

Oil and gas

Solutions for the oil and gas industry

Oil and Gas Industry



Tasks in the oil and gas industry

The oil and gas industry needs to balance their efforts to meet the growing demand for energy with cost pressures and environmental sensitivity. Here, intelligent solutions are crucial to be successful in a highly competitive market. In many cases, the instruments at the core of these solutions are sensor-based technologies, which determine the volume and quality of hydrocarbons from wellhead to fractionator, crude to final product. The data that modern sensors deliver leads to cleaner processes and greater efficiencies than were ever imagined before. We offer the best sensor solutions through a huge range of products and systems to measure and perform even under the most rigorous operating conditions.



Metering



Due to the sheer value of gas transported in great volumes over long distances, even across country borders, and fiscally transacted between companies, a highly accurate, real-time metering solution is crucial. Our sensors and complete metering solutions are ideal for reliable and extremely robust gas flow measurements.

Measuring



Our sensors provide plant operators with a reliable comprehensive data stream, allowing them to control and monitor anything from an individual industrial process to the overall surrounding installation thereby ensuring confidence in the facility's environmental and regulatory compliance.

Quality control



The quality of the feedstock as well as of product streams have to be consistently checked along the entire value chain. By measuring the total stream composition, from the amount of undesired or commercially viable by-products to simply residual impurities at trace levels: our solutions ensure that the required quality level of feedstock, intermediate and final products is achieved.

Emission monitoring



The regulatory requirements for emission monitoring are becoming more stringent worldwide. Our analyzers and system solutions monitor and verify emission limit values and the release of contaminant emissions and other substances into the environment. Trust our expertise when looking for appropriate solutions for particulate and gaseous emission monitoring.

Safety and protection



The safety and protection of industrial sites and their assets, as well as, personnel is always the highest priority. Safety demands in the oil and gas industry are high simply because a catastrophic situation could occur at any time. We offer solutions to detect and prevent explosion hazards and to monitor toxic and/or corrosive substances in process streams and on emission stacks.

Natural gas production and storage

Natural gas is produced from deep underground or subsea conventional reservoirs or from unconventional sources associated with other hydrocarbon reservoirs, e.g., coal deposits or as methane clathrates. By using modern production methods such as fracking, gas stored in rock formations under high pressure is released for extraction. Floating

Production Storage and Offloading (FPSO) units or Floating LNG (FLNG) plants are used as alternatives to traditional offshore production platforms. After gathering and initial purification the gas is transported or stored for use as a fuel or for further processing to higher value products.

Coal seam gas: wellhead and allocation metering



Gas from unconventional sources such as shale (referred to as 'tight gas') or coal seams is often extracted from many wells distributed over a large area. The volume from each well is tallied continuously in order to maintain reservoir integrity, manage field production, and monitor gathering system balance. The meter incorporated at or near the wellhead needs to operate precisely and reliably taking under consideration that the extracted raw gas might contain water, natural gas condensates, and, potentially, highly corrosive and toxic components.

FLOWSIC30 flowmeter



www.endress.com/flowsic30

Flare metering



Flare stacks can be found on almost any oil and gas installation as part of the waste gas system and as controlled vent for high volumes of combustible gases during an upset. By its nature, the pressure, the volume flow and the gas composition in a flare stack can differ significantly over short periods of time. Ultrasonic gas flow measuring devices are well suited for reliable process control of flares through accurate measurement ranging from almost zero flow to gas velocities exceeding 120 m/s (394 ft/s).

FLOWSIC100 Flare-XT flowmeter



www.endress.com/flowsic100-flare

Bidirectional fiscal metering in storage facilities



Underground storage facilities maintain excess inventories in order to meet peak, frequently seasonal, demand cycles, or simply to store product awaiting favorable market conditions. Gas is stored in old salt caverns or by reinjection into exhausted wells. Due to the bidirectional nature of storage (injections and withdrawals), ultrasonic gas flow meters, which are inherently bi-directional and non-mechanical, are a perfect solution. In particular, we employ application specific path layouts, transducer designs, and algorithms to meet this demanding application.

FLOWSIC600-XT flowmeter



www.endress.com/flowsic600-XT

Gas transportation and distribution

Ironically, oil and gas reservoirs and consumer markets are seldom, if ever, close by. Hence, complex transportation systems involving pipelines thousands of kilometers long send product across state, regional, and country borders or to LNG terminals and then to tankers with dynamic filling and measurement systems.

At each sale or fiscal transfer point of product, highly accurate measurement of both volume and quality is critical to ensure no loss in revenue for any party in the value chain. The measurements must be real-time, precise, and reliable in order to meet regulatory and metrological standards which are the basis for transactions between parties.

Custody transfer of natural gas



After production and processing, natural gas is sold to transporters who bring the product to market. Because of the very large volumes involved, pipelines operating at high pressures are used. Measurements must be provided at custody transfer points in accordance to international standards. Such large volumes translate to enormous amounts of money and even a small error can mean huge losses in revenue. Our new gas flow meter FLOWSIC600-XT, also available with eight measurement paths, is certified to deliver the highest rated fiscal gas metering accuracy.

FLOWSIC600-XT flowmeter



www.endress.com/flowsic600-xt

Metering at cryogenic temperatures: LNG boil-off



At temperatures of $-162\text{ }^{\circ}\text{C}$ ($-260\text{ }^{\circ}\text{F}$) at normal pressures, natural gas condenses into Liquefied Natural Gas. LNG takes up only 1/600 of the volume of the gas and is therefore much easier to transport. Transportation of LNG is a good alternative when a pipeline is not feasible. However, constant boil-off from the LNG in tanks and vessels must be either recycled for re-liquefaction or potentially used as fuel for the vessels transporting the LNG. Our ultrasonic gas flow measuring devices allow a precise and reliable fiscal metering of the boil-off losses even at cryogenic temperatures.

FLOWSIC600-XT flowmeter



www.endress.com/flowsic600-xt

Ultrasonic flow metering in distribution networks



Natural gas is delivered to consumers via pipelines or through LNG import terminals to local distributions at measurement points known as city gates. Here, the gas is odorized and pressures are regulated to allow use by end consumers. Our ultrasonic gas flow measuring device FLOWSIC500 is perfect for fiscal measurement in distribution networks from city gates to industrial burners. The uninterrupted, flow-through design, internal flow conditioning, and non-mechanical measurement means virtually no maintenance and allows for installation in almost any piping configuration.

FLOWSIC500 flowmeter



www.endress.com/flowsic500

Natural gas processing

Unprocessed natural gas is typically composed of various percentages of C1 to C6+ hydrocarbons, CO₂, sulfur compounds, mercury, water, O₂, and N₂. Natural gas processing plants must deliver 'dry, clean, natural gas' in order to meet contractual tariff requirements of their pipeline customers or for natural gas liquefaction.

During processing, commercially viable products such as methane (C1), ethane (C2), Liquefied Petroleum Gas (LPG: C3 + C4) and Natural Gas Liquids (NGL) are produced. In highly integrated gas processing plants Gas-to-Liquid (GtL) process trains produce LPG or even base chemicals.

Oxygen enriched air in the Claus process



Claus plants process acid gas removed from the raw natural gas. The acid gas first passes through a thermal stage in which H₂S is partially burned to SO₂ which reacts with H₂S to form elemental sulfur and water. In subsequent catalytic stages H₂S and SO₂ are converted to sulfur at lower temperatures. The oxygen enriched air supply of the Claus furnace allows a higher throughput of acid gas at a lower energy consumption and less hydrogen demand in tail gas treatment. A robust and reliable oxygen analyzer controls the oxygen levels in the combustion air after O₂ injection.

TRANSIC100LP laser oxygen transmitter



www.endress.com/transic100lp

Control of the Merox[®] NGL sweetening process



If unprocessed natural gas contains higher hydrocarbon fractions (C₃+), NGL can be recovered as a commercial product using e.g., cryogenic fractionation processes. If the condensed liquids contain impurities of sulfur compounds known as mercaptans the NGL should be 'sweetened'. In the Merox[®] process, 'sour' components are extracted and oxidized with excess air to form alkyl disulfides. Process gas analyzers are used to monitor the oxidation process by measuring the oxygen level in the excess air vent behind the disulfide separator.

GMS800 gas analyzer



www.endress.com/gms800

Syngas production control



Frequently, natural gas is used as primary feedstock for chemical processes. Syngas, a mixture of mainly H₂ and CO, is produced from methane in a steam reformer. The syngas can then be used as the feedstock for subsequent processes to produce various commercially viable products, such as, methanol, ammonia, LPG, and other petrochemicals. Process gas analyzers are used to monitor the efficiency of the methane conversion. Further downstream low levels of impurities which remain after the syngas shift and purification processes are monitored.

GMS800 gas analyzer



www.endress.com/gms800

Offside and utilities

Outside of the primary processing units, additional on and off site infrastructure and utility installations provide electricity, process heat, gas compression, and waste gas and water treatment for the gas processing plant or LNG terminal. Gas fired power plants, gas turbines for

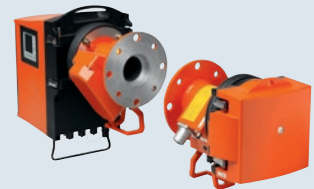
compressor stations, thermal oxidizers, steam boilers, waste water treatment units and flare stack systems will be found around any process plant. Further outside the plants, large tank farms for storage, terminals for import and export, and distribution networks complete the picture.

Emission monitoring of boilers and gas turbines



Process units, utility boilers and ovens, thermal oxidizers or flares for waste gas treatment, compressor stations and other ancillary installations are considered in a total environmental impact assessment. The quantity and type of monitored components and allowable emission limits depend on local environmental policy and permits. The selection of a continuous emission monitoring solution depends on many parameters including fuel type and the process. With an exceptional CEMS portfolio on the market, we offer solutions at the lowest possible cost of ownership.

GM32 in-situ analyzer, GMS800 and MCS200HW extractive analyzer



www.endress.com/gm32
www.endress.com/gms800
www.endress.com/mcs200hw

Monitoring of inertization or blanketing processes



Most feedstock and products in the oil and gas industry are flammable by nature in the presence of oxygen. To prevent explosion hazards the formation of explosive atmospheres must be avoided at all times. This task is accomplished by inertization or blanketing of the pipes and storage tanks with an inert gas like nitrogen or CO₂. Our laser oxygen transmitter minimizes the consumption of the inert gases in an inertization/blanketing loop by monitoring the residual oxygen content with low gas sampling and maintenance requirements.

TRANSIC100LP laser oxygen transmitter



www.endress.com/transic100lp

Natural gas – the big picture

Natural gas is widely used as an energy source for heating, cooking, and power generation and as fuel for vessels and vehicles. Further, natural gas is increasingly important for the manufacturing of chemical products of commercial interest. With growing demand, the production, processing, storage,

transport and distribution of natural gas must keep pace. Gas impurities such as water, mercury and corrosive compounds must be removed in order to meet pipeline specifications and regulatory standards. After purification the gas is stored in tanks or underground reservoirs, and liquefied to LNG

for export, or transported via pipelines and through city gates to industrial, commercial, and residential consumers. From wellhead to burner – We support you with best technical solutions along the whole value chain.



Best available sensor technology along your entire value chain

Gas wells · flare stacks · gas gathering systems · pipelines · landfall stations · underground storage · tank farms · gas metering and compressor stations · gas processing plants · LNG liquefaction and re-gasification · heaters · steam boilers ·



Benchmark products

Ultrasonic gas flowmeters, gas analyzers, dust monitors

Complete solutions

Metering stations, CEMS, analyzer cabinets, shelters

Services

Protects your assets and productivity

A global structure for your international activities

Local competence and support where you need it.

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