	2008
Enbridge (USA and Canada)	2008
Saudi Aramco (Saudi Arabia)	2009
TransCanada (USA and Canada)	2009
BP/Valhall (Norway)	2009
BP/Skarv (Norway)	2009
Tupi TLD (Tesle de Longa Duracao) (Brazil)	2009
StatoilHydro/Gjøa (Norway)	2009



Metering Station (China, 1999)

LACT Units

The Lease Automatic Custody Transfer (LACT) unit is a critical system in the ownership transfer of crude oil and petroleum products from the production site to trucks, pipelines or storage tanks. Through decades of experience in LACT unit design and manufacturing, FMC Technologies has managed to provide precision measurement in even the harshest environments. LACT units from FMC Technologies offer the flexibility of completely-automated or semi-automated 24-hour operation.

FMC Technologies combines an unparalleled depth of engineering expertise and the industry's most reliable system components:

- Turbine meters
- Ultrasonic flowmeters
- Bidirectional, unidirectional and compact provers
- Valves and pumps
- Mixers
- Strainers
- BS&W monitors
- Flow computers
- Control and data acquisition systems
- Complete instrumentation packages

Like any system, a LACT unit must be operated correctly to deliver accurate results. FMC Technologies provides support services, training and consultation to ensure end users always have access to the requisite information pertaining to component performance, calibration and sampling frequency requirements. In addition, FMC Technologies applications experts can provide guidance and solutions to ensure the LACT system is adaptable and dependable for all foreseeable circumstances with provisions for heat tracing, insulation, NACE trim and additional meter runs.

Prover Systems

Flowmeters need to be calibrated to ensure accurate measurement. To accomplish this, proving systems are designed to reduce the uncertainty associated with meter performance. With its years of measurement and verification experience, FMC Technologies is well known for developing accurate proving systems to validate the petroleum industries' numerous critical custody transfer applications.



FMC Technologies offers complete portable or stationary proving systems for pipelines, tanker and barge loading and unloading operations and refiners. Employing unidirectional, bidirectional and compact prover technologies, FMC Technologies prover systems incorporate industry-leading components to ensure the highest measurement excellence.

In partnership with Maloney Technical Products, FMC Technologies Measurement Solutions offers a complete line of heavy-duty, solid foam or inflatable proving spheres in a variety of elastomers and specialty materials. Maloney Pipeline Spheres are compression molded at cavity pressures exceeding 2000 psi, yielding a wear life that is unmatched in the industry.

With FMC Technologies prover systems and Maloney pipeline spheres, customers are ensured improved operational efficiency, reduced operating costs and accurate custody transfer measurement.



systems technologies

Gas Measurement Systems

In this energy hungry world, with ever-increasing natural gas prices, it is of critical importance to know, to a very high degree of accuracy, not only the quantity of gas bought or sold, but also the “quality,” as it is the gas composition which dictates the energy content of the gas.

Very large quantities of natural gas move through pipelines every day; a tiny error in measurement can result in a very significant loss of revenue by the selling company or the buyer, according to the direction in which the error occurs. FMC Technologies’ gas systems and products are designed to decrease the uncertainty of the measurement error and provide reliable, traceable data for operational efficiency and custody transfer.

From initial design through testing and commissioning, FMC Technologies brings single-source responsibility to every system it builds by integrating the leading technologies for maximum results, including:

- Ultrasonic flowmeters
- Vertical vane separators
- Horizontal and vertical filter-separators
- Heaters

- Control and data acquisition systems
- Complete instrumentation packages
- Gas chromatographs
- H₂S analyzers
- Hydrocarbon dew point analyzers
- Moisture analyzers
- Mercaptan analyzers
- Densitometers
- Analyzer shelters
- Control rooms

Energy Measurement

FMC Technologies understands that energy measurement is of key importance in large-scale transaction points, such as border stations, gas refinery outlets and gas grid inlet points.

It is possible for a traditional gas metering system to measure energy directly by the incorporation of an online gas chromatograph at the point of metering. However, coupled with the volumetric flow results generated from the meter, the system can calculate energy flow “online,” rather than “offline” at a laboratory, to substantially increase the accuracy of related financial transactions.



Hainan to Hong Kong
Gas Pipeline (1994)

Pressure Regulation

With the experience gained from designing and manufacturing measurement systems since 1926, FMC Technologies possesses extensive knowledge of pressure regulating systems. Whether an application merits a stand-alone or an integrated system, FMC Technologies' pressure regulation systems provide the optimum solution for any measurement objective.

For every pressure regulation system there are numerous options available with varying degrees of complexity. FMC Technologies' highly-skilled project engineers consider the following factors when developing a pressure regulation system, including:

- Upstream pressure
- Extent of required pressure reduction
- Noise level specification
- Turndown requirements
- Sensitivity of downstream equipment to pressure variations
- Degree of redundancy required for uninterrupted operation

Backed by unparalleled engineering expertise, exceptional technical support services and the industry's most reliable system components, pressure regulation systems by FMC Technologies are able to meet any application requirement.

Filtration and Conditioning

Fuel reaching the gas turbine ignition box must be properly conditioned to meet the required firing temperature, pressure and cleanliness standards. Metered fuel gas is normally required at a steady operating temperature and at a safe margin above dew point. Severe damage may be caused to the turbine if the gas is not ultra clean and dry.

FMC Technologies' gas filtration and conditioning systems provide clean, dry metered

gas at the required pressure and temperature from an untreated, unregulated gas source. FMC Technologies has extensive experience in the design and application of custom and integrated gas filtration and conditioning systems, including those for onshore and offshore production and power generation facilities.

Applications

- Fiscal metering
- Superheating

HIGHLIGHTED GAS MEASUREMENT SYSTEMS

Global Market Location	Year
Saudi Aramco (Saudi Arabia)	1980
Total (Indonesia)	1989 1992 1997
Hamaca (Venezuela)	2001
Saudi Yanbu (Saudi Arabia)	2003
AYTB (Saudi Arabia)	2004
Hydro, Shell/Ormen Lange (Norway)	2004
Hanover (Oman)	2005
Al-Tuwairqi (Saudi Arabia)	2006
Techint (Mexico)	2006
WillBros (West Africa)	2006
StatoilHydro/Easington Langed (United Kingdom)	2006
Bechtel (USA)	2007
Petronet (India)	2007
BVT LNG Costa Azul (Mexico)	2007
Metal Services (Saudi Arabia)	2008



systems technologies

Floating Production Storage and Off-Loading Systems

With each transaction involving large volumes of product and many millions of dollars, measurement accuracy is more significant in marine loading transfers than in any other application. Precision and reliability is required for Floating Production, Storage and Off-Loading (FPSO) metering systems.

FMC Technologies has the experience and products to ensure operational integrity. FMC Technologies has provided more FPSO metering systems than any other company in the world. As a result, FMC Technologies has developed unique capabilities and experiences related to measuring the large flow rates characteristic of marine loading operations. This specialized knowledge and experience is applied to each demanding measurement application to ensure successful project execution from start to finish.

FPSO metering systems from FMC Technologies incorporate the industry's most reliable system components, including:

- Positive Displacement meters
- Turbine meters
- Ultrasonic meters
- Differential pressure meters
- Bidirectional, unidirectional and compact provers
- Valves and pumps
- Mixers
- Strainers
- Control and data acquisition systems
- Flow computers
- Complete instrumentation packages

HIGHLIGHTED FPSO SYSTEMS

Global Market Location	Year
Chevron (Angola)	1982
Modec (Indonesia, China, Mexico, Thailand)	1989 1992 1994 1998 2002
Conoco (Indonesia, Venezuela)	1992 2004
FELS (Norway)	1995
SBM (Russia, Myanmar)	1998 1999
Statoil/Asgard A&C (Norway)	1998 2001
Exxonmobile/Jotun (Norway)	2000
Tanker Pacific (Vietnam, Angola, Thailand, Malaysia)	2002
BP/Holstein LACT Unit (Platform)	2002
BP/Thunderhorse LACT Unit (Platform)	2002
BP/Mad Dog LACT Unit (Platform)	2003
BP/Atlantis LACT Unit (Platform)	2003
PAS Maritime (Indonesia)	2004
Talisman (Malaysia)	2004
Petrochina – LPG Yuyo (Indonesia)	2004
Madura Jaya (Indonesia)	2005
Marathon/Alvheim (Norway)	2006
JVPC Rang Dong – Modec (Vietnam)	2007
Tanker Pacific Cuu Long Su Tu Vang (Vietnam)	2008
Truong Son FPSO (Vietnam)	2008
Bumi Armada Berad (Nigeria)	2009
Total/DSME (Angola)	2009



System destined for Nigeria FPSO (2006)

systems technologies

Liquid and Gas Control Systems and Flow Computers

FMC Technologies' flow computers and control systems are the superior choice for managing and monitoring liquid and gas measurement systems. FMC control systems allow incorporation of the widest range of industry-standard flowmeters, instrumentation, valve actuators and process control systems to provide customers with a full range of solutions to attain cost-effective, accurate and innovative measurement systems.

Applications

- Custody transfer
- Fiscal measurement
- Batch loading and deliveries
- Proving control
- Sampling and analysis

FMC 217 Metering Control System

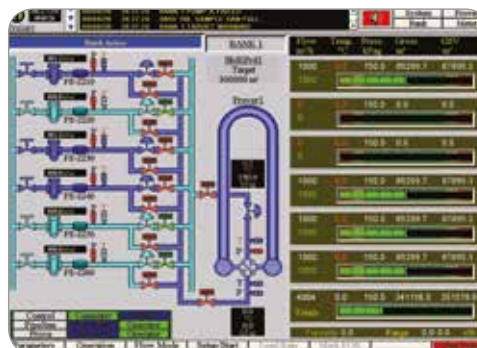
The FMC 217 is a complete metering control system, including field cable termination, signal conditioning, flow computers, supervisory computers and an advanced man-machine interface. The system meets not only recognized international standards but the strictest statutory and regulatory requirements as well.

Features

- Additional meter runs added easily without software changes
- Process variable trending
- Easy-to-understand graphic user interface
- Quick and easy navigation
- Available in fully redundant configuration
- Compatible with a variety of flow computers
- Microsoft Windows based operating system

SyberVisor Supervisory Control System

FMC Technologies' Supervisory Control System, developed and supported in Corpus Christi, TX USA, is a state-of-the-art data acquisition and control system for hydrocarbon measurement.



systems technologies

Liquid and Gas Control Systems and Flow Computers



The Supervisory System employs the latest off the shelf Personal Computer hardware, Microsoft's Windows Operating System, and Wonderware's® InTouch® Human-Machine Interface (HMI). InTouch provides the user with an intuitive, graphical interface that makes metering operations clear and observable. The Supervisory System efficiently controls meter, bank, and prover operations. Additionally, the Supervisory System collects, processes, and reports meter and proving data.



The Supervisor and the reports it generates are based on American Petroleum Institute (API) and AGA recommendations as well as Russian GOST and Regulatory Document requirements and ARAMCO standards.

The Supervisor controls each metering bank in one of two operational modes: batch or pipeline. Batch mode delivers preset amounts based on user entered loading parameters. Pipeline mode provides for flow monitoring and flow balancing. The Supervisor interfaces to the metering bank and prover via communication with various flow and proving computers, i.e. the Fmc²™, the SyberTrol®, etc. The Supervisor controls valves and other auxiliary I/O via communication with a Programmable Logic Controller (PLC). Additionally, the Supervisor reads product quality instrumentation such as densitometers, viscometers, and water and sediment content devices. Furthermore, the Supervisor will also collect a representative "sample" during a batch or time period by pacing the sampling device at an appropriate rate.

The Supervisor can calibrate, or "prove" a meter while it is in operation and at operating flow rates. The Supervisor will align the meter to a displacement prover or a master meter prover, perform the prove, and then ask the user to accept or reject the new meter factor. To facilitate the acceptance decision, statistical analysis of previously accepted meter factors can be provided.



Fmc²™ Flow Management Computer

The Fmc², a fully programmable, fully configurable microprocessor-based flow computer, is the most advanced in the industry. Beyond its ability to continuously monitor and control flow of liquid and gas petroleum products, it allows operators the ease and convenience of full-screen visibility of multistream operations. Compact and flexible, the Fmc² can act as a high-integrity, stand-alone flow computer or as a powerful building block in a supervisory computer control system.

Features

- LCD touch screen with full-color graphics
- Interfacing for remote communications
- Process loop control
- Report printing
- Analog and digital outputs



FPM 207CE Flow Computer

The Kongsberg FPM 207CE is a panel-mount or rack-mount flow computer capable of handling multistream applications with a wide variety of flowmeters. The FPM 207CE can operate as a high-integrity, stand-alone flow computer or as a powerful component in sophisticated metering applications integrated into a supervisory or PCDA system.

Features

- High-performance advanced I/O board with multiple processor computation
- PC104 CPU board with Pentium® class processor
- Rack or panel mount options
- Controlled security access
- Built-In PLC logic for value monitoring and control
- Supports all major international standards for both liquid and gas flow calculations



A close-up photograph of a middle-aged man with grey hair and glasses, wearing a blue work jacket. He is focused on a task, using a pair of pliers to work on a circular meter or gauge. The background is blurred, suggesting an industrial or utility setting. The lighting is bright, highlighting the technician's concentration and the details of his work.

Life-Cycle Maintenance, Training and Support

FMC Technologies' life-cycle maintenance, training and support team is dedicated to providing customers with first-class service to enhance metering system effectiveness, improve productivity and increase profitability.

Supported by an extensive network of authorized service specialists

FMC Technologies has the experience, the skills and the focus to replace, repair or rebuild any measurement equipment or liquid or gas metering system anywhere in the world. Supported by an extensive network of authorized service representatives, FMC Technologies' staff of factory-trained field service engineers can improve metering equipment longevity and operational efficiency.

Plant personnel and environmental safety is of paramount importance in product design and maintenance. FMC Technologies' commitment to safety is relentless. FMC Technologies' service engineers and technicians are fully knowledgeable of and compliant with governmental and industrial safety requirements, both globally and locally.



Benefits

- Improved liquid measurement efficiency
- Increased profitability and throughput
- Reduced operating costs
- Reduced downtime
- Access to measurement specialists



life-cycle maintenance, training and support

In the Field Service and Support

FMC Technologies' field service and customer support engineers are available, on call, any-where in the world to perform and/or assist in the installation, commissioning, service, troubleshooting and verification testing of liquid measurement equipment. By providing superior support, service and quality products, FMC Technologies can improve metering equipment longevity and operational efficiency for our customers.



Services Provided Include:

- On-site diagnostics, calibration and repair of meters, valves and electronic equipment
- Preset and flow computer programming and interfacing to automation systems
- Factory PD meter evaluation, repair, testing and special testing can also be provided
- Factory turbine meter evaluation, repair, testing and tuning to bring existing turbines up to new product standards
- Repair of flow control valves, strainers, transmitters, electronic equipment and other ancillary line accessories

- On-site training for meter technicians, operators, maintenance and engineering personnel
- Operational assistance
- 24/7 on-call or on-line technical support via phone, fax, email or internet for long-distance equipment diagnostics

Turnkey Services

Through its Installed Product Services (IPS) group, FMC Technologies provides turnkey measurement services to the global petroleum and gas industry. Working in unison with the local distributor, IPS provides expert advice and innovative solutions to help customers regain optimum performance of all installed measurement equipment and systems.

- System upgrades
- Maintenance and service contracts
- Installation, commissioning and start-up support
- Measurement consulting services for installed equipment evaluation
- Feasibility studies
- Project management services

IPS will examine your measurement system and define problem areas, then provide an itemized list of equipment and actions required to bring your system out of obsolescence and into excellent working condition. Whether your system was supplied by FMC Technologies or any other manufacturer, IPS has the capability to manage the improvement process from start to finish.

Quality Remanufactured Equipment

FMC Technologies is the industry's leading supplier of quality, factory remanufactured equipment. All remanufactured equipment is rebuilt with genuine Smith Meter® replacement parts and assembled to meet new specifications. Each product is performance tested through its complete operating range and meets or exceeds current published linearity and repeatability specifications. All remanufactured equipment carries the same full one-year warranty as new equipment.



Equipment Buy-Back Program

To meet the demand for quality remanufactured products, Measurement Solutions has an aggressive equipment buy-back program. Under this program, FMC Technologies will purchase used, surplus and obsolete metering equipment for use in these applications:

- Pipeline
- LACT unit
- Marine loading and unloading
- Terminal load rack
- Tank truck equipment



Equipment Exchange Programs

FMC Technologies Measurement Solutions' Equipment Exchange Programs offer a great opportunity for our customers to reduce inventory management requirements and minimize maintenance costs for a wide range of equipment types and applications. By taking advantage of stocked and fully warranted remanufactured items exchanged for your damaged or worn parts, you can eliminate costly service repairs, environmental, and safety concerns while returning your vital measurement devices to their intended performance standards quickly and confidently. Typically within 24 hours, your replacement equipment can be shipped from the factory to your location for immediate installation and operation. From pipeline meters to marketing terminal electronics, the Equipment Exchange Program is your source for fast, reliable and genuine Smith Meter replacement parts.

Available Exchange Programs:

- PD meter innermech
- Turbine meters (IPK)
- Electronic board assembly
- Transmitters



life-cycle maintenance, training and support

World-Class Facilities Testing and Verification



FMC Technologies Test Center guarantees optimum verification of meter performance

To ensure that a meter can operate accurately over a wide flow and viscosity range, it is important that the meter is tested over the dynamic operating range. FMC Technologies comprehensive flow research and test facility located in Erie, Pennsylvania is capable of testing meters over the widest dynamic measurement range of any test facility in the world. PD meters, conventional turbine meter, helical turbine meters, and ultrasonic meters can be tested under dynamically similar operating conditions to guarantee performance in any crude oil application.

- NVLAP accredited to ISO/IEC 17025:2005
- ISO 9001:2008 Certified – Quality Management System
- Flow to 42,000 bph (6,675 m³/h)
- Viscosity 2 to 500 cSt (mm²/s)
- Traceable to international standards
- Dynamic range 100 to 1,000,000 Reynolds Number



The FMC Technologies' Flow Research and Test Center is the only petroleum test laboratory in the world that can ensure true calibration over a dynamic Reynolds Number range of 100 to 1,000,000.

ISO 17025 NVLAP Accreditation

The National Voluntary Laboratory Accreditation Program (NVLAP) run by the US National Institute of Standards and Technology (NIST) ensures that a laboratory fully meets international laboratory standards defined by ISO/IEC 17025. All measurements must be traceable through a National Metrology Institute (NMI) such as NIST that is a member of the International Organization of Legal Metrology (OIML). The accreditation body, NVLAP in this case, assesses factors relevant to a laboratory's ability to produce precise, accurate test and calibration data, including the:

- Technical competence of staff
- Validity and appropriateness of test methods
- Traceability of measurements and calibration to national standards
- Suitability, calibration, and maintenance of equipment under test
- Handling and transportation of test items
- Quality assurance of test and calibration data



life-cycle maintenance, training and support

Customer and Distributor Training

Service Training Workshops

FMC Technologies provides technical training for customers and distributors. Workshops employ a state-of-the-art flow demonstration laboratory that encompasses truck loading and unloading, truck metering, sequential and ratio blending and hydraulic flow control utilizing the AccuLoad® family of preset load controllers. Reflecting FMC Technologies' industry-leading product and system expertise, these workshops address the needs of:

- Companies demanding accurate and reliable systems measurement
- Personnel encountering new metering applications, design changes, improved metering methods and equipment

Training programs may be held on-site at the installation or customer facilities or at any of the FMC Technologies facilities, as well as in a variety of other worldwide locations.



Best Measurement Practices Workshops

Best Measurement Practices workshops offer companies and groups the opportunity to learn metering products and system fundamentals in an unbiased forum that provides methods to determine proper product selection and fundamental principles. Workshops are taught by experts in both products and global metering standards. Best Measurement Practices workshops are organized locally

upon customer request and are customized in several time formats and according to attendee experience levels.

Demonstration Stand for Proper Metering System Design

Proper metering system design is essential for accurate loading and unloading of refined products at the terminal. FMC Technologies' demonstration stand simulates a variety of loading and unloading scenarios, allowing customers to fully comprehend various metering system configurations before selecting the correct design for their terminal application.

Utilizing a variety of components in configurations recommended for accurate load control, the demonstration stand has the following capabilities:

- AccuLoad II to III Upgrade Metering System demonstrates the features of the upgrade using up to a four-product ratio blender.
- AccuLoad III-S Sequential Blender System demonstrates sequential blending of two products through one metering system.
- AccuLoad III-S Ratio Blender System demonstrates the ratio blending of three products through three metering systems and into a single loading arm.
- Unloading System demonstrates the features of the Division II/NEMA IV-approved AccuLoad III-N4, which senses the position of the floats in the air eliminator to control the flow control valve and flow rate of the product being offloaded and measured from the transport.
- AccuLoad III-Q system demonstrates loading of three straight products into a truck compartment that has been fitted with a Civicon overfill and grounding system and includes an explosion-proof Smith Meter® Proximity Card Reader for driver identification and authorization for loading.



Supporting Customers Worldwide

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FMC Technologies and Our Measurement Solutions Legacy Brands

FMC Technologies, Inc. (NYSE: FTI) is the global market leader in subsea systems and a leading provider of technologies and services to the oil and gas industry. We help our customers overcome their most difficult challenges, such as improving shale and subsea infrastructures and operations to reduce cost, maintain uptime, and maximize oil and gas recovery. Named by Forbes® Magazine as one of the World's Most Innovative Companies in 2013, the company has more than 20,000 employees and operates 28 production facilities in 17 countries.

FMC Technologies Measurement Solutions sets the standard for global Best Measurement Practices by designing, manufacturing and servicing the precision products and systems used to measure and control liquids and gases in industrial applications. The Smith Meter® brand is known worldwide for its ability to produce reliable, accurate and consistent measurement results. Similarly, our Sening® brand tank truck components and systems are trusted to provide safety and environmental protection while ensuring accurate measurement during the transport and transfer of liquid products.



**We put you first.
And keep you ahead.**

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