

SENTINEL ANALYZER SELECTED SPECIFICATIONS

Analysis	Amine strength: 20 - 80% Acid gas loading (both CO ₂ & H ₂ S in rich and lean amines) H ₂ S loading
Repeatability	±5.0% of reading or full scale (whichever is greater)
Measurement Range	
Amine Strength	20 to 80%
H₂S Loading	0 to 1 % by weight (other units calculable)
Acid Gas Loading	0 to 1 % by weight (other units calculable)
Stream Capability	6 streams (depends upon stream compatibility)
I/O Capabilities	
Output	3 – Isolated 4-20 ma (standard), optional additional available, 1K Ohm maximum load (user scalable & programmable) 1 – Alphanumeric, two-Line 20 character, vacuum fluorescent display
Inputs	1 – Keypad with 8 keys
Shared Input/Output	8 – Fully programmable 5A 240VAC shared (input/output) relays (expandable to 16); can be used for external-control input or alarm-condition output
Enclosure Rating	IP65, NEMA 4X, CE compliant* NOTE: analyzer can be mounted in purged enclosure to meet customer hazardous area requirements. Contact the manufacturer for details. Stainless steel enclosures available as an option
*Product should be used only as specified. Failure to do so may impair safety protection of the system	
Power Requirements	100 to 240 VAC 50/60 Hz

Please note: we work continuously to improve the performance of our products – all specifications are subject to change without notice.

Galvanic assures flexible, headache-free installation and operation

Galvanic Applied Sciences' expert support team will work with you to determine the best, most cost-effective way for your facility to meet your acid-gas and amine unit-analysis needs. Galvanic's high-performance analyzers are calibrated to your exact specifications and custom-configured at the factory to integrate seamlessly into your existing infrastructure. Galvanic can also supply other key components and services for a total integrated solution – from custom designs and field commissioning for your systems – to analyzer shelters and sample-conditioning panels.



GALVANIC
APPLIED SCIENCES



Application Insight: Sentinel Acid Gas & Amine Analyzer

Cost-Effective H₂S, CO₂, & Acid Gas Loading in Amine Treatment Units



Although naturally occurring components of many natural gas streams, acid gases H₂S and CO₂ can combine with moisture to form corrosive acids that have detrimental effects on pipelines, associated machinery, and analytical equipment. Further, H₂S itself is a hazardous gas harmful to personnel at low levels.

The Sentinel acid gas loading and amine analyzer by Galvanic Applied Sciences offers a high performance-to-price ratio by using proven automated potentiometric titration techniques combined with a rugged design tailored for long-term continuous use and easy maintenance.

Acid Gas – a Major Culprit in Pipeline Corrosion

A report titled 'Pipeline Corrosion' commissioned in November 2008 by the U.S. Department of Transportation indicated 23.3% of all NG transmission pipeline significant incidents were caused by corrosion. The same report indicated the average number of incidents per year from 1988 to 2007 was 18.2, resulting in an average damage cost of \$11.2 million per incident. This translates to an average of 4.2 incidents per year directly attributable to the effects of pipeline corrosion. *Thus, over the 19-year period between 1988 and 2007, there were 79.8 corrosion-related incidents at a cost of nearly \$894 million.* It is not difficult to understand why companies pay such close attention to the causes of pipeline corrosion.

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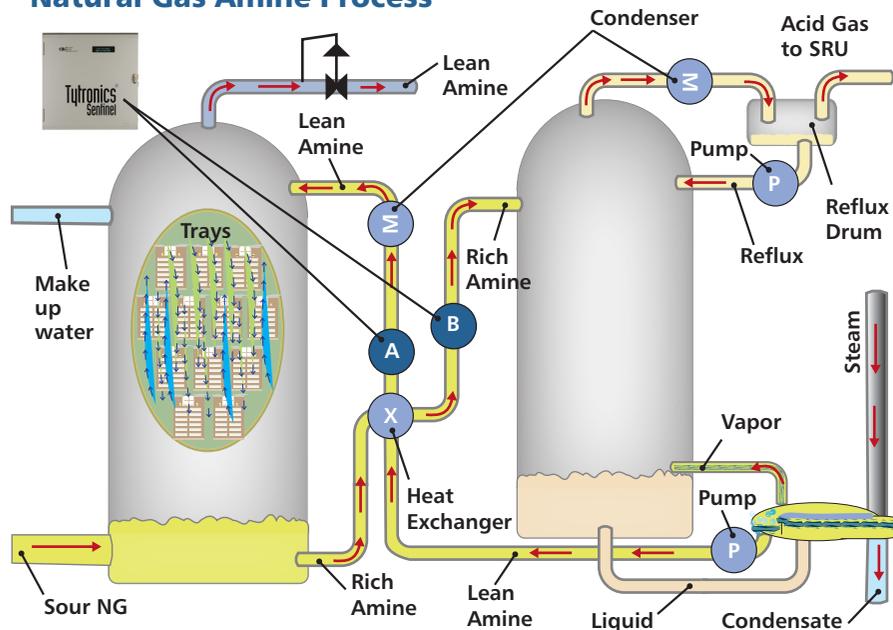
H₂S, CO₂ & Acid Gas Loading in Amine-Treatment Units

During gas sweetening, acid gases are removed by physical (non-reactive) or chemical (reactive) absorption methods, using a variety of amines.

“Sour” (acid-gas-laden) natural gas is passed through an absorber tank with amine fluid flowing in the opposite direction across a series of structures. When the amine comes in contact with the acid gas, it removes the H₂S. The ‘rich’ amine fluid is sent to a regeneration unit, which re-boils off the acid gas. If concentrations levels make it economically viable, it will be sent to a sulfur-recovery unit (SRU) to have the raw sulfur removed.

Monitoring the inlet and outlet of the absorber is critical to optimizing the acid gas removal process because many aspects of the processes can contribute to significant reductions in costs. Monitoring allows regeneration of the amine only when required and reduction of the steam consumption costs associated with amine heating. It can also help to reduce amine loss through carry-over. The diagram below shows a typical natural gas amine unit with the ideal location of Sentinel analyzers for process optimization.

Natural Gas Amine Process



Amines in Acid Gas Removal

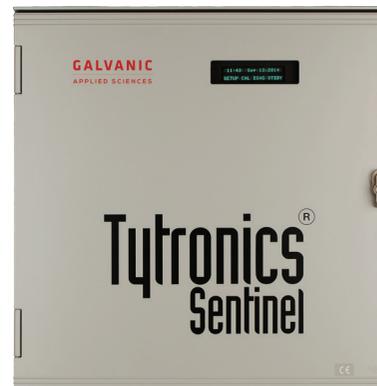
H₂S and/or CO₂ may be removed, depending on the particular application. Some amines remove both in varying ratios; others may remove only one or the other. Examples include:

Chemical Absorption Fluids

- Monoethanolamine (MEA)
- Diethanolamine (DEA)
- Methyldiethanolamine (MDEA)
- Di-isopropylamine (DIPA)
- Di-glycolamine (DGA)
- High-load DEA (activated) & formulated MDEA

Physical Absorption Fluids

- Selexol®
- Sulfinol®
- Propylene carbonate



When combined with Galvanic’s Brimstone 943 TGX H₂S analyzer, the Sentinel H₂S/acid gas analyzer provides operators with the critical information they need to optimize and control the total amine process to realize significant cost savings. The Sentinel provides for amine strength, total acid gas loading (both H₂S & CO₂) and H₂S loading, all of which are major determinations in the SRU amine-regeneration process. Other process-control parameters include: contact temperature, pressure, NG & amine feed flow rates, location of lean amine feed point on the absorber structure, and amine heating levels.

The Sentinel will provide many years of reliable service helping to control and lower costs dramatically through increased operation efficiencies in SRU amine units.

Designed and built to optimize performance in the harshest monitoring environments, Galvanic’s Sentinel acid gas loading and amine analyzer delivers the utmost in ease-of-operation, precise measurements, consistent, field-proven performance – and value:

- Runs in a fully automated mode for routine daily monitoring of process streams, including full automatic recalibration & internal cleaning (as required) at predetermined intervals
- Precise industrial titrator that performs on-line chemical analysis using established potentiometric titration ion-reaction measurement technology
- Digital input control for remote control providing on-demand manual operation of analysis, calibration, or cleaning functions
- Multi-stream capability to enable monitoring of both rich- & lean-amine streams with a single analyzer
- Rugged design for long life under harsh operating conditions
- Internal sample fast loop and rapid reaction electrodes provide fast analyzer response for efficient process control
- Easy to operate with simple menu-driven selections
- Modular design provides quick access and easy maintenance throughout
- Unmatched price-to-performance ratio