competences

Oil & Gas: Strengthen your plant's safety, productivity and availability

Endress+Hauser

People for Process Automation

Reducing complexities

One of the critical success factors all throughout Endress+Hauser has been the dedicated customer focus. Endress+Hauser is committed to develop products and solutions that fit customers' daily challenges, such as safety, productivity and availability.

We know that safety allows no compromise. The Oil & Gas industry is handling materials that are combustible and can pose a great threat to the environment. Naturally, safe processes are of the utmost importance to protect your staff, nature and equipment.

Since oil and gas prices are highly volatile, efficiency is also crucial for success. This means that you have to closely monitor all your processes to influence and adapt them, if necessary. In order to do so, you need reliable and exact information on all key parameters.

Finally, you need to do more with less. While there must be periodic breaks in production for planned maintenance, your production also suffers from unplanned shutdowns due to equipment failure or insufficient equipment redundancy. These forced outages are a burden on their employees. That's why you need a reliable partner who is there for you in the long haul and has global presence.

Overfilling of atmospheric storages tanks occurs once in every 3'300 filling operations according to Marsh

Up to 1'600 USD per meter can be the annual maintenance cost for mechanical PD meters

Emergency shutdown costs 250K USD per hour (for a 100K bbl/day refinery; crude oil price 60 USD/bbl)

Fuel for thought

With vast experience in the Oil & Gas sector, we help you to perform, comply and thrive.

Although energy throughput around the world can be volatile and unpredictable, your operation cannot be. Whether upstream or downstream, you need a partner who understands that you must maintain and maximize plant availability - and do it with ever scarcer resources.

Being one of our customers, you don't have to worry about any of that. We assure your plant's safety, optimize your productivity and enable high availability of your plant.

Want to know more about our Oil & Gas expertise?
Then visit us on www.endress.com/oil-gas

Customers around the world gain a wealth of information from their processes by using our **products, solutions and services**

Relying on our **industry knowledge and skills,** we work together with our customers to find the best solution for every application

Partner of choice
As an EPC, Integrator or Plant Builder, you need to meet extremely demanding schedules, while meeting the highest safety standards. Endress+Hauser provides innovative products, solutions and services to a diversified portfolio through superior project delivery expertise and quality of execution. Our experts have extensive knowledge of the instrumentation and your processes.

As a family-owned company since 1953, we are a reliable partner in every respect – **for our customers, employees and shareholders**

Ensuring plant safety

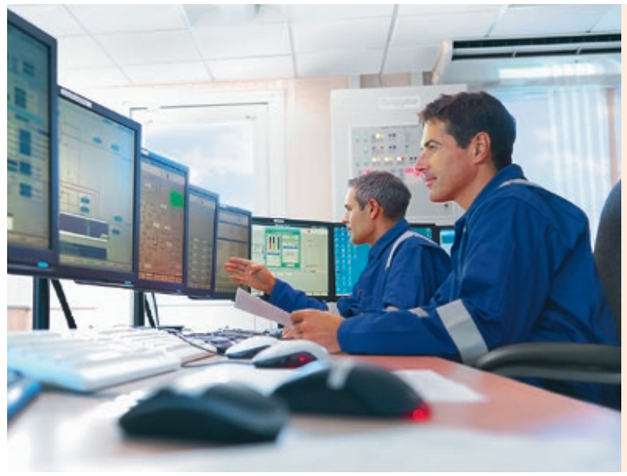
Safety allows no compromise. We manufacture accurate, robust and reliable instrumentation, which, in turn, increases reliability and productivity.

- Measurement of quality parameters crucial for clean operations (e.g. H_2S)
- Largest portfolio of safety instruments
- We understand, contribute, and comply with international regulations

Optimizing productivity

Just as your goal is to extract maximum resources, ours is to maximize the efficiency and return on investment (ROI) of your production.

- Accurate and traceable info: Full integration in ERP system, Heartbeat Technology™, additional process information
- Combination of industry know-how with applied measurement technology



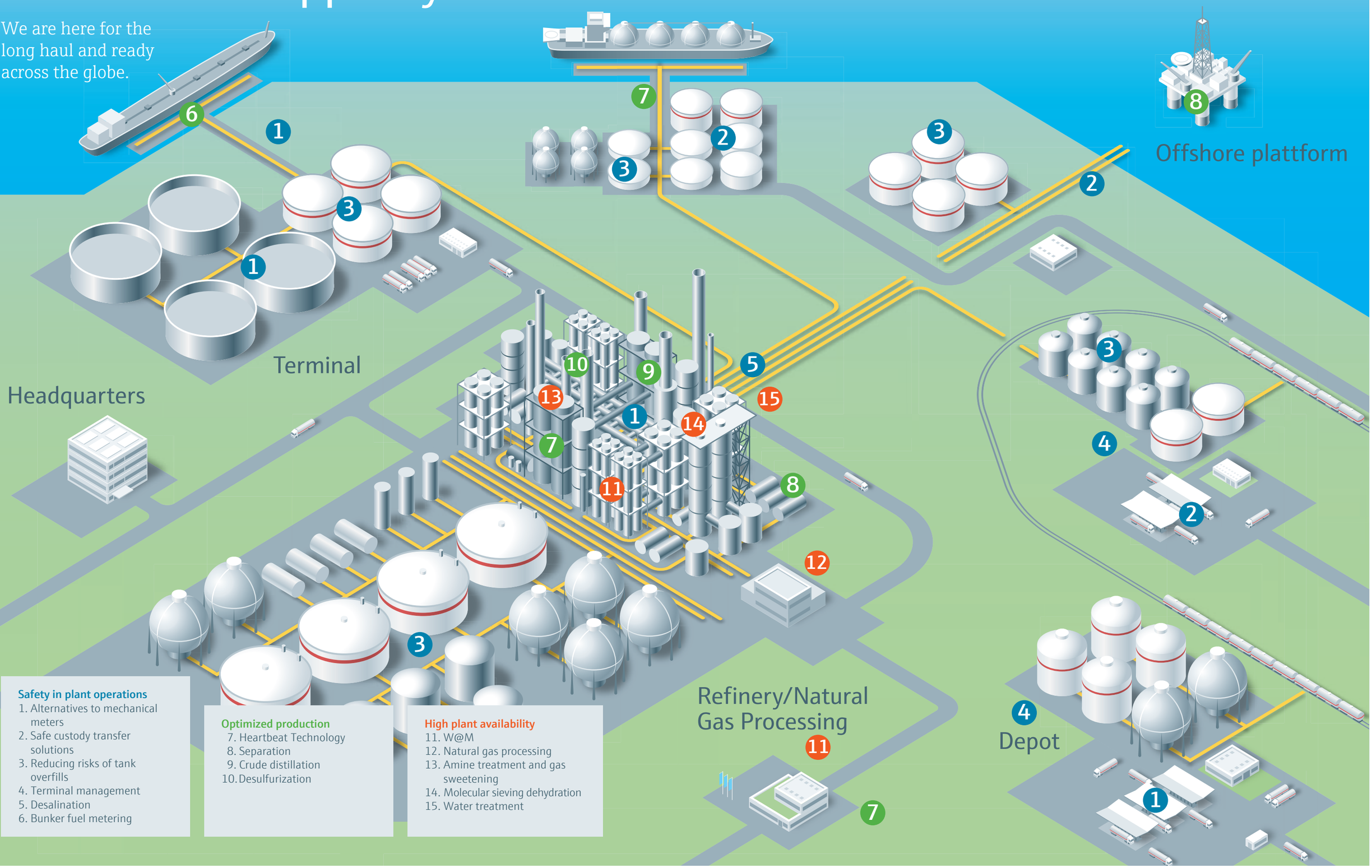
Enabling high plant availability

The Oil & Gas industry faces three challenges: complexity, innovation, and availability of resources. We can assist you with each.

- Reliable and trustworthy information: W@M, Heartbeat
- Our staff knows what works and what doesn't because of their experience and network in place

How can we support you

We are here for the long haul and ready across the globe.



Ensuring plant safety

We measure all your quality parameters crucial for clean operations. We offer you the largest portfolio of safety instruments. Our highly trained staff knows everything about international regulations.

Compliance with globally accepted standards IEC 61511, IEC 61508 and API 2350

Good alternatives to your mechanical meters

When first installed, mechanical meters work fine. But when assets are aging and the technology has reached its limits, maintenance costs rise. By depending on the imperfections of the mechanical meter, your process remains stable. However, a break can lead to a complete production shutdown resulting in money lost, reduced safety and reliability. Based on our process knowledge and technical expertise, a uniform approach through clear procedures ensures that the work we conduct for you is done properly. Our instrumentation as well as our solutions and services will help you make fast decisions.

- Compliance with safety API 2350 recommendations
- Reduced engineering, commissioning time and maintenance costs
- Greater process availability and reliability
- Increased product output - lowest total cost of ownership
- Proof testing intervals of up to 12 years

Peace of mind with safe custody metering solutions

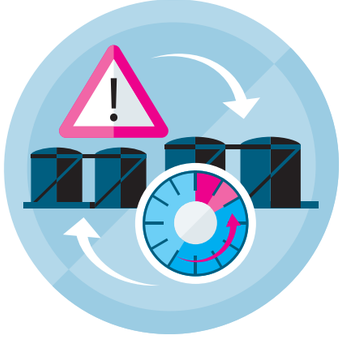
Loading and offloading processes can lead to conflicting situations. Our highly accurate and reliable Coriolis flowmeters require minimal maintenance and recalibration. Thanks to the large meter sizes available more ships, trucks and railcars can be handled per day, increasing your transfer capacity while guaranteeing accuracy, transparency and safety during the process.

- Safer loading thanks to higher tolerance of air content than with mechanical meters
- Get your plant up and running on time and on budget due to commissioning site management

Reducing the risk of tank overfills

Level measurements in storage tanks can fail without warning. It is good practice to separate the continuous level measurement and overfill prevention functions into two distinct systems. Relying on old devices or technologies is critical as they often do not provide self-diagnostics, therefore you will only be warned when it is already too late. We offer a pre-configured overfill prevention system with independent safety certification for the entire safety loop (compliance with API standard 2350), from measurement and control to element correction. This helps you to:

- Increase integrity and reliability
- Reduce operational risk
- Reduce engineering and commissioning time
- Reduce maintenance expenses



<5 min is the time needed to run a proof-testing on 16 tanks

24/7 is the visibility you get with our inventory monitoring solutions

Terminal management

More than ever before, the importance of terminal automation is increasing. This is due to changes in markets, competition as well as in the regulatory and social environment. We offer terminal automation systems for all applications e.g. road, rail, ship and barge loading, depots and terminals; management of process sub-systems and transports to business systems (ERP...); and scalable solutions from simple stand-alone stations for small depots to full client server systems for larger sites.

- Reduced installation, operation and maintenance costs
- Custody transfer metering skids conform to API and MID
- Enhanced accuracy for better volume and mass

Desalination

Endress+Hauser is the first choice to measure all kinds of parameters dissolved in water. A selection of portable and permanently installed sampling units allows for easy analysis of the vast amounts of water being used in desalination and other units. Liquiport is a small, portable and cooled sampling containment unit with an integrated data logger and power supply to be operated in Ex-zones.

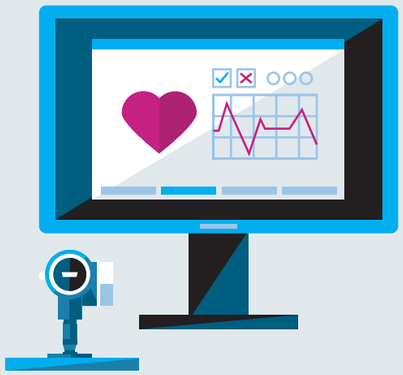
Bunker fuel metering

Replacing traditional quantity measurement by bunker fuel metering systems containing Coriolis flowmeters brings you more transparency. The system ensures that air pockets are included correctly in the measurement when emptying tanks. And, during the fueling process, multiple process parameters are simultaneously monitored and graphically displayed as “metering profiles” via a control panel. The buyer as well as the supplier have complete transparency before, during and after fueling.

- Increased profitability
- Absolute security
- Higher trust

Optimizing productivity

We offer a variety of different technologies for accurate and traceable process information. We not only deliver state-of-the-art technology, but also combine it with our extensive know-how in the Oil & Gas industry.



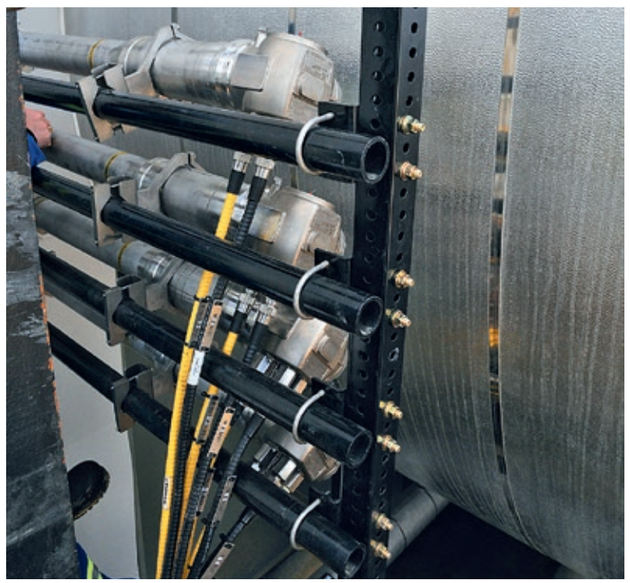
Heartbeat Technology
Thanks to Heartbeat Technology measurement points can be easily verified without interrupting your processes. As the devices continuously diagnose themselves, test cycles can be extended. The self-diagnostic functions of our instruments not only increase the reliability and safety of critical control points, but also support your documentation with automatically generated reports. These reports also provide precise instructions for necessary maintenance procedures. Furthermore, the process and device parameters can be used to optimize your maintenance efforts and your processes as such.

Get transparency on your separation process

Separating hydrocarbon liquids from water and sediments is challenging. To get optimal performance from the separation processes, you need reliable information on all key parameters such as temperature, pressure, level, flow and interface. Measurement of the interface can be relatively simple or extremely complicated and relies on a combination of know-how and applied technology.

The only way to effectively control the separation between oil, water, gas and sand is by measuring the various phases. Often, there is not a distinct interface, rather a continuous graduation from one phase to another. Identifying the thickness and position of the various layers is essential to control the injection of demulsifiers and anti-foam agents.

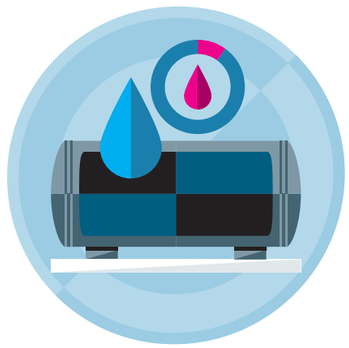
- Best-in-class instrumentation
- Open standards for control flexibility
- Product quality and consistency
- Easy retrofit for profiler solution



Accuracy and reliability in crude distillation columns

Getting an accurate and reliable measurement at the distillation column is critical for yield accounting, meeting production targets, planning and scheduling. You need to maximize the feed rate while ensuring the mixture of crude types meets environmental specifications. Troubles could lead to costly shutdowns. This is why our experienced team of engineers can help design and select the right devices for your critical measuring points e.g. guided wave radar.

- Greater process availability and reliability
- Safety risks are minimized
- Lowest total cost of ownership



8,500 L of demulsifiers saved in a year

Desulfurization, prevent channeling & hotspots in hydrofiner

Due to environmental regulations, the sulfur content in oil products has to be limited, and this can only be achieved by catalytic desulfurization in a hydrofiner. Proven in use in many applications around the world, the multipoint temperature assembly MultiSens Flex contains individual temperature sensors mounted on an individual nozzle. Your vessel requires only a minimum number of nozzles and openings to provide enough temperature measuring points for 3D monitoring.

- Thermocouples can be retracted and changed during vessel operation, avoiding an unplanned shut down
- Fully engineered/standardized solution for your needs
- Increased efficiency, reliability and safety

Enabling high plant availability

Technologies such as W@M and Heartbeat™ provide you with reliable information you can trust on. With our worldwide network and highly skilled staff we always find the right solution for your requirements.

Maintain your installed base with W@M Portal
The web-based W@M Portal allows for real-time data monitoring of your process, permitting proactive maintenance of your devices. You get fast access to critical information, such as spare parts, product availability and reports. Quick access to the right information speeds up your processes, such as repair or replacement of an instrument or downloading certificates for inspections. Furthermore, the up-to-date data allows reliable planning of your maintenance events.

More information:
www.endress.com/life-cycle-management-portal

Natural gas processing

Raw natural gas is a complex mixture of methane (CH_4), hydrocarbon condensates (natural gas liquids – NGLs), water, and contaminants; hydrogen sulfide (H_2S), and carbon dioxide (CO_2). The composition of natural gas varies based on the geological formation it is extracted from. You therefore need reliable solutions to separate methane from other hydrocarbons, fluids, and contaminants entrained in raw wellhead gas to produce pipeline-quality dry natural gas.

Amine treatment and gas sweetening

Raw natural gas from different formations contains varying amounts of acid gases (H_2S and CO_2). Gas sweetening processes remove corrosive acid gases from sour gas and amine treatment is used to scrub H_2S and CO_2. In operation, sour gas is contacted with an aqueous amine solution which removes H_2S and $CO_2$by chemical reaction and absorption. You need a solution to measure the acid gases concentrations at the inlet and outlet of an amine treatment unit to control and optimize the treatment process.

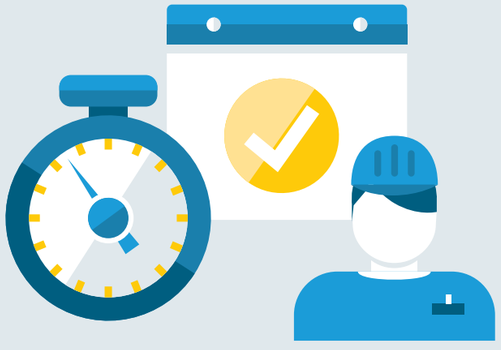
- Fast response to H_2S and CO_2 concentration changes
- Laser-based measurement is highly selective and accurate for H_2S and CO_2 measurements in natural gas
- Patented Differential Spectroscopy technique measures H_2S at low ppm levels
- Low maintenance and OPEX costs

400K USD is the amount you save by avoiding a two-day shutdown for reloading the molecular sieve

Molecular sieve dehydration

Sweet natural gas exiting in an amine treatment unit is saturated with water vapor. Some water can be removed by passing the wet gas through a knock-out drum, followed by compression and cooling. Molecular sieve dehydration is used to obtain the very low H_2O concentration (< 0.1 ppm) required in low temperature and cryogenic processes for NGL extraction and liquefied natural gas (LNG) production. Our TDLAS analyzers which can detect breakthrough in molecular sieve beds.

- Patented Differential Spectroscopy technique measures H_2O at sub-ppm levels
- Laser-based measurement is highly selective and accurate for H_2O in natural gas
- Integrated permeation tube supports automated analyzer validation checks



Services – by your side
Our network of service engineers spans the globe, ensuring that wherever you are based, you can benefit from our technical expertise and support. Our service departments offer comprehensive maintenance contracts, Instrument Management Solutions (IMS), workshop repairs, spares management, on-site commissioning, trouble shooting, small installations and a technical service advice and support over the phone.

Customer service at a glance:
- Commissioning and installation
- Project management
- Preventive maintenance
- Spare part express service
- Training
- Helpdesk
- On-line documentation
- Asset management services
- Calibration services

Water treatment

Furnaces produce heat and steam which demand professional boiler water treatment and monitoring. Endress+Hauser provides for the entire range of water analysis parameters and stores the data parallel to DCs or PLC in the paperless Memograph recorder. In case, for example, the boiler water's salinity is rising above the threshold, Memograph activates alarm functions and records them to make them tamperproof.

References

Optimized and safer operations at Heide refinery

Customer challenge:
Schleswig-Holstein is home to one of Germany's most well-known oil refineries. 4.5 million tonnes of crude oil are processed into fuels and petrochemical products at the extensive compound near the town of Heide each year. The refinery was looking for new ways to optimize its production while complying with strict quality standards.

Our solution:
Turn four into two - Previously, Coriolis mass flow measuring systems were only available as a four-wire system with separate power supply lines and signal lines. However, Endress+Hauser's development engineers have managed to deliver the technology in a 2-wire, loop-powered system, an innovation which would have been unthinkable just a few years ago.

Customer benefit:
- Easy integration
- Costs advantage up to 1'200 Euros per measuring point
- Quick adjustments due to intrinsically safe Ex-concept
- Unmatched safety

... and how can we help to improve your processes?
Visit us at www.endress.com/oil-gas

"For us, Proline Promass 200 is an attractive alternative to traditional four-wire devices. We see a lot of potential here for optimizing the operation of our refinery. Thanks to very easy system integration and ATEX planning, we can quickly make any adjustments needed in our plants."

Tony Kydonakis – I/E Asset Engineer

www.addresses.endress.com

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