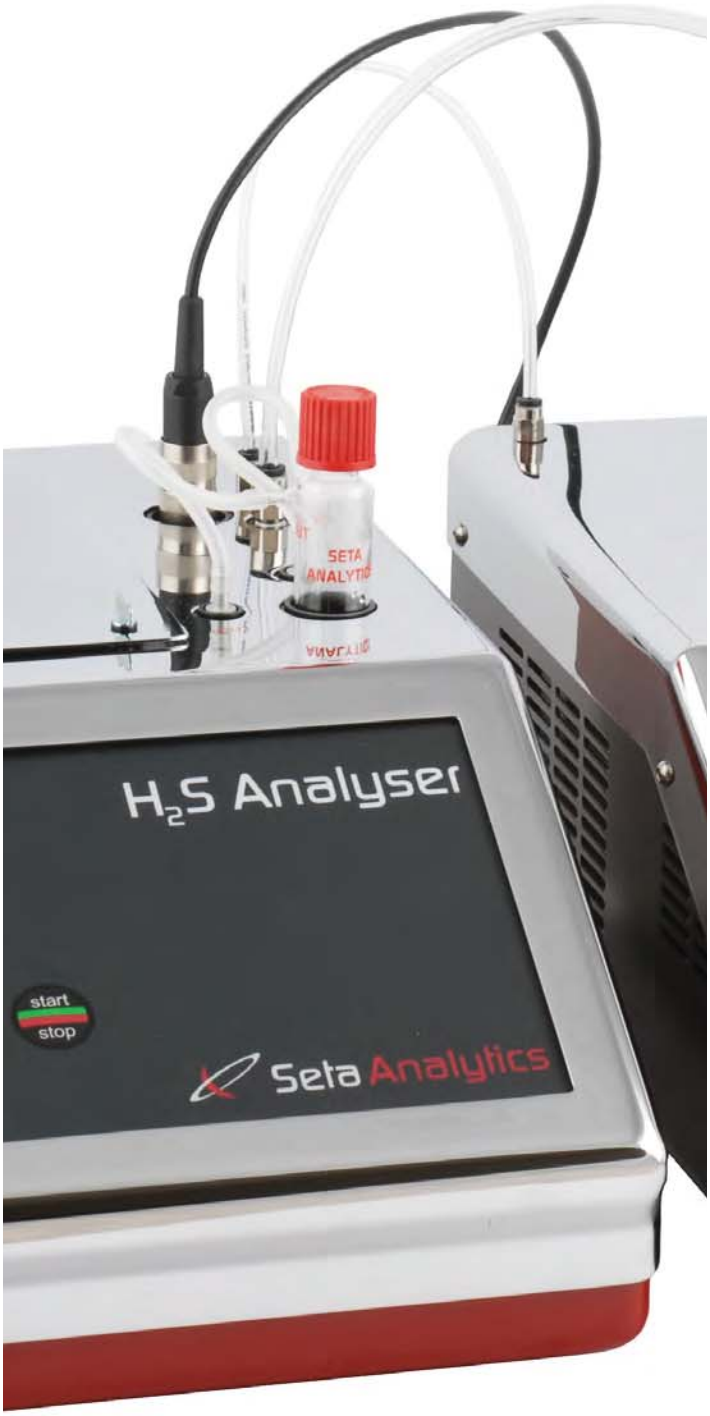
Seta Analytics



H_2S Analyser

Fast Hydrogen Sulfide Analysis of Crude Oil

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Hydrogen Sulfide management in Crude Oil

Managing hydrogen sulfide (H_2S) is a challenge at every stage of hydrocarbon production, refining and transportation. Hydrogen sulfide is highly toxic, reduces product value, compromises environmental and safety compliance, corrodes infrastructure, produces noxious odours and has other detrimental effects. Crude oil considered to contain high levels of H_2S may be refused by the operator and devalued by the customer.

Remedial treatment (scavenging)

A considerable amount of gas may be dissolved in the wellhead crude oil which must be stabilised and/or removed to meet pipeline, storage and tankerage safety requirements. Efficient treatment requires a fast and robust means of determining H_2S levels in the liquid phase to minimise the amount of additive required for cost effective remediation.

Current measurement of H_2S in crude oil

Two traditional test methods are used for determination of H_2S levels in the field, ASTM D5705 and UOP163.

- ASTM D5705 method is based on the agitation of the sample and measurement of the vapour space gas concentration using a lead acetate filled gas detection tube, however this does NOT measure the H_2S present in the liquid phase. The method qualifies the presence of H_2S but is less precise in quantifying the actual gas levels, and staining of the tubes can lead to mis-interpretation of results.

  Importantly measurement of the vapour phase does not provide sufficient information about the actual H_2S 'potential' of the crude oil which varies due to conditions under which it is transported and stored, for example ullage space, temperature, agitation, storage duration and so on; all factors that can have a bearing on the levels of H_2S that may actually be evolved.

- UOP 163 method is based on titration measurement of the liquid phase and relies on agitation of the sample under test at atmospheric pressure; a disadvantage of this test is that the method can lead to significant loss of entrained H_2S. Mixing of the sample and reagents is not always thorough due to differences in sample solvency. Interpretation of the results is subjective and not specific to H_2S which can be wrongly identified. Originally developed for measuring mercaptan Sulfur of downstream distillates, limited information is available on interferences when measuring crude oil and there is potential for over reading.

Both methods are operator dependent and lack precision, especially at low gas levels.

Within the industry Lead Acetate tape is used as the basis of a number of tests, (including UOP163 and D5705). The use of lead acetate exposes technicians to a substance which is itself classified as hazardous and toxic. Handling and disposal of the tape requires special measures to avoid damage to comply with environmental and health regulations.

Rapid measurement of H_2S in crude oil

H_2S limits for Crude Oil

H_2S 'potential' varies according to the type of crude oil being tested, as an example, a crude oil containing 70 ppm (by weight) H_2S in the liquid phase has been shown to produce a concentration of more than 7000 ppm (by volume) in the gas phase. In the maritime industry the OSHA Permissible Exposure Limit (PEL) in the gas phase is 10 ppm hydrogen sulfide. The NIOSH recommended exposure level for 10 minutes per day is 10 ppm.

A primary objective for testing and treatment of crude oil is the reduction of hydrogen sulfide content in the liquid phase to typically 7ppm or less (equivalent to a cargo headspace content of typically 70ppm or less).

Fast liquid phase H_2S analysis of crude oil by Seta Analytics H_2S Analyser

The H_2S Analyser purges H_2S from the test sample by a combination of heat and agitation, and evolved H_2S gas is measured by an advanced gas specific detector. The Analyser incorporates a unique Vapour Phase Processor (VPP) which preconditions the sample to eliminate interferences by Mercaptans and other chemical species that may be present to ensure H_2S sensitivity is optimised.

The instrument offers a cost effective solution for H_2S measurement - no costly or hazardous chemicals are required and there is no need for analytical preparation by laboratory chemists. It is fully portable and provides very fast repeat sample measurement capability.

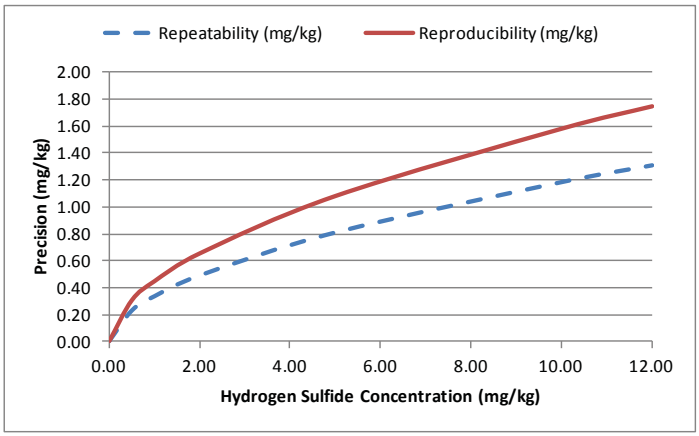
The H_2S Analyser is designed to support product Quality Control and Safety standards by evaluating product within approved H_2S specification limits. It also offers rapid evaluation data to assist crude oil remediation treatment.

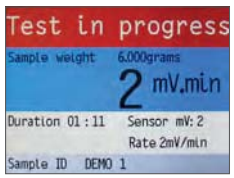
Principle

A small volume of sample is dissolved in a specially formulated diluent and heated under precisely controlled conditions to release any entrained H_2S present in the sample.

Clean air is passed through the test vessel and purges any H_2S gases into the sensor chamber where gas levels are measured; airflow through the sensor is monitored by a mass flow meter.

When H_2S concentrations have been fully driven off from the sample, the Analyser will calculate and report the total volume of H_2S released.





Operation

20ml volume of diluent is decanted into the test vessel, which is then inserted into a heater chamber.

When the diluent has reached 60°C (approximately 5 minutes), up to 5ml of sample is added.

Sample identity, operator name, empty/charged syringe values are input via the control membrane panel and the test is initiated by pressing the START/ STOP Button.

Automatic test result and error reports

Thereafter sample analysis is fully automatic and results are stored to memory at the end of each test.

The Analyser software automatically detects malfunctions and alerts if sample/ test analysis is void.

Download to PC

Results can be printed out or downloaded via the RS232 interface.

Analyser Specification

Measurement range	0-250 mg/kg H_2S in the liquid phase (0-250 ppm H_2S)
Test temperature	Ambient to 60°C
Viscosity Range	Up to 3000 mm2/s
Principle of measurement	Advanced Electrochemical sensor
Test duration	15 minutes
Sample size	100µl to 5ml (depending on H2S concentration)
Diluent volume	20ml
Voltage	12V DC, supplied with universal A/C transformer
Power	60W max
Computer interface	RS232
Size (HxWxD)	210 x 300 x 410 mm
Weight	8kg