Increased gas quality, process control, and asset integrity

Reliable H_2S measurement in real time with the JT33 TDLAS gas analyzer

JT33 TDLAS gas analyzer

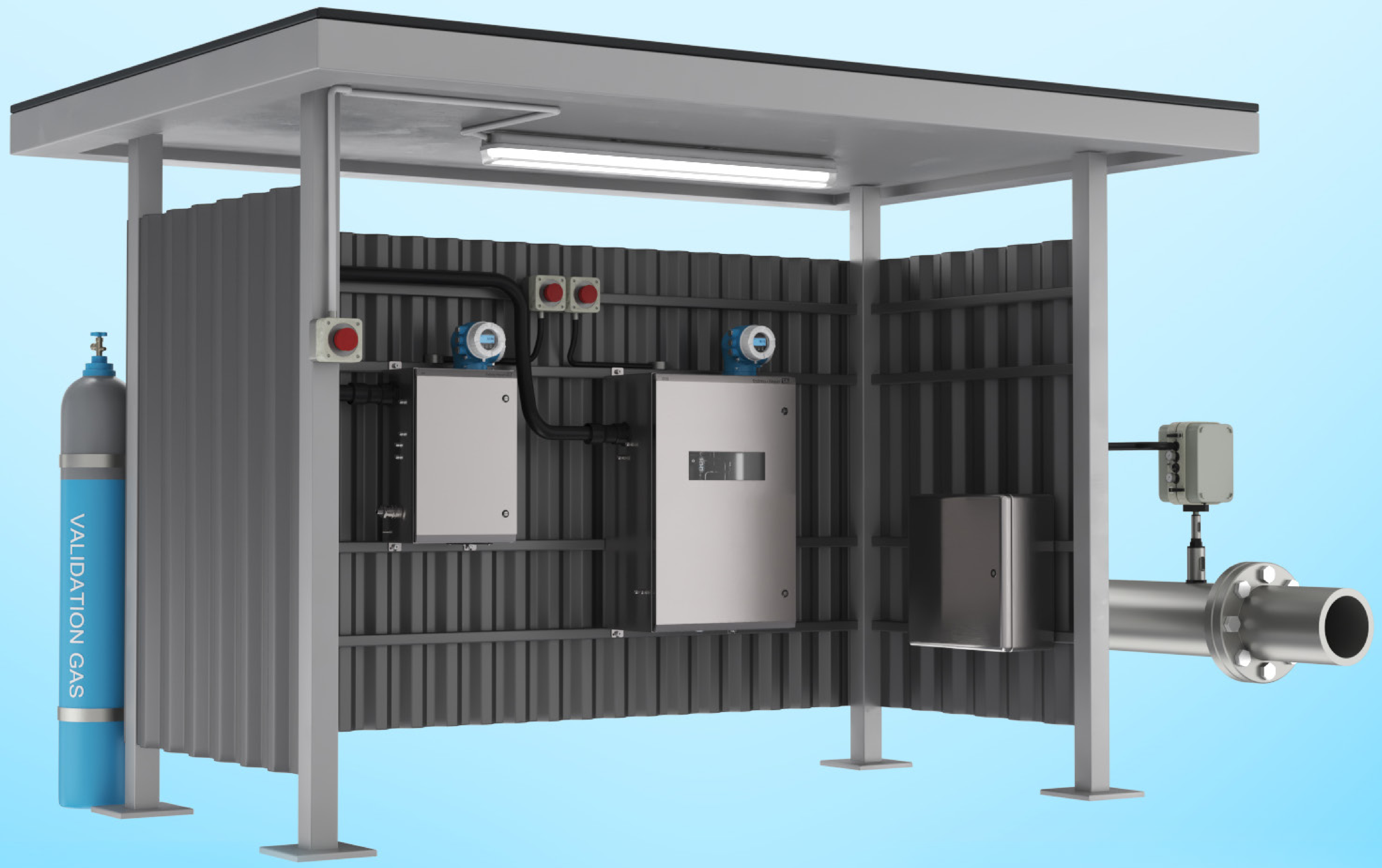
The JT33 gas analyzer uses proven tunable diode laser absorption spectroscopy (TDLAS) to reliably measure H_2S in industrial gas streams. Using a patented differential spectroscopy technique, the JT33 reacts fast to analyte concentration changes, enabling high-resolution, continuous measurement of trace H_2S in seconds.

- Proven differential technology which tolerates contaminants and stream changes in tough applications
- Auto-validation to confirm analyzer health in the field
- Heartbeat Technology for automatically stored historical data, spectrum logging, diagnostics, and verification reporting
- NIST-traceable calibration with superior accuracy and repeatability
- Field-serviceable components and modules
- User-friendly interface with intuitive menu and integrated web server software

Take a look at the product video

Visit the product website

Download the print brochure



The JT33 TDLAS gas analyzer (right) is part of a new family of Endress+Hauser TDLAS gas analyzers.

Benefits at a glance

The JT33 TDLAS gas analyzer optimizes gas processes and maximizes operational efficiency. It enables plant owners and operators to meet gas quality standards, improve process control, and ensure asset integrity.

The JT33 produces highly reliable measurement results which are immune to common interferences. With no field calibration or moving parts and virtually no consumables, the JT33 also provides a unique value equation — low maintenance requirements combined with low overall cost of ownership.

Enable continuous gas deliveries
Avoid shut-ins, flaring, and custody disputes

Minimize downtime and maximize repair flexibility
Enjoy field-serviceable, interchangeable components for quick and easy repairs without recalibration

Maintain high plant availability
Get on-demand reporting and advanced diagnostics using Heartbeat Technology

Reduce maintenance costs and OPEX
Eliminate consumables such as carrier gases, light sources, and lead acetate tape

Accurately measure trace-level H_2S in tough applications
Avoid errors with virtually no interferences from contaminants or stream changes

Solve custody transfer challenges
Continuously measure gas quality to meet tariff requirements

Reliably meet gas purity specifications
Verify measurement accuracy by auto-validating analyzer health in the field

Ensure safety and asset integrity
Help prevent pipeline corrosion and avoid process shutdown risk with real-time contaminant measurement

Challenges in Oil & Gas

The Oil and Gas industry is under increased pressure to deliver the highest levels of process efficiency and product quality. Tight gas quality control is essential to prevent pipeline corrosion and hydrate formation, as well as shut-ins, flaring, delivery disruptions, and safety incidents.

Reliable H_2S measurement plays a vital role in keeping gas operations up and running, and ensuring gas specifications are met for custody transfers.

Traditional H_2S measurement techniques often produce inconsistent readings due to contaminant interferences and stream changes. Many require consumables like carrier gases, light sources, and lead acetate tape which means costly maintenance and frequent calibration.

Delivering rapid, reliable H_2S measurements using proven differential technology, the JT33 TDLAS gas analyzer is a game changer. Its user-friendly, maintenance-free design delivers precise, consistent H_2S measurements that tolerate contaminants and stream changes in tough applications.

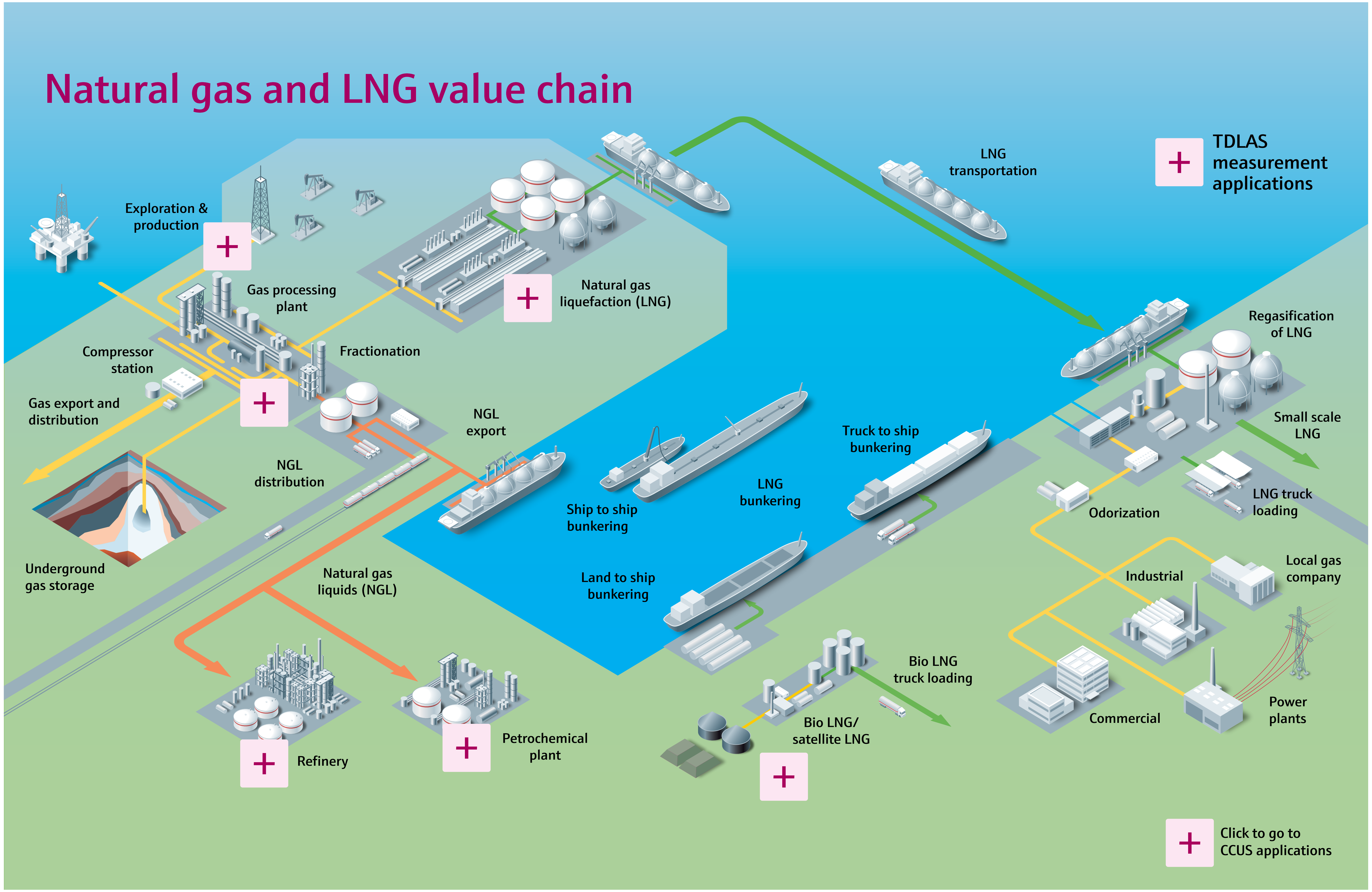
Across the Oil & Gas industry, the best-in-class JT33 stands out as a beacon of dependable reliability, ready to meet current and future measurement challenges head-on.

Check out applications

Relevant applications in Oil & Gas

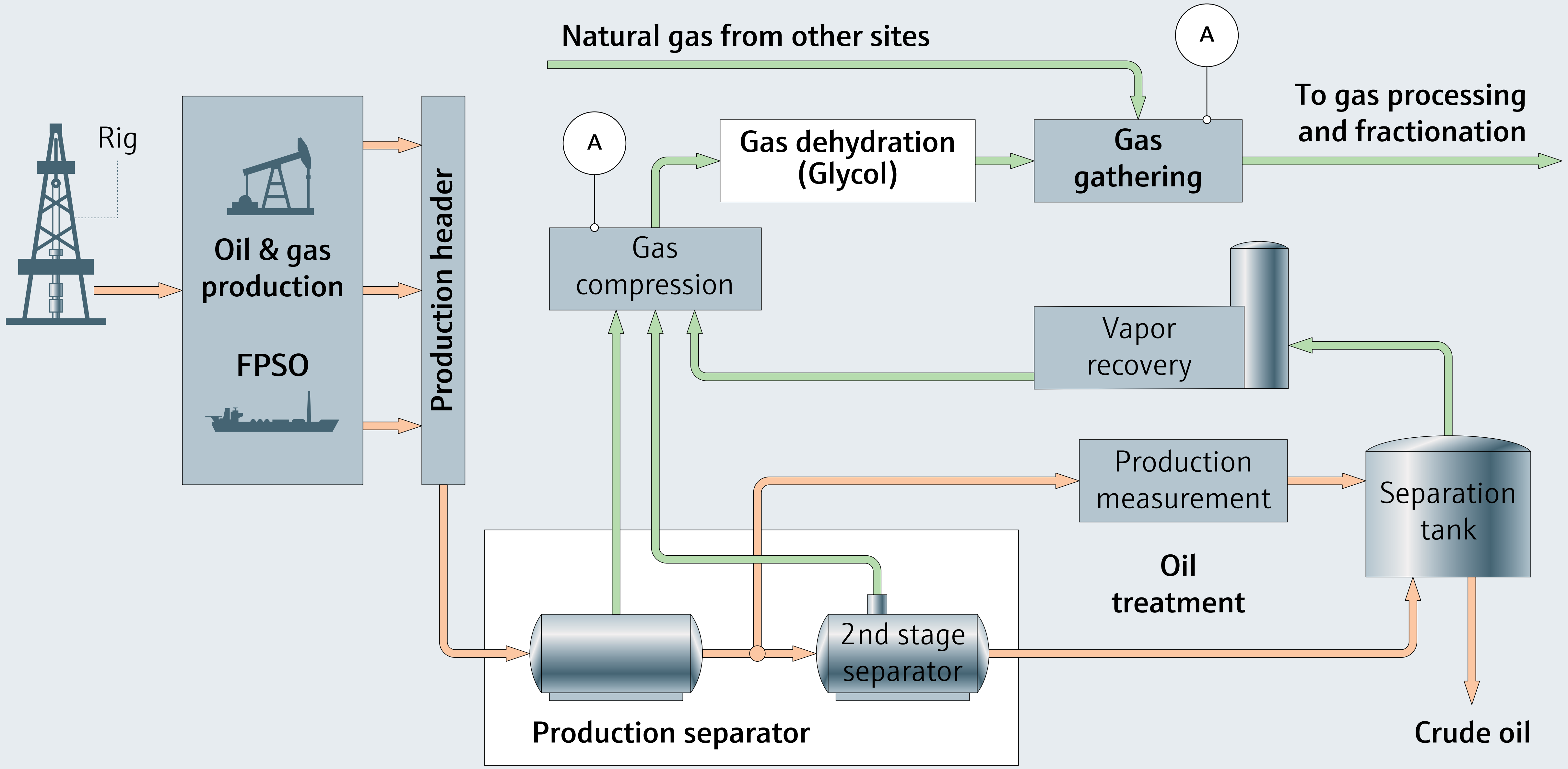
The JT33 TDLAS gas analyzer plays a prominent role in supporting the Oil & Gas industry, from traditional natural gas applications to new emerging markets in the energy ecosystem. Whether in pipelines, plants, or gas streams, H_2S must be measured accurately around the clock to maintain gas quality standards, maximize process efficiencies, and protect asset investments.

- Natural gas pipelines
- Natural gas processing
- LNG
- Refining
- Petrochemical
- Biomethane
- CCUS



Natural gas pipelines

H_2S naturally occurs in most oil and gas reservoirs. When combined with moisture, highly corrosive compounds can form in pipelines, compressor stations, and other distribution points. Upstream producers can employ multiple strategies to sweeten the natural gas to reduce the H_2S. Continuous measurement is important to optimize the gas sweetening process, prevent corrosion, and ensure the final product meets natural gas quality specifications.



Your challenge
Measuring task: H_2S measurement
Measuring points: Natural gas separators, compressors, and gathering pipelines
Measuring range: 0-10 to 0-500 ppmv
Composition: Raw natural gas with heavier hydrocarbons, oxygen and other contaminants

Our answer
The **JT33 TDLAS gas analyzer** provides reliable, 24/7 H_2S measurement to enable gas pipeline operators to optimize gas sweetening processes, prevent corrosion, minimize the risk of an uncontrollable event, and ensure that product quality specifications are met so that the gas can be transported via pipeline.

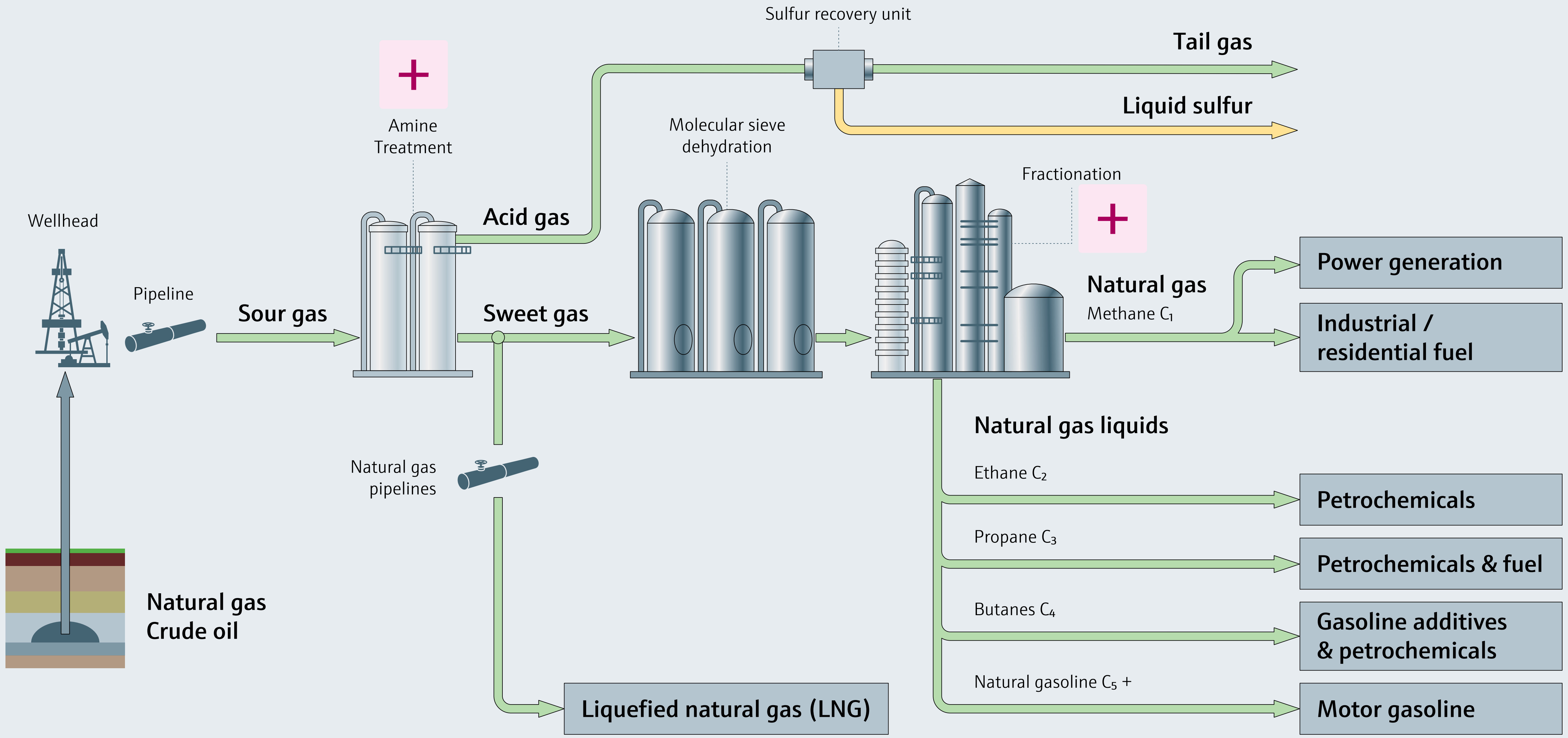
Natural gas processing

Raw natural gas is a complex mixture of methane, hydrocarbon condensates (natural gas liquids - NGLs), water, and contaminants such as H_2S. Natural gas processing involves separating methane (CH_4) from other hydrocarbons, fluids, and contaminants entrained in raw wellhead gas to produce pipeline-quality natural gas.

Key processing steps include amine treatment to remove H_2S from sour gas and fractionation to separate and recover NGLs (ethane, propane, butane) from pipeline quality natural gas. Reliable H_2S measurement at these stages is important to optimize processes, assure gas quality, and protect assets.

Amine treatment and gas sweetening

NGL fractionation



Your challenge
Measuring task: H_2S measurement
Measuring points: Inlet and outlet of amine treatment or solid scavenger, NGL fractionation
Measuring range: 0-10 to 0-500 ppmv
Composition: Sour and sweetened natural gas, C_2 to C_4 hydrocarbons

Our answer
The **JT33 TDLAS gas analyzer** performs on-line measurement of H_2S at critical points in the gas treatment process, optimizing applicable specifications. Specifically, accurate H_2S concentration measurement helps you improve process control, meet stringent product specifications, mitigate corrosion damage, and reduce operating costs during gas sweetening and NGL fractionation.

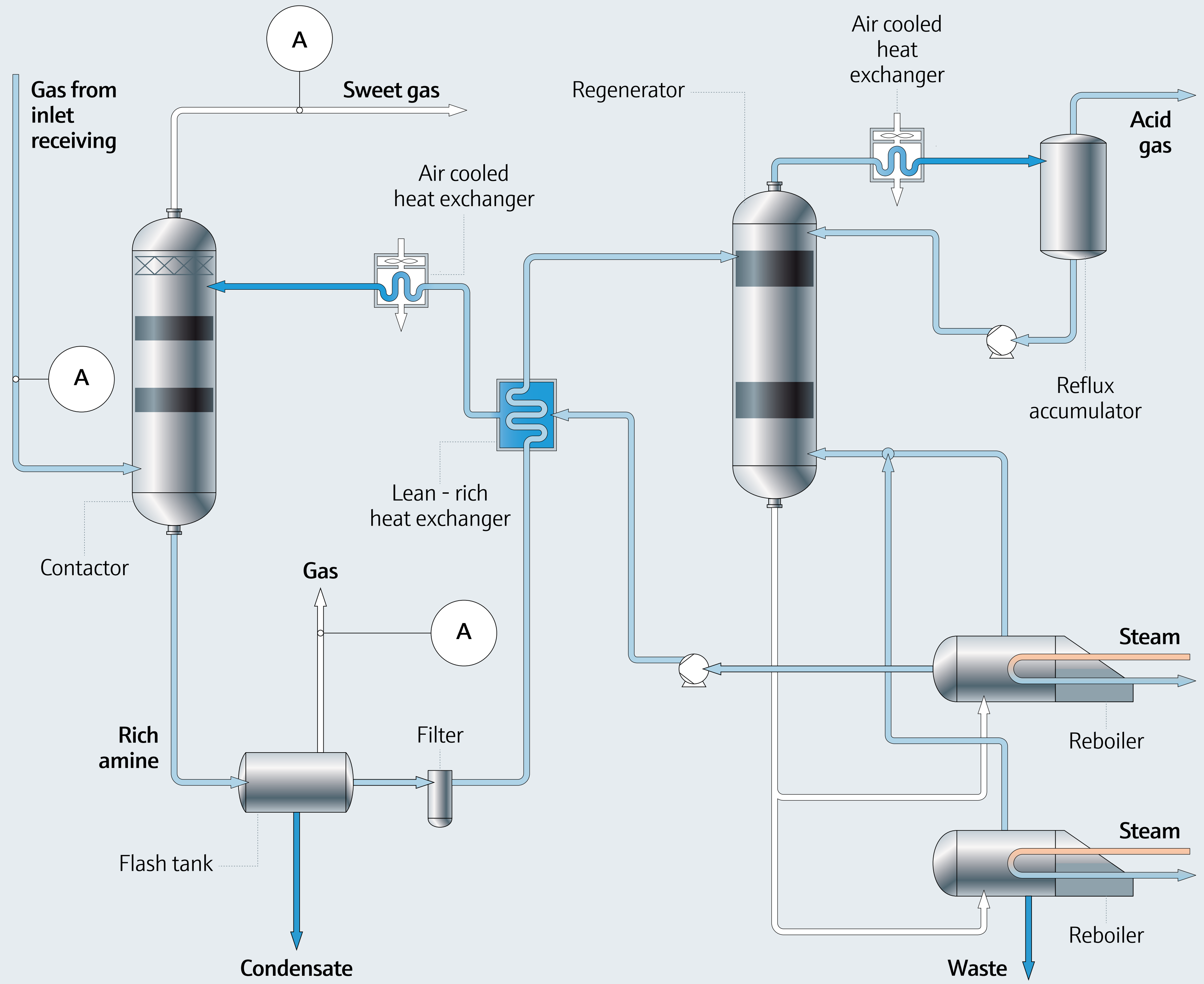
Amine treatment and gas sweetening

Natural gas that contains H_2S in excess of specifications for pipeline-quality gas is generally considered sour gas. Amine treatment units are commonly used in gas processing plants to scrub H_2S from natural gas.

Accurately measuring the H_2S concentration in sour gas at the inlet and the sweet gas at the outlet of the amine treatment unit is important for control and optimization of the treatment process.

NGL fractionation

back to process



Your challenge
Measuring task: H_2S measurement
Measuring points: Amine treatment unit outlet and inlet
Measuring range: 0-10 to 0-500 ppmv
Composition: Sour and sweetened natural gas prior to NGL removal

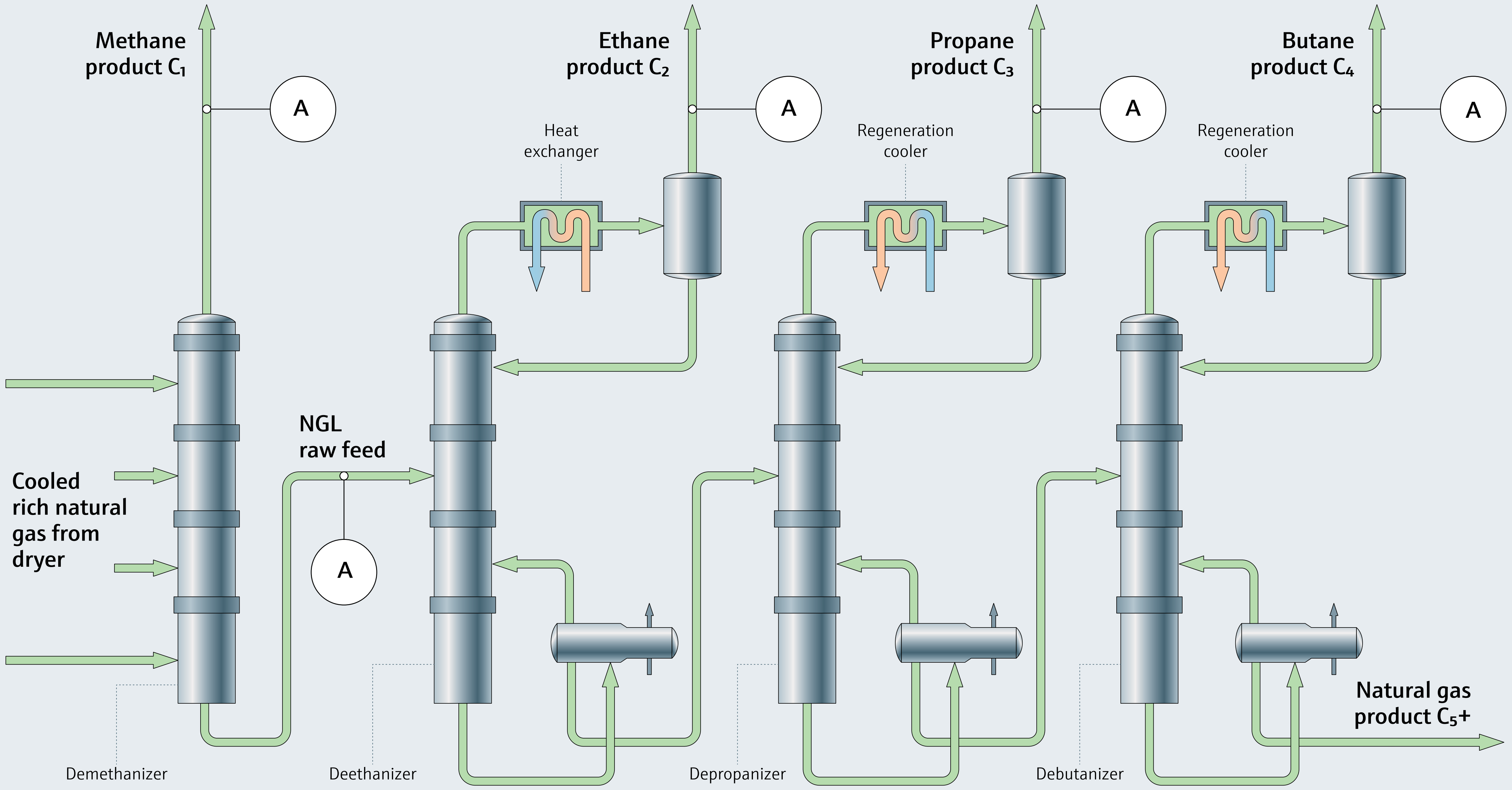
Our answer
The **JT33 TDLAS gas analyzer** continuously measures H_2S concentration in sour gas and sweet gas at inlet and outlet points during amine treatment. Rapid, real-time H_2S measurement allows you to closely monitor and control these processes while safeguarding the integrity of your equipment and ensuring overall gas product quality.

back to process

Natural gas liquid (NGL) fractionation

Wellhead natural gas from some geological formations contains recoverable amounts of natural gas liquids (NGLs): ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), and a mix of C_5+ hydrocarbons. These NGL compounds are commercially valuable as feedstocks for production of petrochemicals, octane-boosting gasoline additives, and for use as fuels.

Cryogenic processing is used to separate NGLs from methane and fractionate the NGL mixture into distinct fractionation products. Purity specifications for NGL fractionation products are based on their intended use and downstream processing. H_2S is one of the key contaminants measured in NGL fractionation products to ensure applicable specifications are met.



Amine treatment and gas sweetening

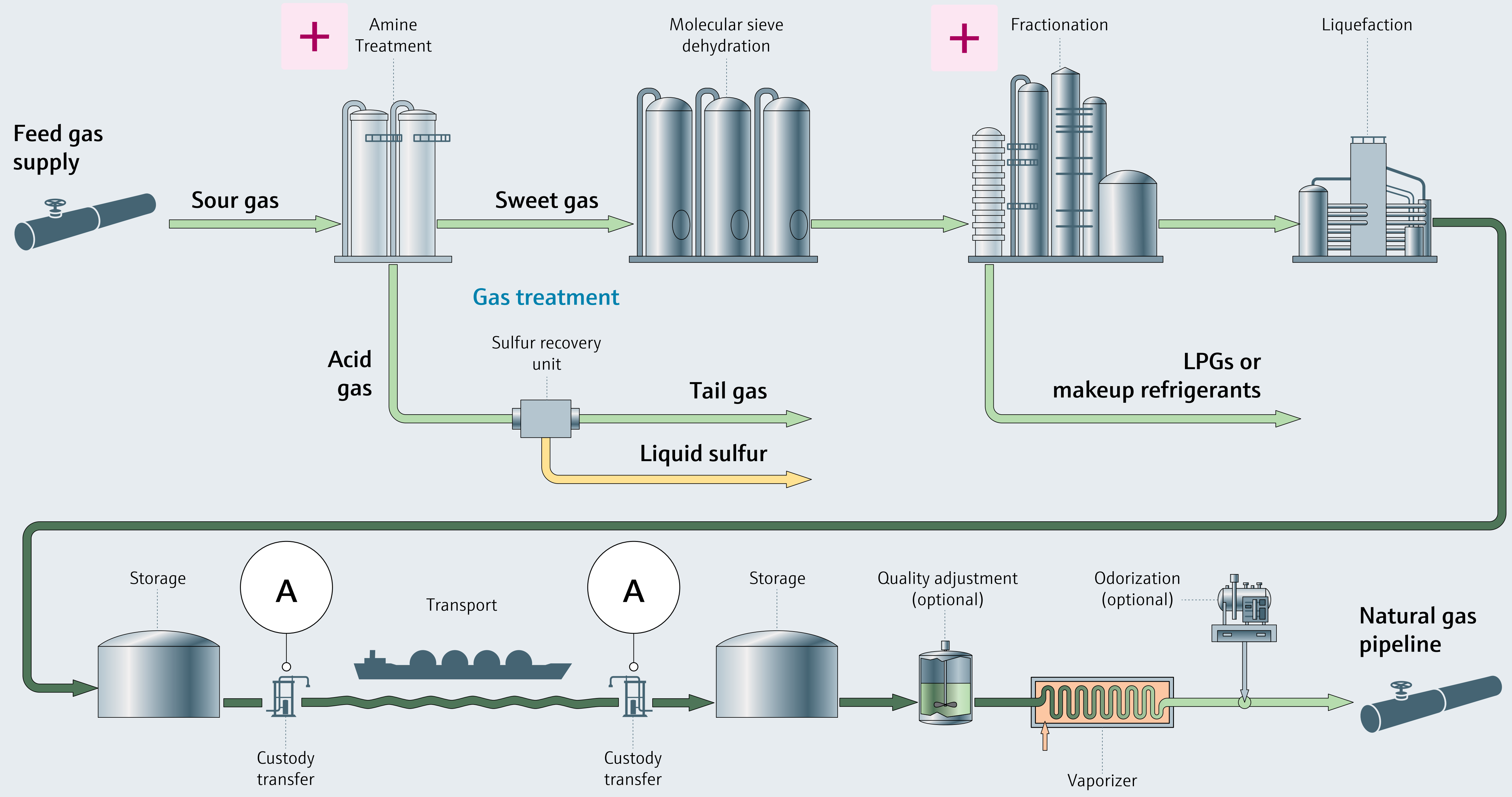
Your challenge
Measuring task: H_2S measurement
Measuring points: Y-grade, ethane, propane, ethane/propane mix, butane
Measuring range: 0-20 ppmv (typical)
Composition: C_1 to C_4 hydrocarbons

Our answer
The **JT33 TDLAS gas analyzer** performs on-line measurement of H_2S in valuable NGL fractionation products (Y-grade, ethane, propane, ethane/propane mix, and butane) to ensure purity specifications are met for their intended use and downstream processing. By detecting levels of H_2S in NGL fractionization processes, the JT33 also helps to protect your assets from corrosion.

Liquefied natural gas (LNG)

Raw natural gas from different geological formations contains varying amounts of acid gas including H_2S. This contaminant must be removed from LNG feed gas to prevent H_2S from exceeding gas quality specifications.

Acid gas containing elevated levels of H_2S is a byproduct of the process which may be fed to a sulfur recovery unit (SRU) to convert and recover elemental sulfur from H_2S in the acid gas. Measuring H_2S concentration in the acid gas stream must be done to optimize the oxidation process occurring inside the SRU.



Amine treatment and gas sweetening in LNG

Natural gas liquid (NGL) fractionation in LNG

Your challenge
Measuring task: H_2S measurement
Measuring points: Amine treatment and fractionation processess
Measuring range: 0-10 ppmv (typical)
Composition: Pipeline quality natural gas which may have already undergone some upstream treatment

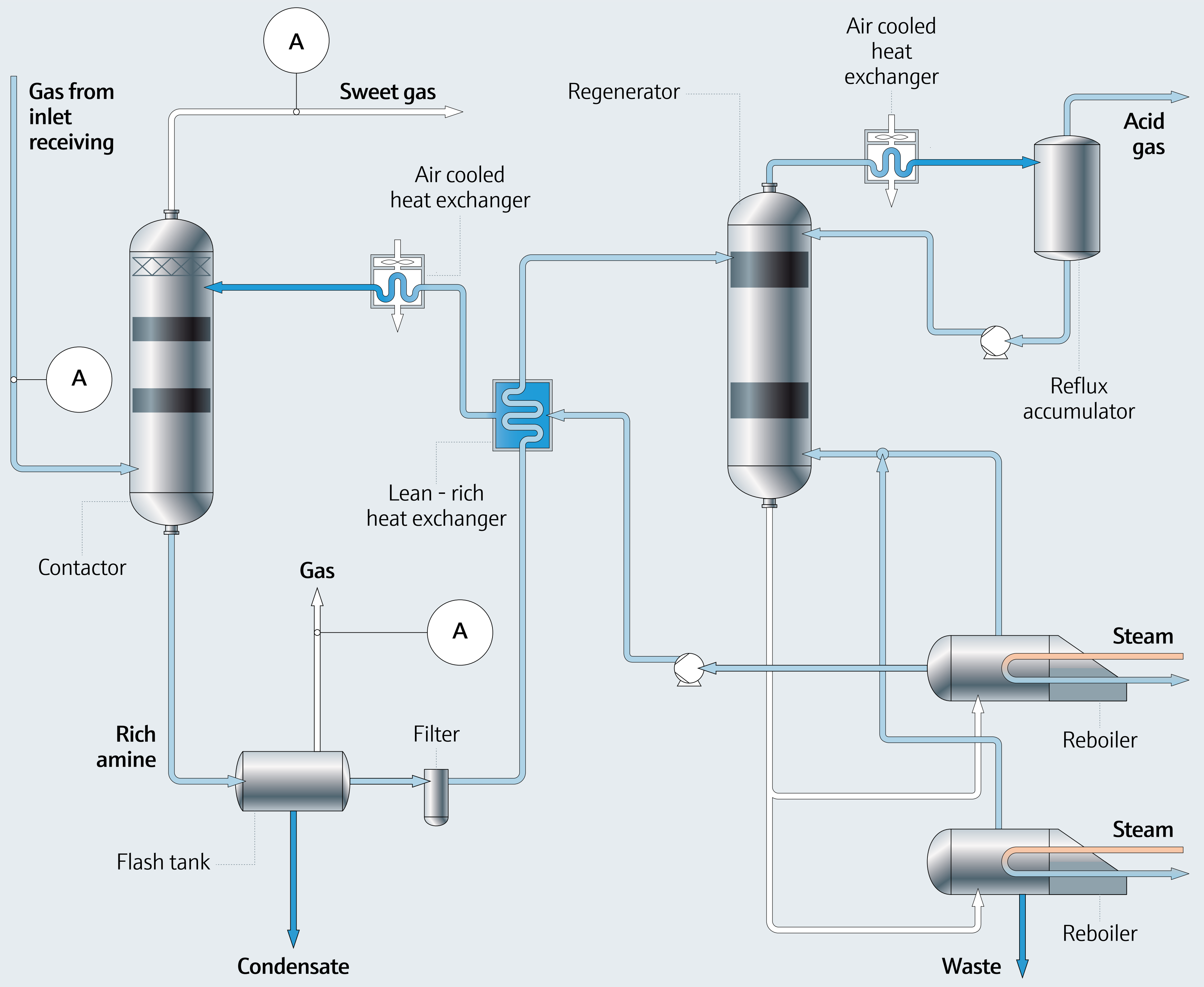
Our answer
The **JT33 TDLAS gas analyzer** provides fast and reliable readings of trace H_2S in LNG gas streams without expensive maintenance delays. The JT33 allows you to monitor H_2S concentration from the feed gas to baseload LNG plant in real time. Such tight process control ensures continuous, uninterrupted operation of liquefaction trains and on-time LNG loading and shipments.

back to LNG

Amine treatment and gas sweetening in LNG

Amine treatment is the most common process employed in LNG plants to scrub H_2S from natural gas prior to liquefaction. The treatment process must reduce the concentration of H_2S below 4 ppm to avoid corrosion and meet custody transfer specifications.

At the inlet and outlet to the amine treatment unit, accurate and continuous H_2S measurement is crucial.



NGL fractionation for LNG

Your challenge

Measuring task: H_2S measurement

Measuring points: Amine treatment unit outlet and inlets

Measuring range: 0-10 ppmv

Composition: Pipeline quality natural gas which may have already undergone some upstream treatment

Our answer

The **JT33 TDLAS gas analyzer** provides reliable on-line monitoring of H_2S concentration in sour gas at the inlet and sweet gas at the outlet of an amine treatment unit. The JT33 provides fast and accurate low ppm-level measurements under varying operating conditions and feedstocks in real time. In doing so, you can optimize gas sweetening processes while enhancing the efficiency and safety of assets and personnel across your LNG plant.

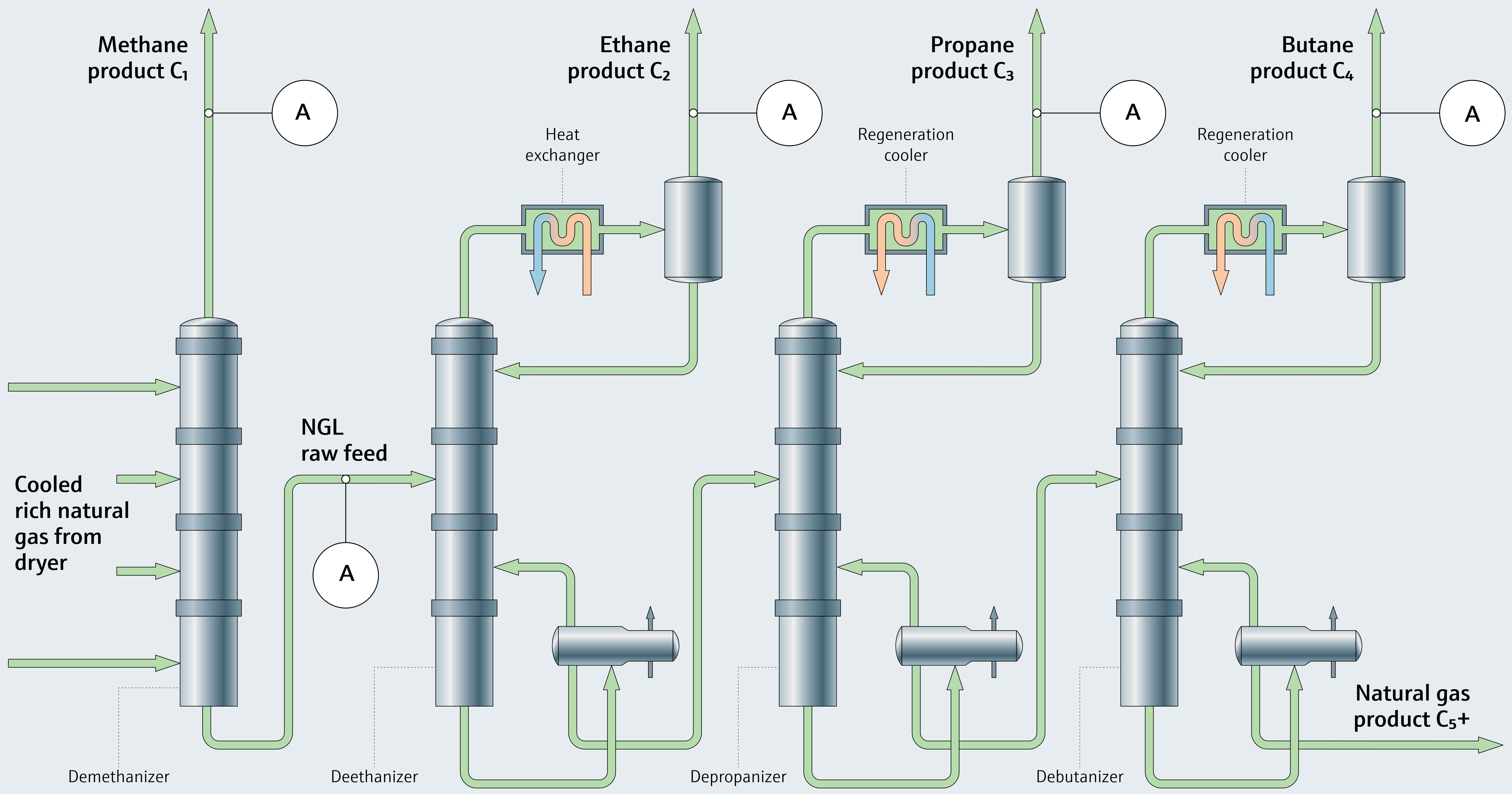
back to LNG

Natural gas liquid (NGL) fractionation in LNG

Natural gas must be purified prior to liquefaction and transport. Depending upon the source of natural gas, some amounts of natural gas liquids (NGLs) may be present. These other hydrocarbons have different dewpoints which interfere with the liquefaction process. In addition, these NGL compounds are commercially valuable as feedstocks for production of petrochemicals, octane-boosting gasoline additives, and for use as fuels.

Cryogenic processing is used to separate NGLs from methane and fractionate the NGL mixture into distinct fractionation products. Purity specifications for NGL fractionation products are based on their intended use and downstream processing. H_2S is one of the key contaminants measured in NGL fractionation products to ensure applicable specifications are met.

Amine treatment and gas sweetening in LNG



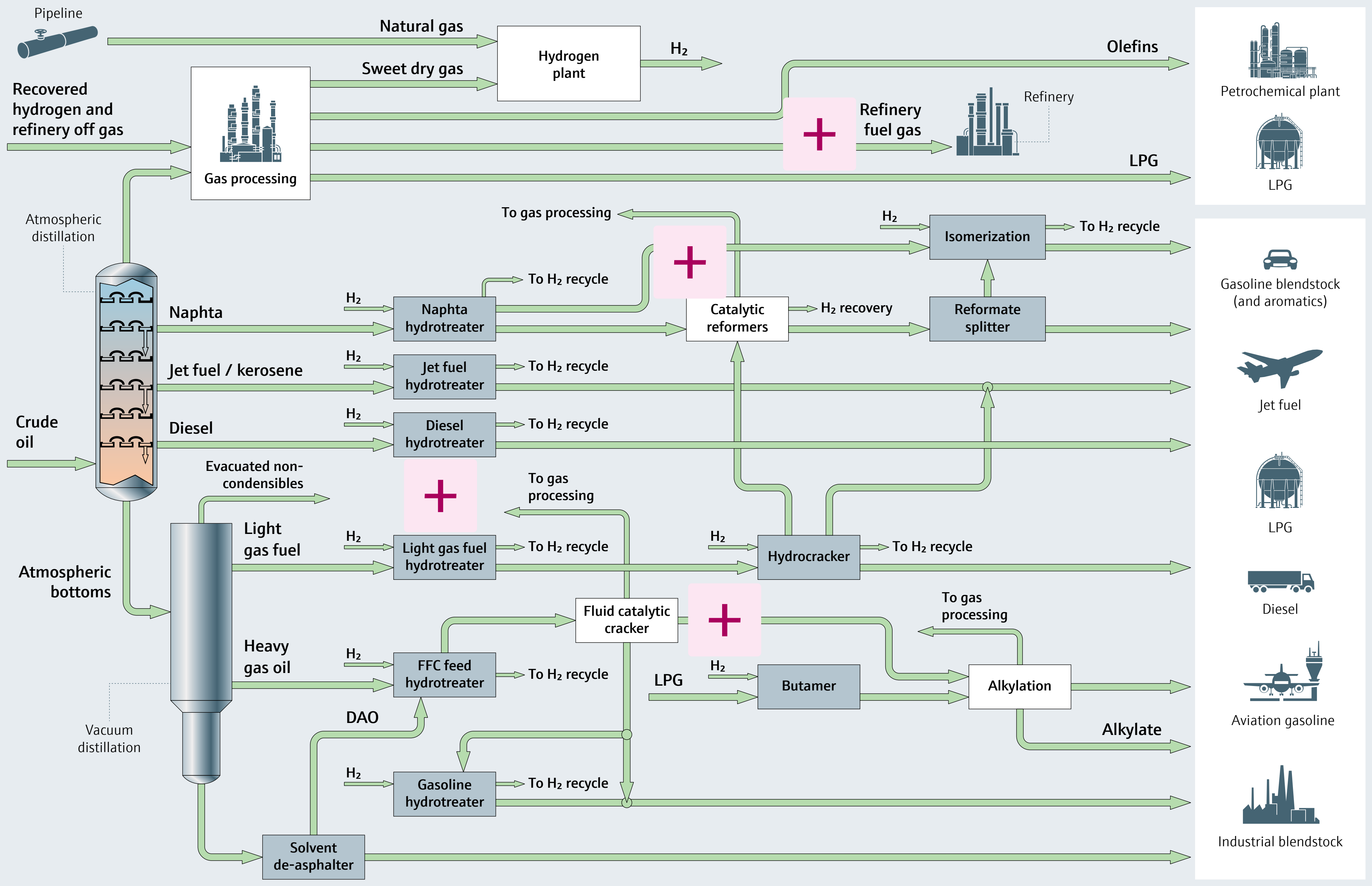
Your challenge
Measuring task: H_2S measurement
Measuring points: Y-grade, ethane, propane, ethane/propane mix, butane
Measuring range: 0-20 ppmv (typical)
Composition: C_1 to C_4 hydrocarbons

Our answer
The **JT33 TDLAS gas analyzer** performs on-line measurement of H_2S in valuable NGL fractionation products (Y-grade, ethane, propane, ethane/propane mix, and butane) to ensure purity specifications are met for their intended use and downstream processing. By detecting levels of H_2S in NGL fractionization processes, the JT33 also helps to protect your assets from corrosion.

Refining

The design of a refinery gas distribution network and management of gas streams directly affect production capacity. Refineries must produce, recover, treat, and recycle hydrogen and other gases in order to produce low-sulfur clean fuels. To do so, contaminants like H_2S must be removed from refinery gas streams.

On-line monitoring of H_2S provides refineries with the data needed to improve process control, meet product specifications, and mitigate corrosion and catalyst poisoning. It is also used to comply with environmental regulations and treat hydrogen and off-gas streams for use in downstream refinery and petrochemical processes.



Your challenge

Measuring task: H_2S measurement

Measuring points: Hydrogen recycle applications, fuel/flare gas, FCCU propylene production

Measuring range: 0-10 to 0-500 ppmv

Composition: Refinery gases may have C_1 to C_6+ hydrocarbons as well as CO, N_2, and H_2 present

Our answer

JT33 TDLAS gas analyzers perform on-line measurement of H_2S in refinery process gas streams to help control the contaminant and optimize unit operations. By providing reliable, continuous H_2S measurement, the JT33 allows you to boost overall operational efficiency, process yields, and refinery operating margins. With the help of the JT33, you can assure product quality and asset protection in many key refining processes.

Hydrodesulfurization

Fluid catalytic cracker unit (FCCU)s

Semi-regenerative catalytic reformer (SRR)

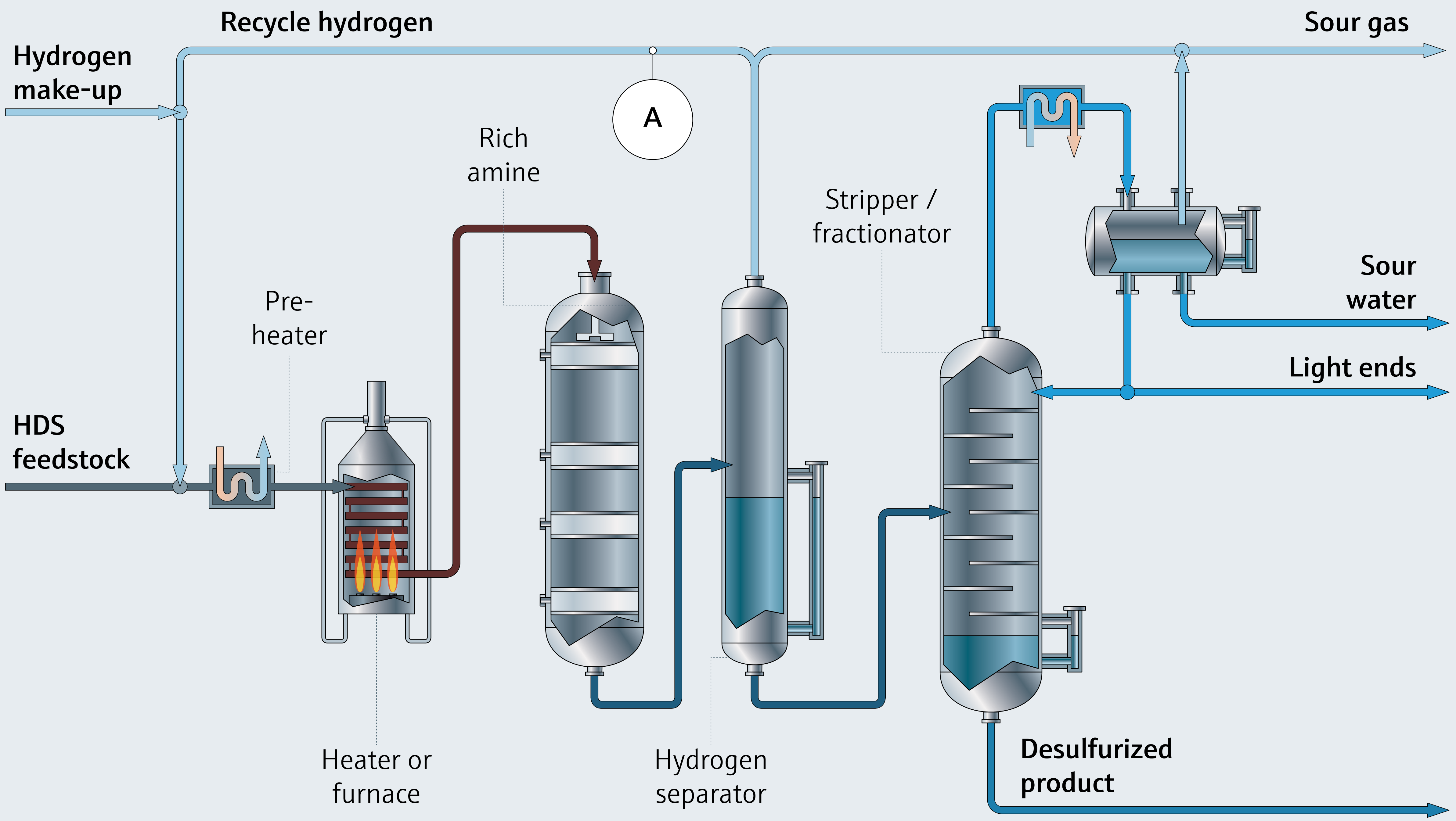
Fuel and flare gases

back to refining

Hydrodesulfurization

Hydrodesulfurization (HDS) is a refinery process unit that uses hydrogen to remove sulfur compounds from liquid hydrocarbon streams such as gasoline, naphtha, and fuel oils. The hydrogen used in the process is recycled through a high-pressure separator. H_2S is measured in the hydrogen recycle gas to ensure the amine treatment removal process is operating efficiently.

The JT33 with TDLAS technology is ideal for this application since the stream composition may vary depending upon the feedstock being treated.



Your challenge

Measuring task: H_2S measurement
Measuring points: Downstream of amine treatment and high-pressure separator
Measuring range: 0-50 to 0-200 ppmv
Composition: 70 to 90% H_2 with trace hydrocarbons present

Our answer

The **JT33 TDLAS gas analyzer** provides on-line monitoring of H_2S in hydrogen backgrounds. The JT33's use of a patented differential spectroscopy technique enables the analyzer to adapt to stream changes caused by changing feedstock. Optional auto-validation ensures that the user will have complete confidence in the measurement accuracy of the analyzer.

Fluid catalytic cracker units (FCCUs)

Semi-regenerative catalytic reformer (SRR)

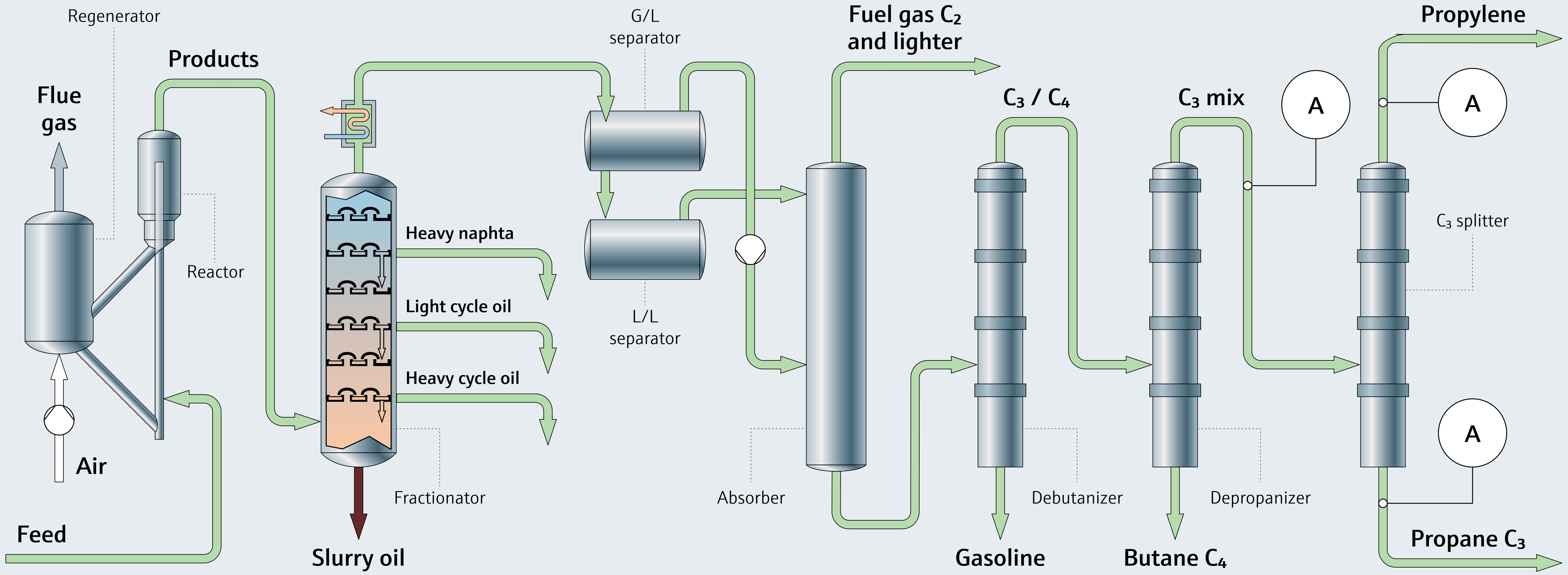
Fuel and flare gases

back to refining

Fluid catalytic cracker units (FCCUs)

Fluid catalytic cracking units (FCCUs) are a major source of the propylene feedstock generated in refinery processes. The yield of propylene from an FCCU varies with feedstock and operating conditions. Refineries operate FCCUs to achieve a balance of gasoline and propylene production. Propylene is then supplied to petrochemical users for additional processing.

The gas plant associated with an FCCU separates fuel gas from C_3 and C_4 gases and gasoline, and contains treatment equipment to remove H_2S and other contaminants from these products. Many downstream petrochemical processes employ catalysts that are highly sensitive to H_2S. Therefore, this contaminant must be removed from C_3 propane/propylene mixtures to avoid carryover into the separated propane and propylene product streams.



Your challenge
Measuring task: H_2S measurement
Measuring points: Outlet of depropanizer and C_3 splitting columns
Measuring range: 0-20 ppmv
Composition: Pure propane and propylene as well as blended C_3 mix

Our answer
The **JT33 TDLAS gas analyzer** provides on-line monitoring of H_2S in C_3 mix and the separated propane and propylene product streams. This gives you confidence that purity specifications are being met for downstream refinery and petrochemical production processes. The JT33's use of a patented differential spectroscopy technique enables detection and quantitation of low ppm levels of H_2S in propane/propylene mixtures without interferences from other contaminants and stream changes.

Hydrodesulfurization

Semi-regenerative catalytic reformer (SRR)

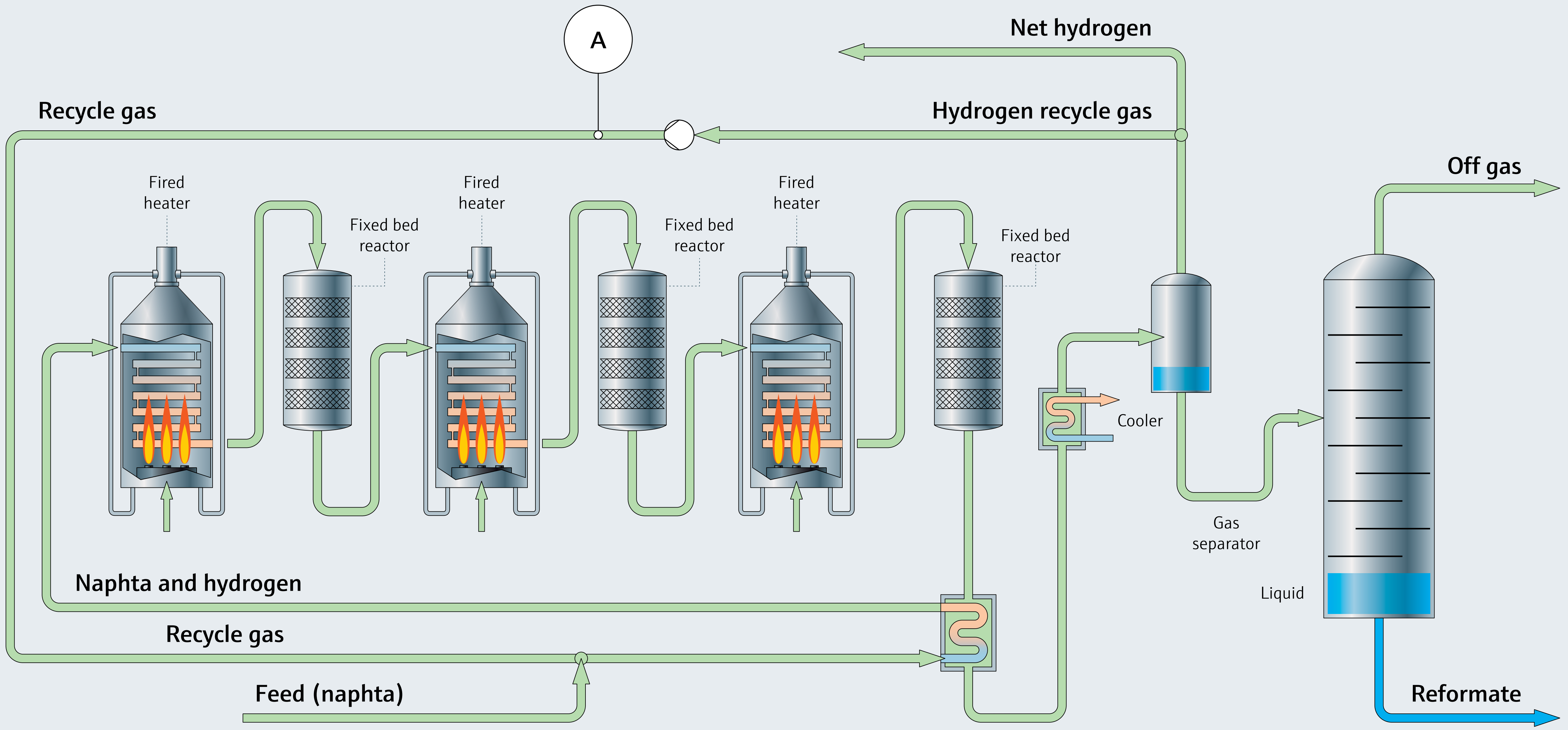
Fuel and flare gases

back to refining

Semi-regenerative catalytic reformer (SRR)

Catalytic reformers convert naphtha into high-octane aromatic compounds used in gasoline blending and yield large quantities of hydrogen which is recycled and used in other refinery processes. A semi-regenerative catalytic reformer (SRR) unit has three fixed bed catalytic reactors employing a platinum/rhenium catalyst on a chloride alumina support. Water and an organic chloride compound are continuously injected to maintain acid sites needed to perform the conversion reactions.

Inside an SRR, sulfur compounds are converted into H_2S which is entrained in the recycle and net hydrogen streams. On-line monitoring of H_2S in the hydrogen recycle gas helps prevent poisoning of the platinum/rhenium catalyst.



Your challenge
Measuring task: H_2S measurement
Measuring points: Hydrogen recycle gas downstream of the compressor
Measuring range: 0-10 to 0-300 ppmv
Composition: 70 to 90% H_2 with trace hydrocarbons present

Our answer
The **JT33 TDLAS gas analyzer** offers reliable on-line monitoring of H_2S in the hydrogen recycle gas. With continuous H_2S measurement in real time, you can avoid the risk of poisoning the platinum/rhenium catalyst and keep your SRR in operation, possibly saving hundreds of thousands of dollars per day in lost production.

Hydrodesulfurization
Fluid catalytic cracker units (FCCUs)
Fuel and flare gases

Fuel and flare gases

Refinery fuel gas is composed of a mixture of hydrogen and C_1 to C_5 hydrocarbons recovered from different unit operations within a refinery for use as fuel in fired heaters and boilers. Sulfur (SO_2) emissions from combustion of fuel gas and flare systems are heavily regulated around the globe.

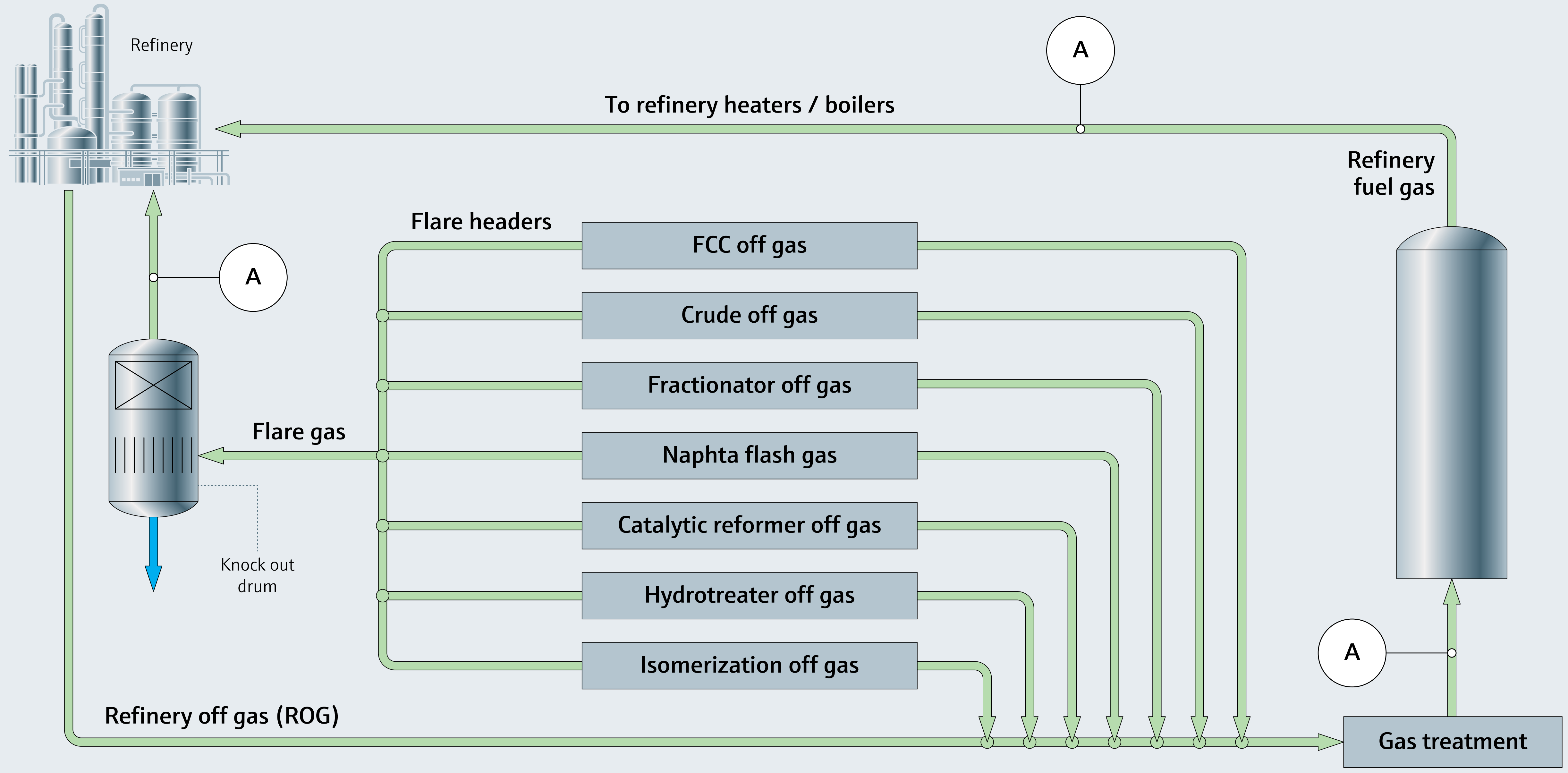
The U.S. EPA recognizes that measurement of H_2S gives a good approximation of the total SO_2 that is generated from combustion of refinery fuel and flare gases. The required measurement range for H_2S in fuel gas is 0–300 ppmv. The regulatory limit is 162 ppmv. One measurement every 15 minutes (96 times / day) is required to meet U.S. EPA requirements for continuous emissions monitoring. For flare gas, H_2S levels must not exceed 162 ppmv over a three-hour rolling average time period (approximately 500 lbs. of SO_2 in any 24-hour period). Similar regulations aimed at reducing SO_2 emissions have been promulgated in Europe, the Middle East, and Asia.

Hydrodesulfurization

Fluid catalytic cracker units (FCCUs)

Semi-regenerative catalytic reformer (SRR)

back to refining



Your challenge
Measuring task: H_2S measurement
Measuring points: Off-gas from refinery processes or downstream of gas treatment
Measuring range: 0-300 ppmv
Composition: Gas can be a mixture of hydrocarbons, hydrogen, carbon monoxide, nitrogen, and oxygen

Our answer
The **JT33 TDLAS gas analyzer** delivers accurate, 24/7 H_2S measurement results in refinery fuel and flare gas systems to allow you to meet worldwide regulatory requirements aimed at reducing SO_2 emissions.

The JT33 offers 2-point validation which is important to confirm that the analyzer is operating properly within its calibration range (a requirement for U.S. EPA compliance).

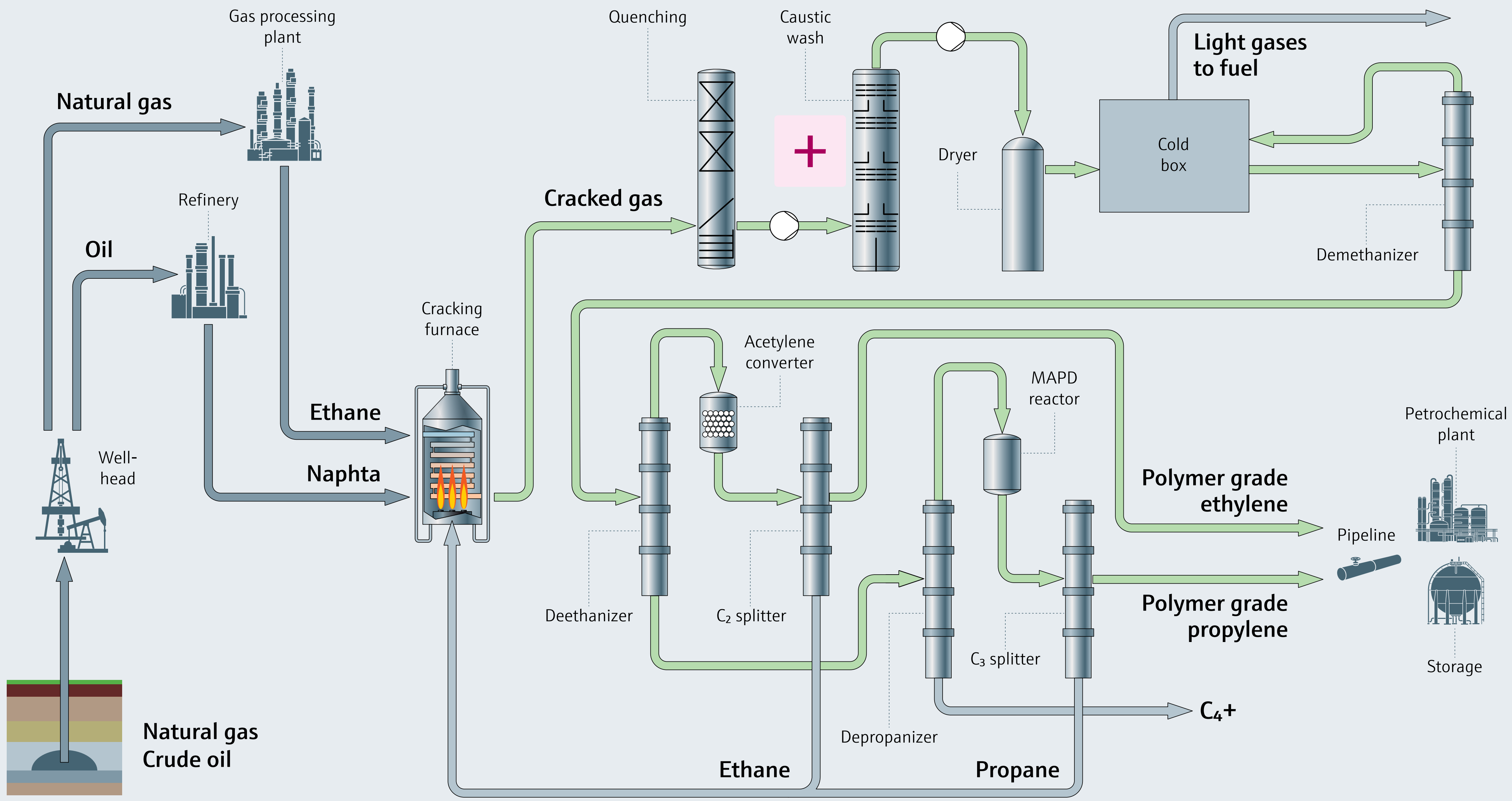
Petrochemical

Petrochemical processes create chemical products, such as plastics, from hydrocarbon feedstocks generated by petroleum refining. There are two general classes of petrochemical production – olefins and aromatics.

The JT33 H_2S analyzer is primarily used in olefin production where lighter, gas-phase hydrocarbons, such as ethane and propane, are further processed to generate polypropylene and ethylene. H_2S is considered an undesirable contaminant in many of these processes. Therefore, it must be monitored and removed for quality and safety reasons.

The unit operations of a petrochemical plant may have some similarities to a refinery.

Caustic wash treatment



Your challenge
Measuring task: H_2S measurement
Measuring points: Various fractionation stages; caustic wash tower in olefins production
Measuring range: 0-10 to 0-500 ppmv
Composition: Methane, C_2 and C_3 gases, hydrogen, and cracked gas

Our answer
JT33 TDLAS gas analyzers can be configured with stream composition options that match the typical backgrounds found in olefins applications. Factory calibration using these background gases ensures the highest accuracy for your H_2S measurement.

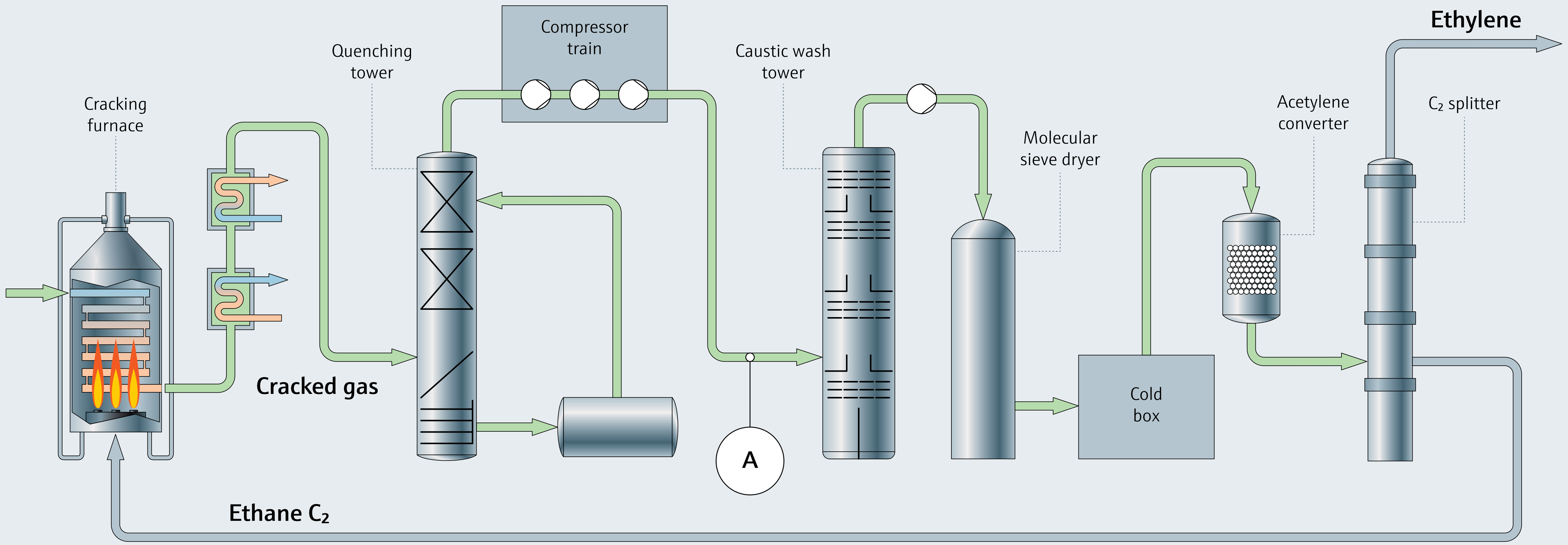
Caustic wash treatment

The acid gas produced by steam cracking of hydrocarbon feed stocks must be treated to remove H_2S which is corrosive and a catalyst poison. Cracked gas exiting the quench tower is compressed by a multistage compressor. The gas is fed to a caustic wash tower located upstream of the final compression stage.

Inside the caustic wash tower, the gas is contacted with a countercurrent stream of aqueous sodium hydroxide (NaOH). This reacts with H_2S forming sodium sulfide (Na_2S) and sodium hydrosulfate (NaHS) which are absorbed in the liquid phase. Fresh NaOH solution must be added to maintain the efficiency of these scavenging reactions.

H_2S needs to be carefully monitored at the inlet of caustic wash towers to help control NaOH concentration and compensate for changes in H_2S and NaOH depletion.

< back to petrochemical



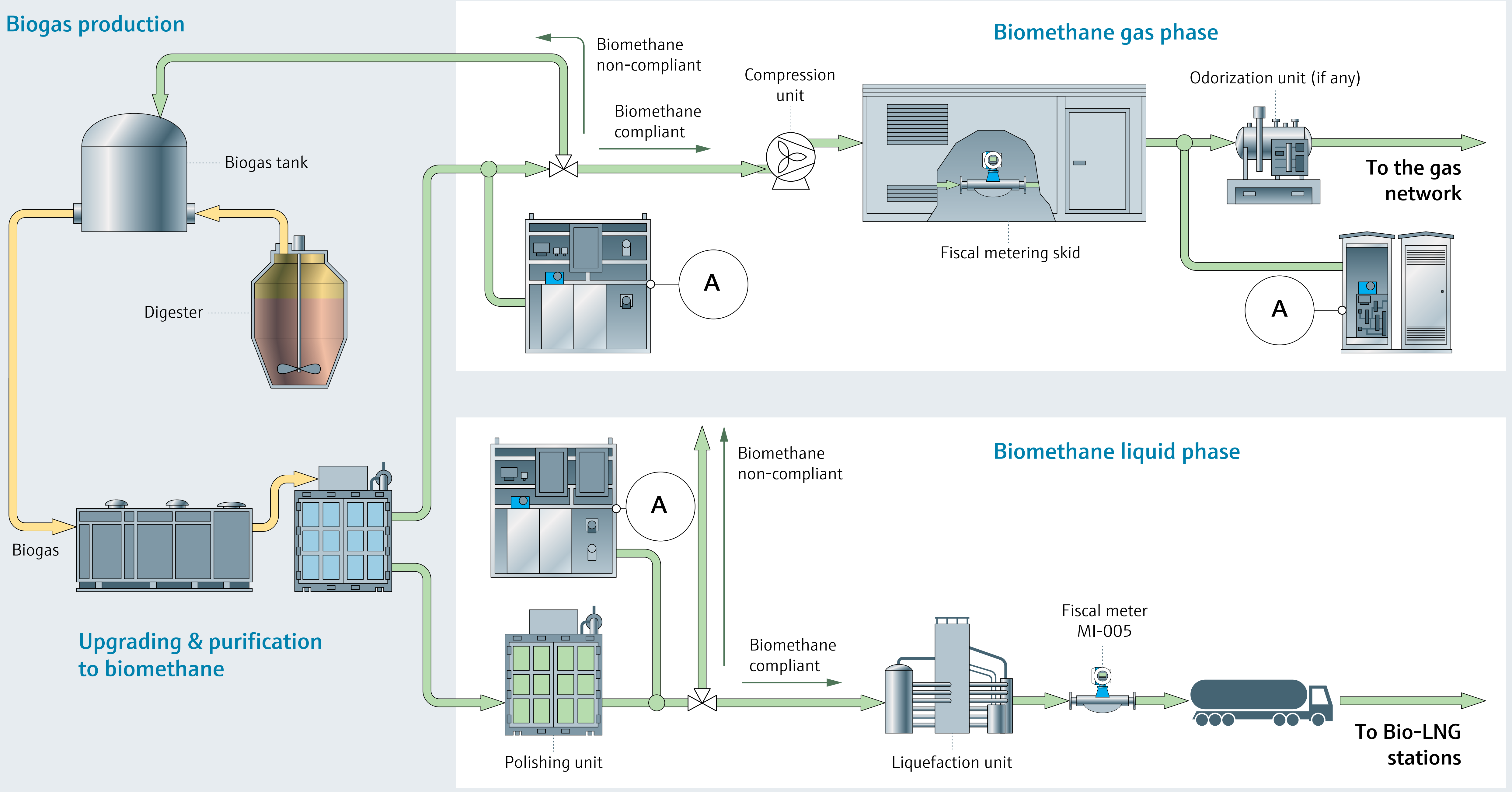
Your challenge
Measuring task: H_2S measurement
Measuring points: Inlet to caustic wash towers
Measuring range: 0-10 to 0-500 ppmv
Composition: A mix of hydrocarbons; primarily methane and hydrogen with smaller percentages of C_2 through C_5+

Our answer
The **JT33 TDLAS gas analyzer** monitors H_2S at the inlet of caustic wash towers to help control NaOH concentration and compensate for changes in H_2S loading and NaOH depletions.

Biomethane

Biomethane, or renewable natural gas (RNG) as it is called in some regions, is produced through the aerobic fermentation of biological material known as biogas. After purification stages, the resulting biomethane is similar in composition to traditional natural gas.

Contaminants such as H_2S may be present in the raw biogas from the digester. The biogas producer must remove these impurities prior to its sale to the gas grid owner. The measurement of H_2S is an important parameter to ensure that the final biomethane meets quality specifications. Final H_2S concentration is agreed upon by both stakeholders. The H_2S concentration is measured as part of the custody transfer process. JT33 TDLAS gas analyzers provide reliable, accurate measurements for each party and ensure that the biomethane producer's purification processes are working properly.



Your challenge
Measuring task: H_2S measurement
Measuring points: Final custody transfer prior to pipeline injection or bioLNG liquefaction
Measuring range: 0-10 ppmv
Composition: Similar to pipeline-quality natural gas

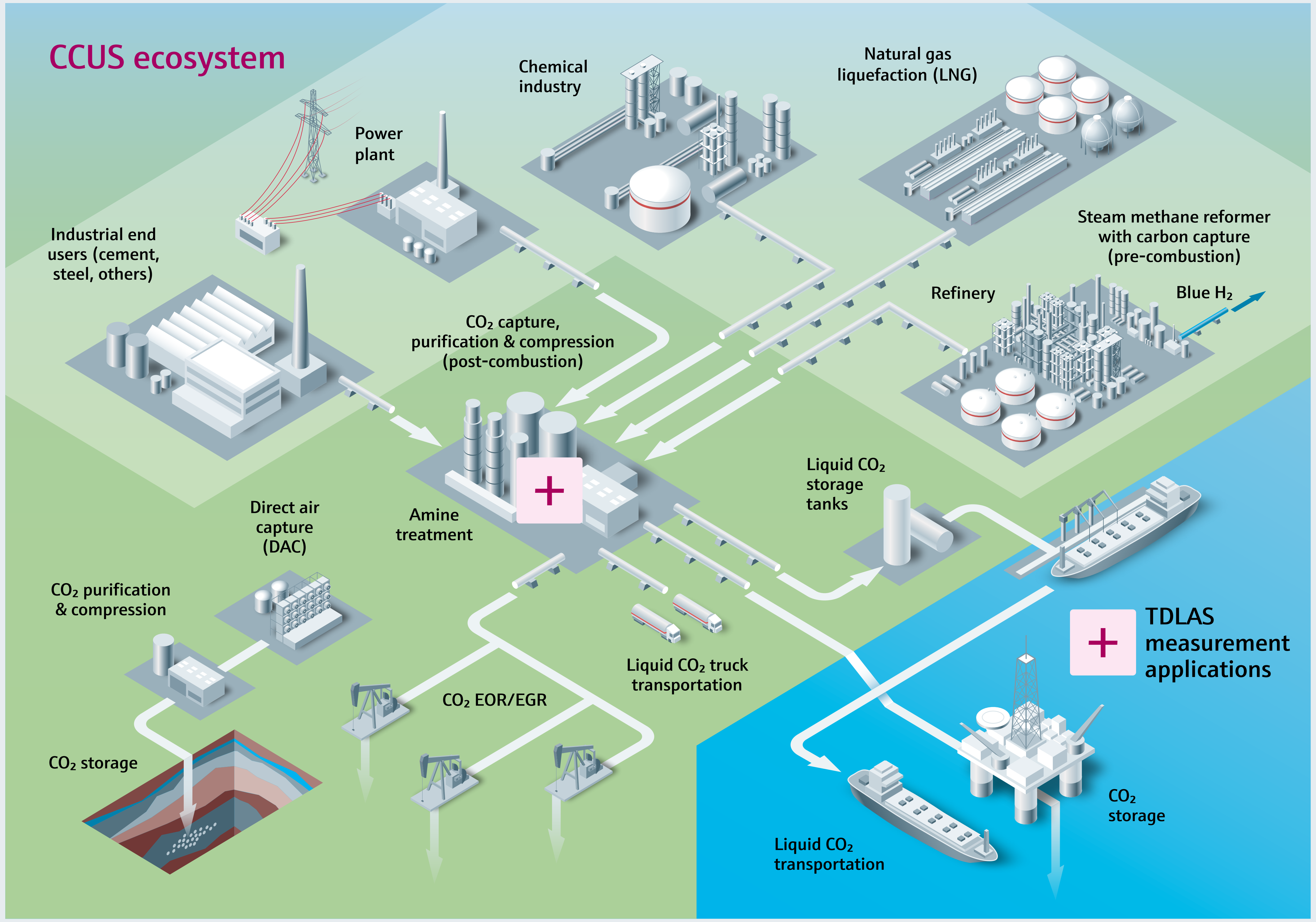
Our answer
JT33 TDLAS gas analyzers prevent corrosion and minimize the risk of an uncontrollable event, ensuring asset integrity in biomethane pipelines. The measurement is also a requirement for custody transfer.

Carbon capture, utilization, and storage (CCUS)

Sulfur compounds may be present in carbon dioxide captured from hydrocarbon processing and various combustion gases. Rapid, reliable analysis of H_2S in carbon dioxide streams is vital to ensure safety, process control, and gas quality for CCUS applications.

CCUS measurement challenges are that CO_2 pipelines can be susceptible to corrosion, and the presence of H_2S can accelerate the corrosion rate. Measuring the concentration of this impurity helps pipeline operators control carbon removal processes and ensure that the CO_2 meets quality specifications. Rapid, reliable readings of these compounds provide process validation, enable regulatory compliance, and ensure pipeline integrity.

Amine treatment in CCUS



Your challenge
Measuring task: H_2S measurement
Measuring points: Amine treatment and CO_2 storage
Measuring range: 0-10 to 0-500 ppmv
Composition: 90 to 100% CO_2 with other trace impurities

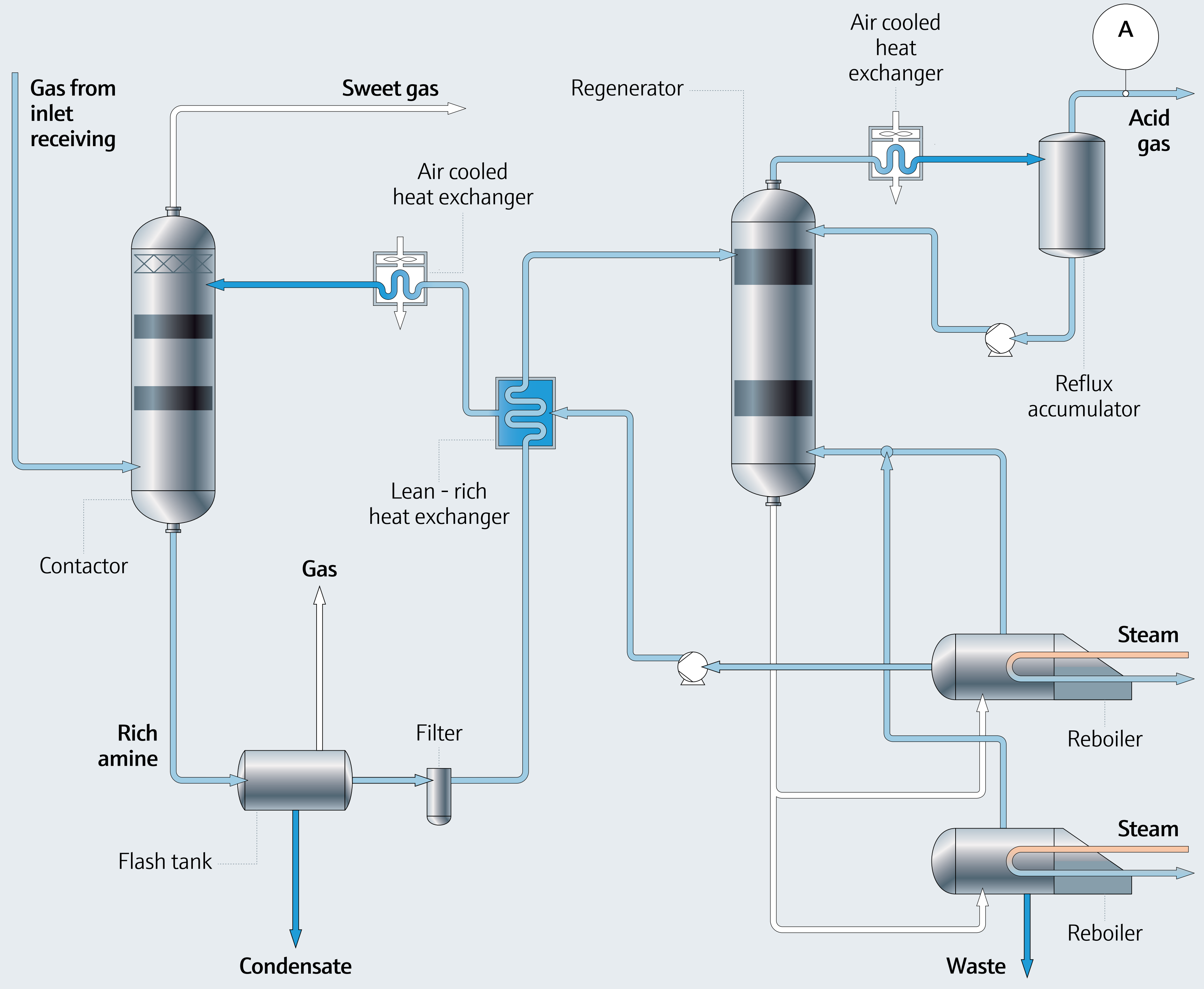
Our answer
The **JT33 TDLAS gas analyzer** arms you with the H_2S measurement data you need to monitor your carbon capture processes and ensure that CO_2 meets quality specifications.

< back to CCUS

Amine treatment in CCUS

Amine treatment is one of the most frequent methods to remove carbon dioxide from various industrial gas processes. Often, if the gas stream being treated has hydrogen sulfide, it may carryover into the purified CO_2 stream at the acid gas outlet of the amine treatment process. H_2S must be measured and removed prior to compression and injection into CO_2 pipelines.

The TDLAS technology in JT33 allows for part-per-million H_2S measurement in the pure CO_2 background with no measurement interference. The quick response of the measurement can be used to recirculate off-spec CO_2 back through the amine treatment process should H_2S be present.



Your challenge
Measuring task: H_2S measurement
Measuring points: Acid gas outlet of the amine treatment process
Measuring range: 0-10 to 0-500 ppm
Composition: 90 to 100% CO_2 with other trace impurities

Our answer
The **JT33 TDLAS gas analyzer** has flexible, user selectable background options to accommodate the high concentration CO_2 stream that H_2S will be measured in. The wavelength is highly specific to H_2S; therefore, CO_2 poses little to no interference and you can obtain a highly accurate measurement.

TDLAS measuring principle

Proven laser-based optical technology for rapid, reliable analyte measurement

Tunable diode laser absorption spectroscopy (TDLAS) is a laser-based optical technique to detect and measure the concentration of impurities in process gas streams.

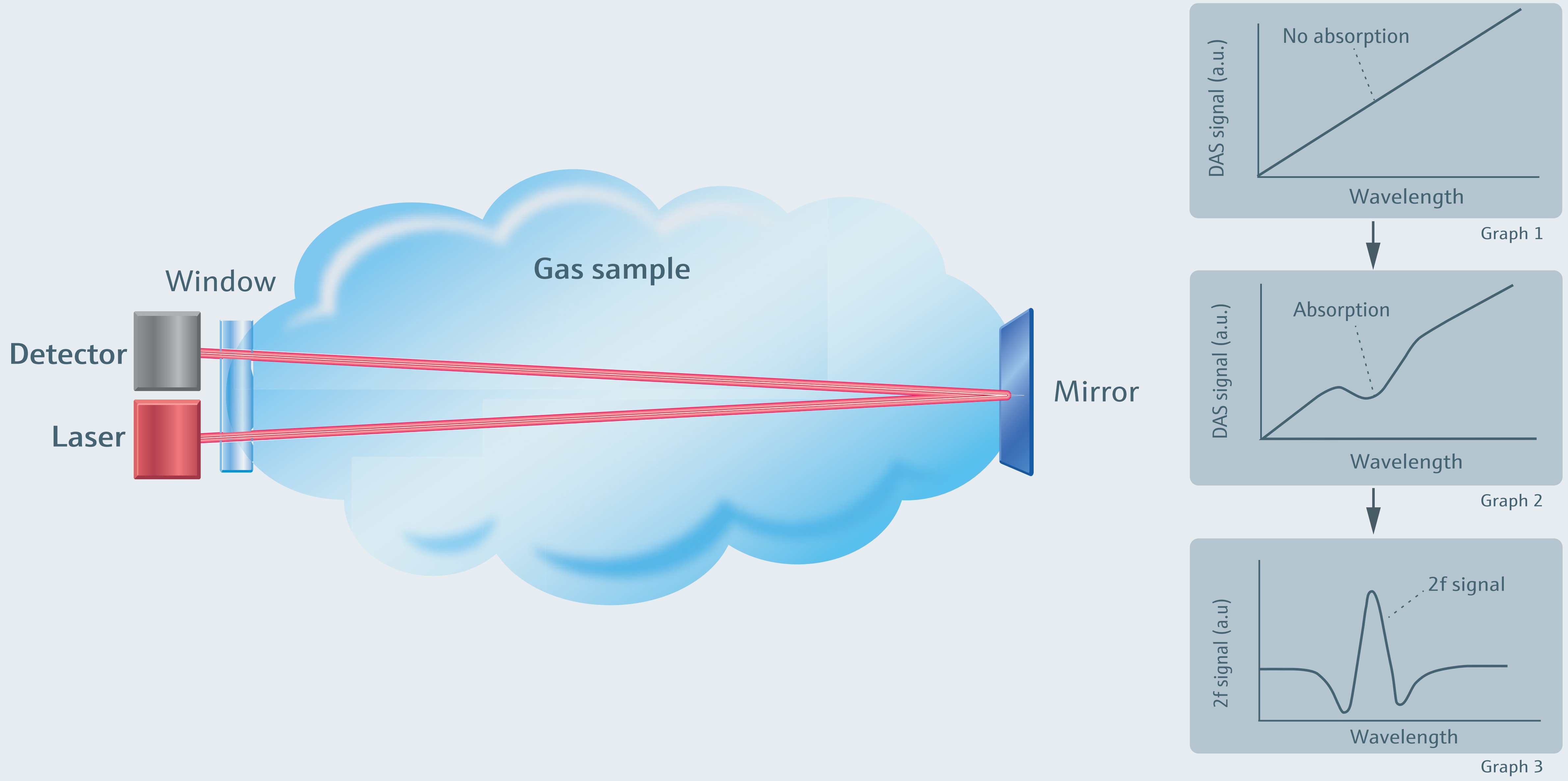
In normal operation, process gas from a sampling probe is introduced to the sample cell of the TDLAS analyzer. A tunable diode laser emits a light with a specific near-infrared (NIR) or visible wavelength that can be absorbed by H_2S molecules.

The laser light enters the sample cell, passes through the gas, gets reflected by one or more mirrors, and is finally aimed into a photodiode detector.

A window isolates the laser and detector from the process gas. Using this design, measurements can be performed with absolutely no contact between the process gas (and entrained contaminants) and critical analyzer components.

H_2S molecules in the gas sample absorb and reduce the intensity of light in direct proportion to their concentrations according to the Lambert-Beer law.

Differential technology



The system measures the transmitted laser intensity as a function of the scanned laser wavelength as depicted in Graph 1 and 2 above. Graph 1 has no absorption and Graph 2 has significant absorption as indicated by the “dip” in intensity at a specific wavelength. To improve detection sensitivity over simple direction absorption spectroscopy (DAS), wavelength modulation spectroscopy (WMS) with second harmonic (2f) detection is employed. The 2f signal is illustrated in Graph 3.

This approach significantly improves the signal-to-noise ratio supporting high-sensitivity measurements. The 2f signal is processed using advanced algorithms to calculate analyte concentration in the process gas.

Differential technology

A patented spectral subtraction TDLAS technique for accurate trace-level measurement of H_2S

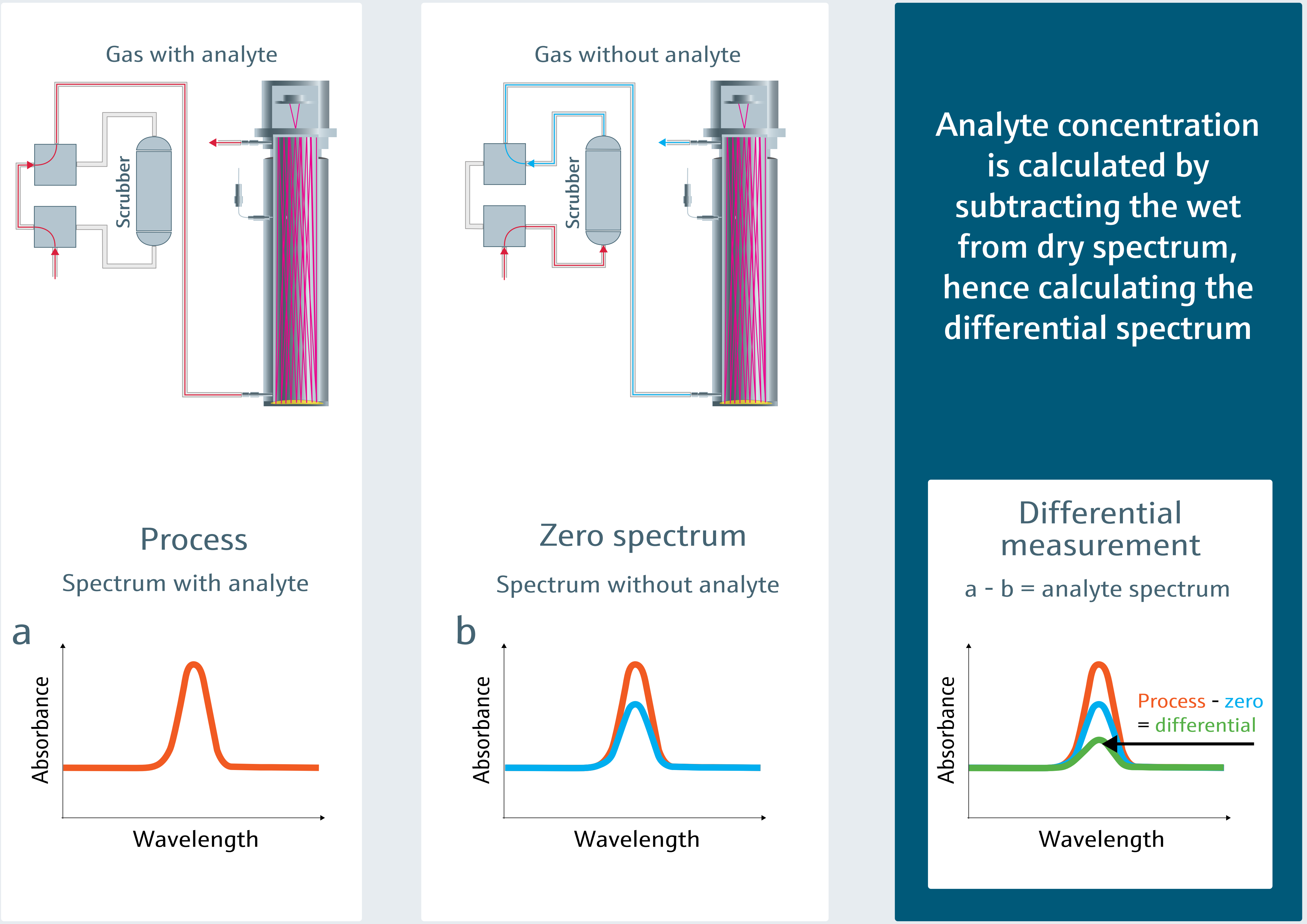
TDLAS analyzer systems, powered by SpectraSensors TDLAS technology, include a patented spectral subtraction technique that enables trace-level (sub-ppm) measurements of H_2S to be made when a process gas sample contains very low levels of an analyte and background gas interferences.

In operation, the TDLAS analyzer performs a sequence of steps to obtain a "zero" or "dry" spectrum and "process" or "wet" spectrum that are used to calculate analyte concentration by spectral subtraction, as depicted in the figure at right.

The dry spectrum is obtained by passing the process gas sample through a high-efficiency scrubber which selectively removes the trace analyte without altering the process gas composition and background absorbance. The analyzer records the resulting dry spectrum of the process gas and automatically switches the sample gas flow path to bypass the scrubber and collect the wet spectrum.

Subtraction of the recorded dry spectrum from the wet spectrum generates a differential spectrum of the trace analyte which is free of background interferences. The analyte concentration is calculated from the differential spectrum.

back to principle



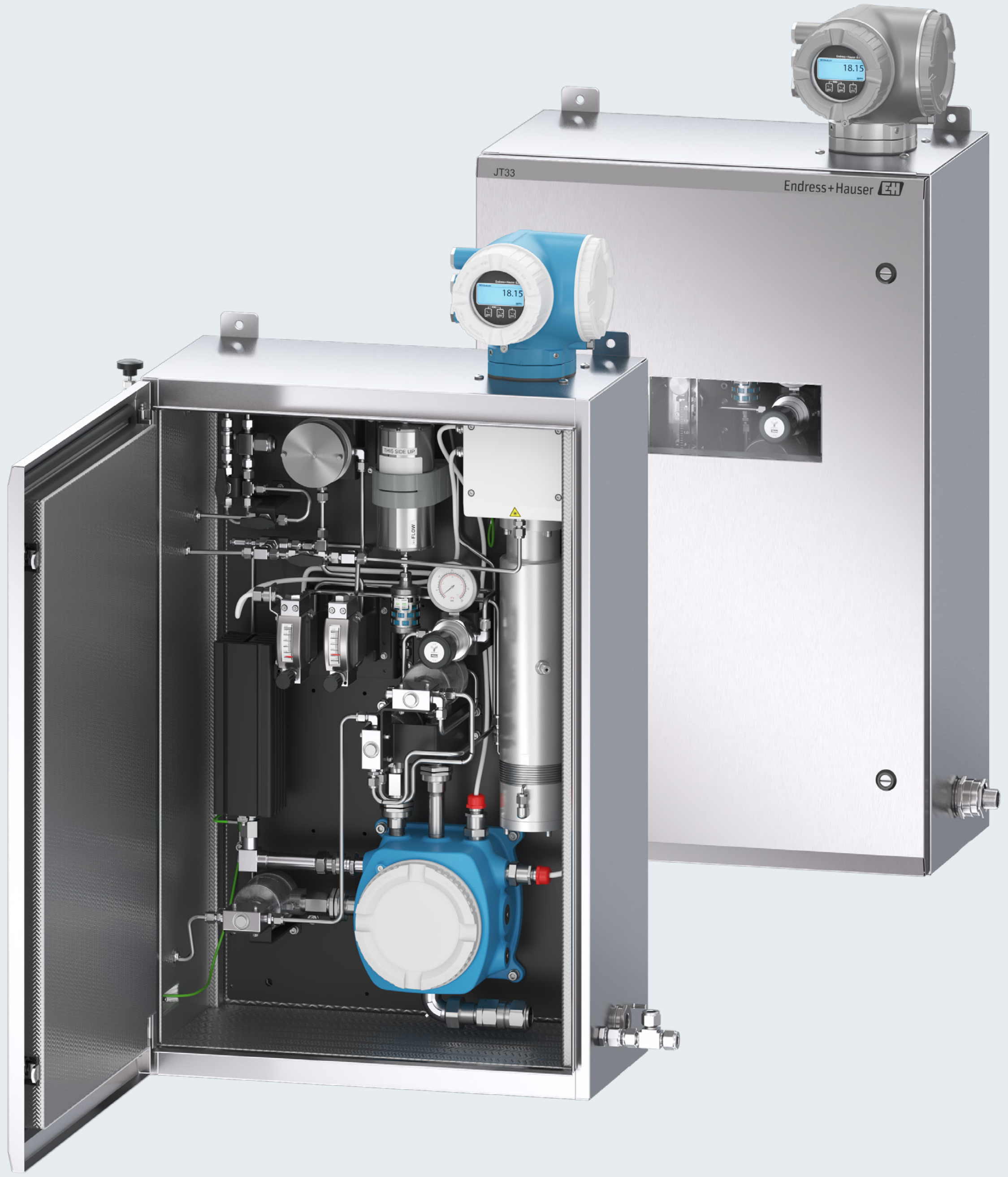
Differential technology uses gas with the analyte (a) and subtracts gas with the analyte removed (b) to calculate the analyte concentration.

Technical data

Understanding JT33 features and options

The JT33 H_2S analyzer has additional options to give the customer flexibility to customize the product for their specific needs.

Target measurement	▪ H_2S (hydrogen sulfide)
Measurement ranges	▪ 0-10 ppm to 0-500 ppm; other ranges by request
Controller operation	▪ Configuration via display or web servers
Outputs and communication	▪ I/O 1: Modbus RTU over RS485 or Modbus TCP over Ethernet ▪ I/O2 and I/O3: software configurable; set as relay output, analog input (4-20 mA), analog output (4-20 mA) or digital/status output
Power supply	▪ Controller: 24 VDC ±20% or 100-240 VAC ±10%, 50/60 Hz, 10W ▪ Sample conditioning system: AC 100 to 240 VAC ±10%, 50/60Hz, 275W
Inlet pressure range	▪ 207 to 310 kPaG (30 to 45 psig)
Sample cell operating pressure range	▪ 800-1200 mbara (atmosphere) or 800-1700 mbara (flare)
Wetted materials including sample measuring cell	▪ 316L stainless steel, FKM O-rings, glass, PCTFE/PTFE
Certifications and marks	



JT33 housing / enclosure

JT33 validation

JT33 sample conditioning

JT33 stream composition

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JT33 housing and enclosure

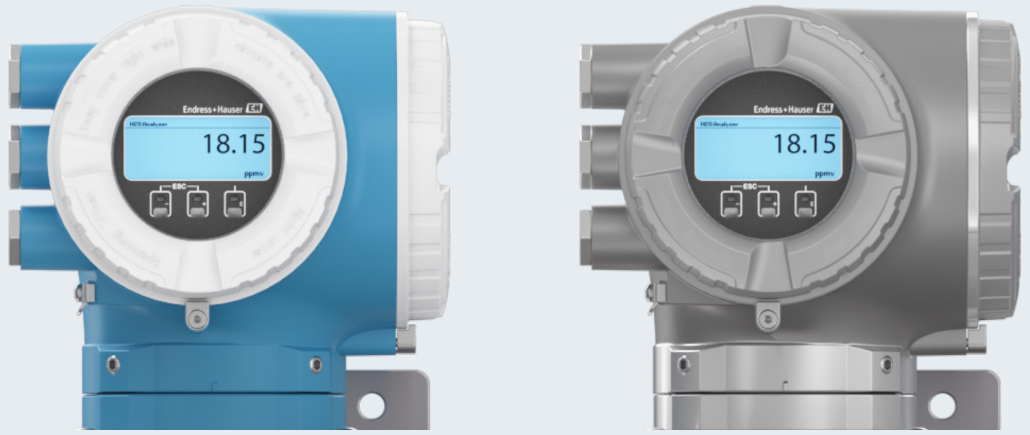
Options for challenging environments

JT33 has several options for users in corrosive atmospheres, such as found in offshore or seaside installations.

JT33 validation

JT33 sample conditioning

JT33 stream composition



Housing material	▪ Epoxy coated aluminum (standard) ▪ Cast stainless (optional)
Display	▪ LCD display* with touchscreen
Operation	▪ Via fieldbus protocol (Modbus RS485) ▪ Via local display (touchscreen) ▪ Via web server

* auto-rotatable depending on mounting position

The housing design incorporates the familiar Endress+Hauser user interface currently used on flow measurement products. The Exd design provides an illuminated navigation through the menu using the glass infrared HMI.

The JT33 is also compatible with the DKX001 remote display for installations where remote keypad access is required.

Enclosure options	▪ 304 stainless (standard) ▪ 316 stainless (optional) ▪ 304 stainless with window (optional) ▪ 316 stainless with window (optional)

The sample conditioning enclosure provides necessary protection for sampling components as well as the spectrometer assembly. Choose from two different grades of stainless steel with window options to view sample gas and bypass flow rates.

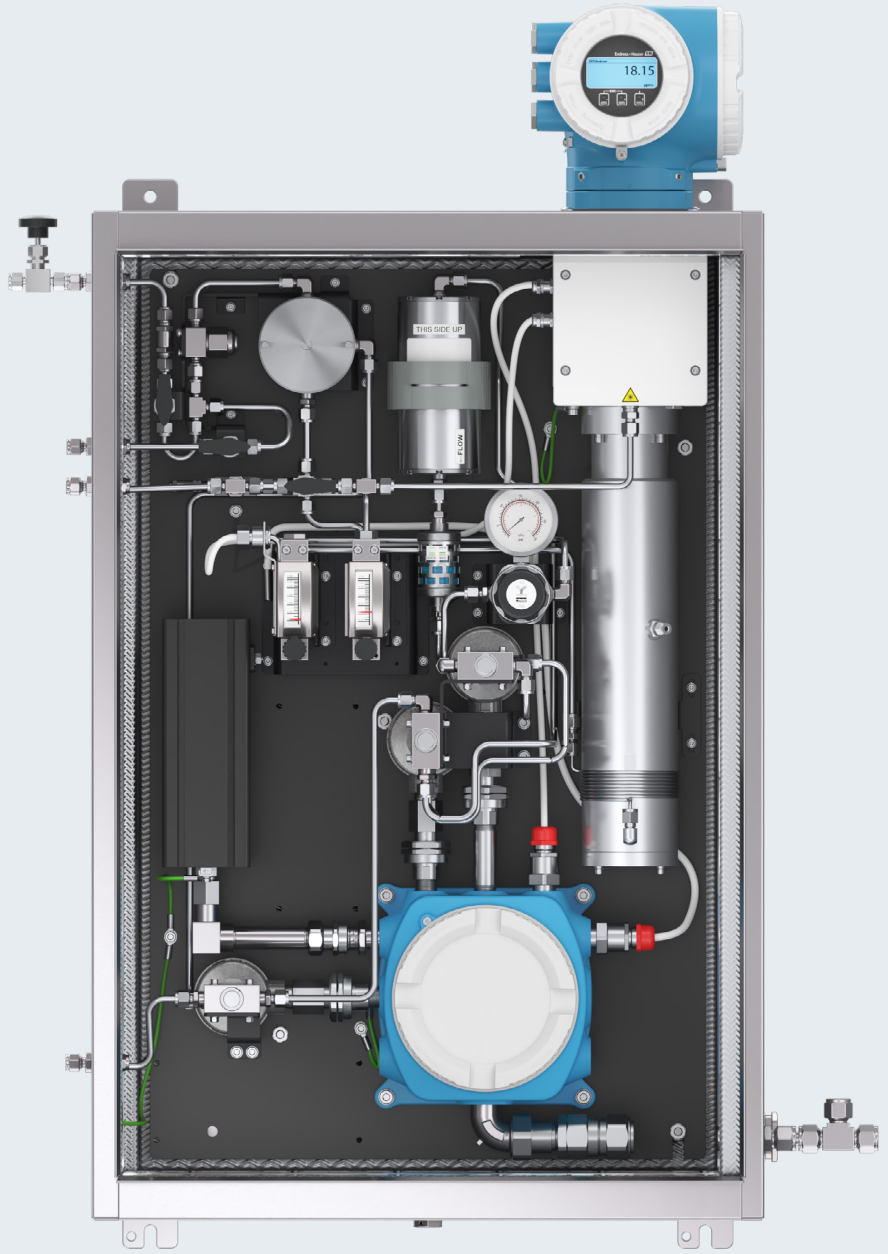
JT33 validation

Validation is a beneficial tool to confirm that an analyzer is measuring within published specifications. The JT33 uses external validation gas with a known amount of H_2S to verify the analyzer is working correctly. Options for either manual or automated validation allow multiple methods to support critical installations. An integral heater with various power options ensures a uniform gas temperature within the system.

JT33 housing / enclosure

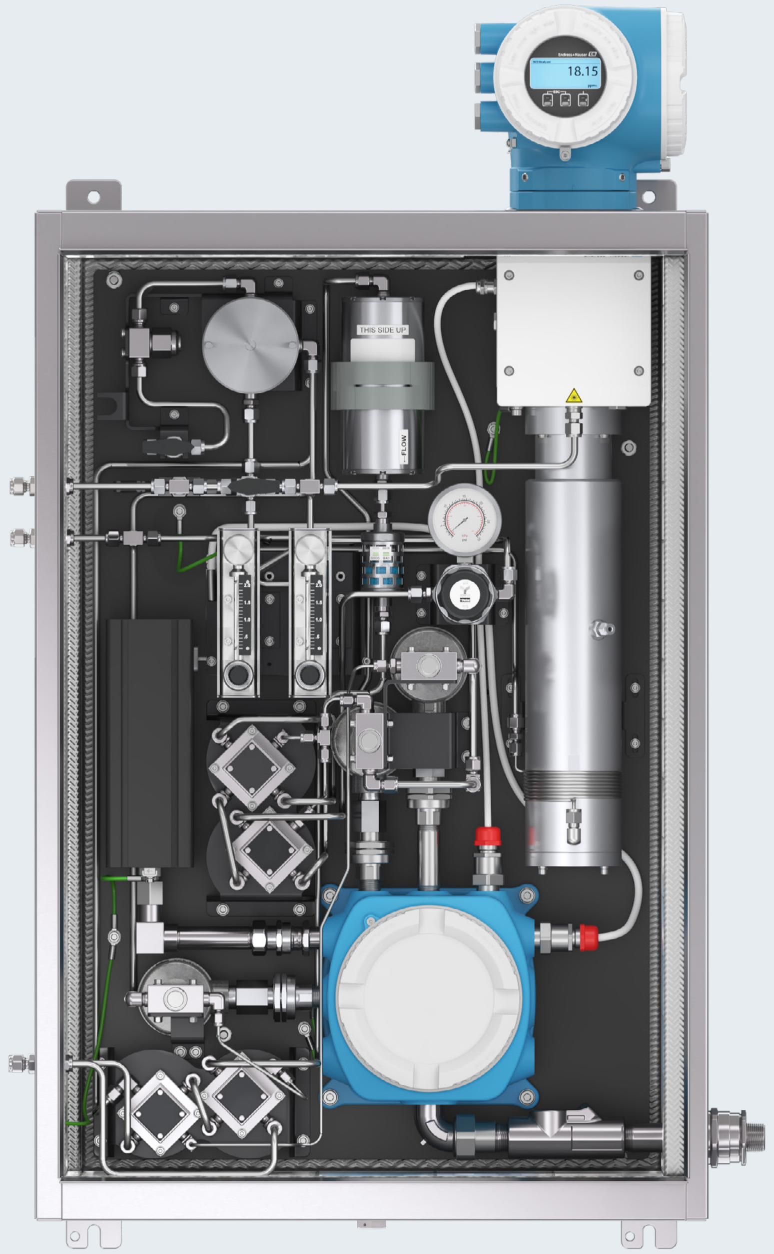
JT33 sample conditioning

JT33 stream composition



Manual validation

- Lowest cost option
- JT33 supplied with 3-way valve on sample inlet
- The 3-way valve is used to switch from process to validation gas
- A customer-added padlock can be used to avoid tampering with the valve



Auto validation

- Solenoid valves located within the enclosure can switch between process and validation gases
- Auto validation control is initiated through the web server or keypad
- Either 1-or 2-point validation can be performed using the auto validation
- Optional pneumatic valves are used when instrument air is available

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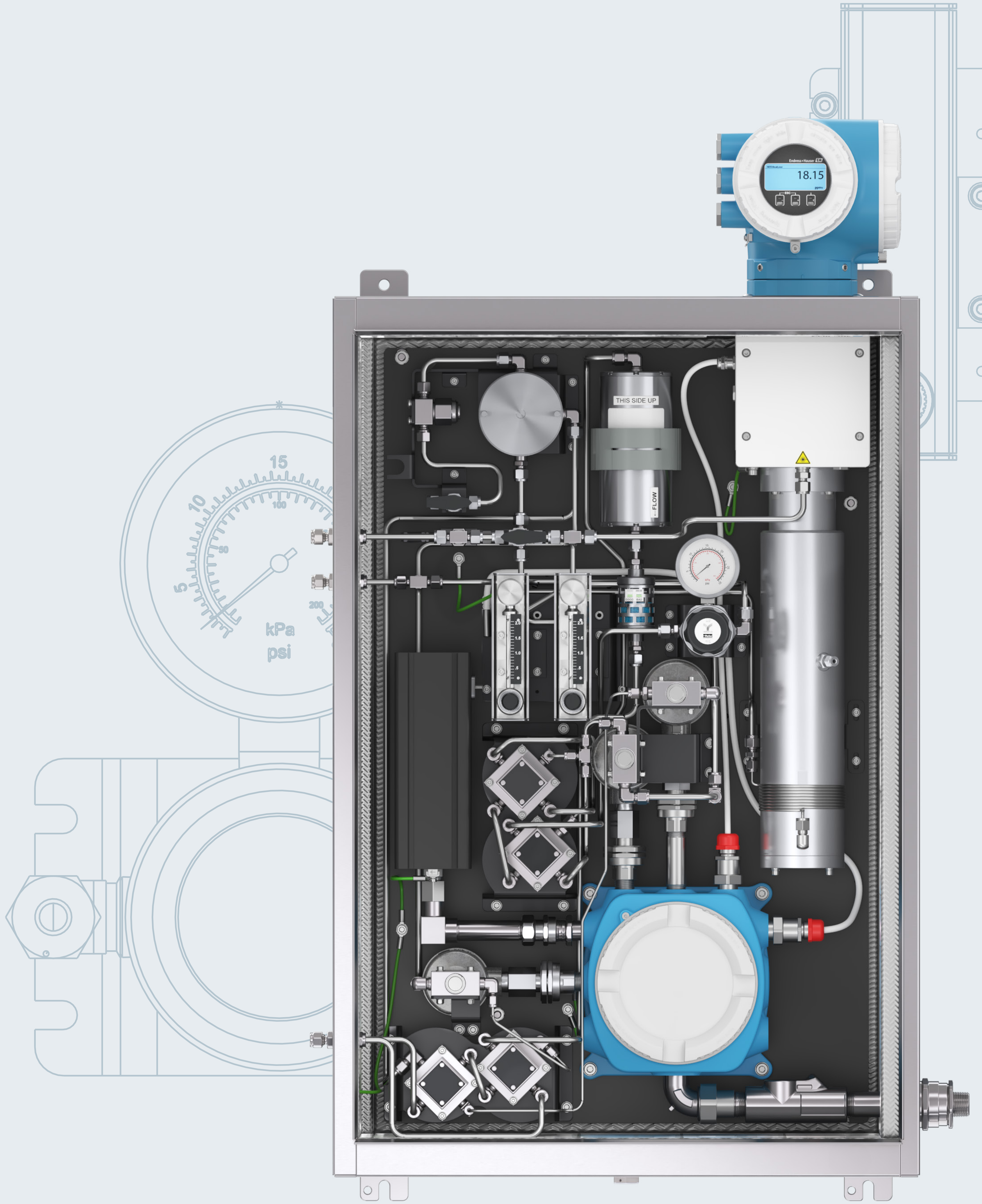
JT33 sample conditioning

The sample conditioning system helps control the gas pressure and flow rate to the measurement cell. Impurities such as dust, droplets, and aerosols are removed in the sample conditioning system to protect the spectrometer.

JT33 housing / enclosure

JT33 validation

JT33 stream composition



Sample conditioning options	▪ JT33 lets you customize the sample system to meet the needs of your business. Custom options are now standard features that can be specified with the product order code.
Safety purge	▪ Purge connections for the sample system and enclosure ▪ Recommended for high H_2S applications (>300 ppm)
Flow meters	▪ Glass tube or armored metal flow meters ▪ Optional flow alarms with hazardous area rating
Premium pressure regulator	▪ Optional upgraded pressure regulator

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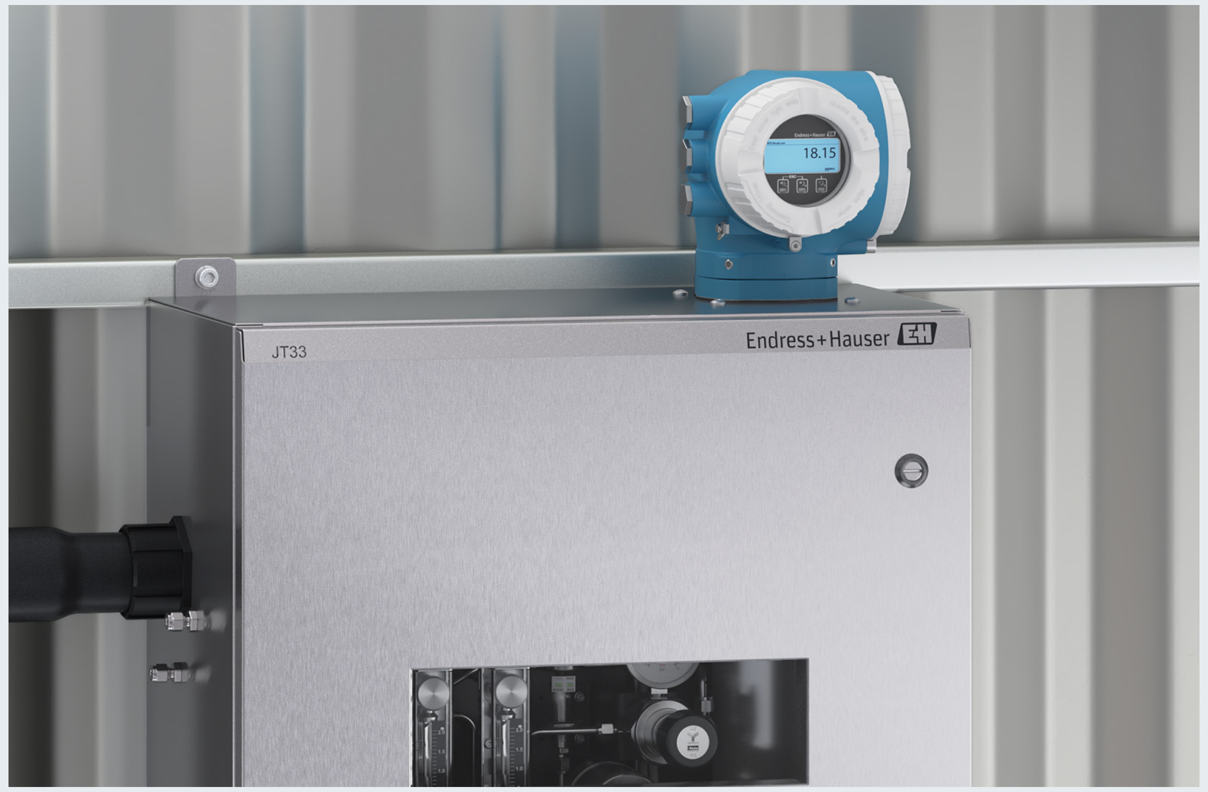
JT33 stream composition

When different gas backgrounds are unaccounted for, measurement error may occur. JT33 offers users the ability to select their stream compensation from a variety of common applications found in natural gas, NGP, LNG, refining, petrochemical, biomethane, and CCUS.

JT33 housing / enclosure

JT33 validation

JT33 sample conditioning



Stream composition options
Examples of each stream are provided in the Technical Information document for the JT33. Have a process that does not seem to match? Consult with our Sales Support team for a review of your application. Get the highest accuracy and repeatability for your process.

- Pick from a variety of common application streams when configuring the JT33
- Custom calibration of the analyzer is available using the concentrations specified by the customer
- All JT33 analyzers ship with a calibration data sheet showing the stream composition and expected performance specifications for the measurement range

Option	Stream composition
T01	Natural gas, 90% or more methane
T02	Natural gas, 50% or more methane, up to 20% ethane
T03	Natural gas, up to 50% methane with 50% or more CO_2
T22	NGL stream with 95% or more ethane
T23	NGL stream with an ethane and propane mix
T31	NGL Y-grade stream with a mix of C_2+ (for streams with C_5+ up to 5%)
T32	NGL stream with 90% or more propane (for streams with C_5+ up to 5%)
T33	NGL stream with 75% or more butane (for streams with C_5+ up to 5%)
T42	NGL stream with a propane & propylene mix
T61	Gas stream with 70% or more hydrogen
T62	Fuel or flare gas (for streams with C_5+ up to 5%)
T90	Caustic tower feed gas (for streams with C_5+ up to 5%)

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