Oilfield Processing
Measurement and Control
Oil and Gas Separation

Only the measurement and flow experts at FMC Technologies can combine products, services and expertise to provide a wide range of highly accurate, well designed devices and systems required for efficient, state-of-the-art oilfield techniques used in today’s fast-paced, competitive industry.
Overview

Proper separation design and function is a crucial component to a well-managed oilfield and is totally dependent on the types of wells within the field.

**Crude oil wells** often produce raw natural gas referred to as associated gas. The gas can exist separately from the crude oil in the underground formation or can be dissolved in the crude oil.

**Dry gas wells** typically produce only raw natural gas that does not contain any hydrocarbon liquids. Such gas is called non-associated gas.

**Condensate wells** produce raw natural gas along with natural gas liquids (ethane, propane, butane and so on). Such gas is also non-associated gas and is often referred to as “wet gas.”

The ideal separator is designed to divide the wellstream into liquid-free gas, gas-free liquid and produced water. Separator operating conditions will vary depending on wellstream fluid characteristics and flowing parameters. To achieve good, stable separation, the liquid level and gas-liquid interfaces should be controlled, along with temperature and pressure control. Once separation is completed, accurate measurement of the flowing streams (oil, gas and water) will account for the products produced by the wells.

Selection of proper metering and control instrumentation is critical to the management of the separator and the accurate reporting of produced products.

Within the oilfield, the three most common applications for separators are well testing, production and allocation.

The most common types of separators used are horizontal and vertical two-phase, three-phase and two-phase cyclone-type separators for well testing.
Well Testing

Accurate measurement and control of each component of a multiphase production stream, prior to comingling for further processing, is necessary for the effective management of oil and gas production and asset allocation. A typical installation is normally designed to handle testing for multiple producing wells with varying stream parameters and flowing conditions.

This emphasizes the need for very accurate measurement with precise temperature and pressure control and interface in order to ensure proper separation within the test vessel.

Conventional two-phase, three-phase, compact two-phase or GLCC (Gas/Liquid Cyclonic Cylinder) separators can be used in well testing applications.
Production

Bulk production separation is extremely critical. In oil and gas processing, each process required for a given field has been designed to handle the expected reservoir conditions. The subsequent individual product streams coming from the bulk production separator need to be within a product range that the process can handle and pass on to the next process in the sequence. If the separator does not perform to expectations, there will be issues with every process in the sequence. Therefore, it is essential that the separator be controlled to allow for precise liquid/gas separation and accurate product-stream measurement. The importance of the bulk production separator system demands precise temperature, pressure and level interface devices. The metering devices must be capable of handling a wide range of product parameters and flow conditions while maintaining accuracy.

THREE-PHASE SEPARATOR

TWO-PHASE SEPARATOR
Allocation

In allocation, a separator's function is similar to a test separator, because allocation measurement is used to determine what portion of the total production from a field can be attributed to each individual well or lease.

Most fields have a wide variety of operating parameters and flow conditions, which demand precise temperature, pressure and level interface devices. The metering devices used in allocation measurement must be capable of handling such a variety while also maintaining accuracy.

A heater treater is used as part of the oil production process and separates oil from water, along with any solids from the production stream, by using heat and retention time. The oil from the heater treater can be measured for allocation and transferred to oil storage for custody measurement.

THREE-PHASE SEPARATOR

HEATER TREATER

Fuel Pots are designed to remove free liquid from the instrument air/gas supply line used to control pneumatic devices. Sized properly, the fuel pot serves as a volume pot to assure the end devices have enough volume of supply to work properly at maximum consumption.
Instruments

Levellflex FMP51
Continuous Level
- Reliable measuring for changing media
- High availability
- Integrated data memory
- Factory precalibrated
- Intuitive, menu-guided operating concept in national languages
- Simple integration into control or asset management systems
- Exact instrument and process diagnosis to assist fast decisions

Levellflex FMP55
Interface Level
- Reliable measuring for interface with emulsion
- High availability
- Integrated data memory
- Factory precalibrated
- Intuitive, menu-guided operating concept in national languages
- Simple integration into control or asset management systems
- ATEx, IEC, EX, FM, CSA

Liqiphant FTL8x
Level Switch
- Overspill protection
- Easy integration
- Continuously self-monitoring
- No calibration: quick, low-cost start-up
- No mechanically moving parts: no maintenance, no wear, long operating life

Water Cut Probe and Monitor
- Provides the highest possible sensitivity, resolution and accuracy for water content determination in crude oil and natural gas condensate
- For water content up to 25%
- Enhanced digital signal processing and full product temperature compensation

Liqicap FM151
Capacitive Level
- Units are precalibrated for conductive processes
- Built-in DAT chip stores calibration data
- Short measured value reaction time
- Universal application
- Fully insulated rod probe, for standard and extreme process conditions

Cerabar PMP71
Process Pressure
- Used for process pressure monitoring up to SIS3, certified according to IEC 61508
- Overload resistant and function monitored
- Continuous modularity for differential pressure, hydrostatic and pressure
- Extensive diagnostics functions

jTEMP TMT 162
Temperature Transmitter
- Dual input temperature field transmitter
- High reliability in harsh environments due to dual compartment housing and compact electronics

TH13
Temperature Sensors
- TH13 assembly in thermowells with spring loaded insert and enclosure
- U.S. manufacturing of temperature components and complete assemblies, protection heat and insulating shields, ceramic fiber sheath protection

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- Provides the highest possible sensitivity, resolution and accuracy for water content determination in crude oil and natural gas condensate
- For water content up to 25%
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Deltabar PMD75
Differential Pressure
- Reduce backwash and contamination by measuring pressure across debris filters
- Robust ceramic sensors can handle the toughest of applications
- Overload resistant and function monitored

Deltabar FMD72
Electronic DP
- Differential pressure measurement is often used to measure the level in pressurized and vacuum tanks
- Traditional differential pressure measurement using impulse lines and capillaries have issues such as icing up, clogging, leaky taps and dry/wet leg inconsistencies
- All of these issues can lead to less accuracy, process safety risks and greater total cost of ownership
- With the FMD72 Electronic DP system, all of these issues are eliminated

Liquiline CM442
Analytics
- Simple, easy to maintain measurement for detecting excess oil in water, and thus validate the operation of the separator
- Memosens technology gives the user actual run time hours. This along with Sensor Check System can alert for extreme coating and planned maintenance verses reactionary
Flow Metering Technologies

**INVALCO WH Series**
- **Turbine Meter**
  - INVALCO WH Oilfield Series Meter utilizes a rugged durable three-piece rotor/stator required for the extreme oil patch demands
  - Wide flow, temperature, and pressure range
  - Superior accuracy
  - Small in size and weight
  - Heavy duty stainless steel construction for durability and long service life

**Promass 83F & F 100**
- **Coriolis Meter**
  - Density calibration under process conditions < 0.0005 g/cc
  - High accuracy even under varying, demanding process conditions
  - Superior zero stability
  - Self-draining and compact low profile design
  - Application specific “Quick Setup” (83F)
  - Heartbeat Technology™ (hBT™) on-board diagnostics and verification tool (F 100)
  - HistorOM™ for event, configuration and data storage (F 100)

**Promass 83E & E 100**
- **Coriolis Meter**
  - Density calibration under process conditions < 0.0005 g/cc
  - High accuracy even under varying, demanding process conditions
  - Low cost of ownership
  - Self-draining and compact low profile design
  - Application specific “Quick Setup” (83E)
  - Heartbeat Technology™ (hBT™) on-board diagnostics and verification tool (E 100)
  - HistorOM™ for event, configuration and data storage (E 100)

**Smith Meter® Model E3 & F4**
- **Positive Displacement (PD) Meter**
  - Streamlined flow path provides low pressure drop
  - Superior accuracy and measurement stability
  - Immune to paraffin build-up
  - No electricity required
  - Low friction ball bearings, fixed cam-type timing, and rugged construction for sustained accuracy and long service life

**INVALCO 400 Series**
- **Control Valve**
  - Ideal for temperature and pressure applications such as separators, heater treaters and free water knockouts
  - Soft plug for tight shut-off
  - Double port construction for maximum discharge rates

**Smith Meter® SC13 Series**
- **Positive Displacement (PD) Meter**
  - Streamlined flow path provides low pressure drop
  - Superior accuracy and measurement stability
  - Immune to paraffin build-up
  - No electricity required
  - Low friction ball bearings, fixed cam-type timing, and rugged construction for sustained accuracy and long service life

**Promag 55S**
- **Electromagnetic Meter**
  - High resistance to abrasion thanks to industry-optimized linings and measuring electrodes
  - No pressure loss
  - Insensitive to vibration
  - Software options for: electrode cleaning, advanced diagnostics, calculation of mass flow and solids content
  - High degree of efficiency due to the modular device and operating concept

**INVALCO IMS 780**
- **Interface Management System**
  - Excellent sensitivity and repeatability
  - Non-fouling probe
  - Convenient operator interface provides visual status indication and greatly reduced set-up time
  - Individually adjustable dual outputs with time delay
  - Approved for use in hazardous locations
  - Probe length variations available

**INVALCO 500 Series**
- **Displacer Type Level Controller**
  - Simple, reliable, and easy to maintain
  - General purpose pilot enclosure is suitable for many exposed applications
  - All exhaust gas is vented inside and then to the atmosphere through a screened vent connection
  - Cover plate is gasketed and pressure gauges are of corrosion-resistant materials
  - Weather proof pilot enclosure

**Flow Computer**
- **microFlow.net Liquid or Gas Flow Computer**
  - Sediment and water monitor input and NSV calculation
  - Automatically corrects volumes per API MPMS Chapter 11.1-2004 and many other tables
  - Temperature, pressure, and density compensation and averaging
  - Network compatible
  - Interfaces with Proline Coriolis meters
  - Customizable report formats
  - Multi-level security access

**CT Series Flex Tube®**
- **Back Pressure Valve**
  - Maintains back pressure on vent lines from separators, treaters, dehydrators, compressor stations and gas gathering systems
  - Internal sensing line reduces the chance of blockage

**Prowirl 72F**
We put you first.
And keep you ahead.