



SS2100 TRACE MOISTURE IN GTL SYNGAS (SASOL PROCESS)

Product Code 65701

KEY FEATURES

- Extremely fast analysis time – 1 second updates possible
- No consumables – Low Cost of Ownership
- No routine service needed
- High resolution laser-based measurement eliminates errors due to interferences
- Reliable Tunable Diode Laser lasts years



Tunable Diode Laser technology is perfect for fast, sensitive H₂O measurements in Synthol Reactor Tail Gas Scrubber applications.

SYNTHOL PROCESS The Synthol process starts with synthesis gas from coal or natural gas to make hydrocarbon liquids and waxes in a Fischer-Tropsch reactor. The liquids are separated and refined to make transportation fuels and chemicals.

CRITICAL CONTROL OF MOISTURE

Moisture must be removed prior to downstream cryogenic recovery and separation of the C₂ and C₃ hydrocarbons present. Fixed bed desiccant dryers are often used to remove the moisture (Fig. 1). Two beds are normal, with one in service while the other is being regenerated. Sometimes, two beds are used in series with a moisture monitor between the sample beds. When the first bed is exhausted it is regenerated and becomes the second bed after regeneration. For streams with variable concentrations of water, the measurement of water at the inlet to the dryers is necessary to control the amount of time each bed is operating and to anticipate water break-through.

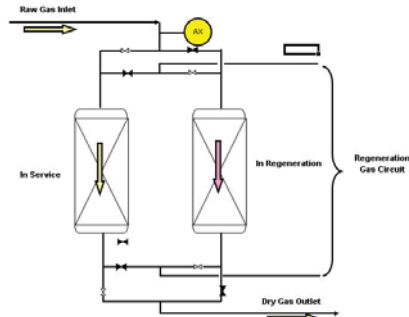


Figure 1

TRADITIONAL MEASUREMENT SOLUTIONS Aluminum Oxide capacitance probes, electrochemical and vibrating quartz crystal moisture analyzers have been the traditional method for monitoring the

levels of H₂O in Desiccant Dryer Outlets. Unfortunately, trace hydrocarbons and other contaminants present in the stream contaminate the capacitance and electrochemical probes, resulting in high maintenance costs due to the need to be constantly replaced. It's not uncommon for moisture probes to be replaced multiple times a year. Quartz crystal moisture meters have slow wet-up and dry-down times that are slow to detect break-through from the dryers.

SPECTRASENSORS' SOLUTION

SpectraSensors SS2100 is the ideal solution for this challenging application. Its non-contact laser and detector is impervious to damage from contaminants. Tunable Diode Laser technology means that measurement interferences from other infrared absorbing compounds are avoided. There are no wet-up or dry-down delays, resulting in fast updates even when the concentration changes dramatically (Fig. 2).

Only SpectraSensors employs Differential Spectroscopy, which incorporates a dryer using metal getter technology to subtract the spectrum of the dry gas from the wet spectrum. This allows the SS2100 to measure streams whose background gas compositions changes.

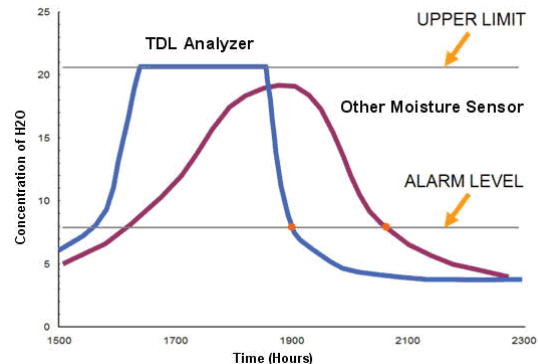


Figure 2: Fast Response of TDL Moisture Analyzer vs. Conventional Moisture Analyzer

SS2100 Moisture Analyzer

SPECIFICATIONS

Application Data

Target Components	H ₂ O in GTL/SynGas (Sasol Process)
Typical Measurement Ranges	0-10ppm, 0-20ppm (other ranges available upon request)*
Typical Precision	±2% of Full Scale
Measurement Response Time	1 to ~60 seconds*
Principle of Measurement	Differential Tunable Diode Laser Absorption Spectroscopy (H ₂ O scrubber included)
Environmental Temperature Range	-20° to 50° C (-4° to 122° F) -10° to 60° C (14° to 140° F) <i>optional</i>
Sample Inlet Pressure	70kPag (10 PSIG) typical 210kPag (30 PSIG) maximum
Sample Cell Temperature Range	Maintain at 50° C ±2° C
Maximum Cell Pressure	70kPag (10 PSIG)
Sample Flow Rate	3-4 L/min (6.4 to 8.5 scfh)*
Recommended Validation	A certified blend of H ₂ O in Nitrogen balance is diluted with dried sample in the sample conditioning system under flow control



Electrical Data

Power	100-240 VAC, 50-60 Hz standard
Max Current	Controller: 1 A @ 120 VAC
Controller to Cell Cable Length	1m standard (3m, 5m & 10m available optionally)
Communication	Current Loop Output 4-20 mA Isolated, 1200 ohms @ 24 VDC max load. Serial: ASCII Text RS232C standard, Modbus RS232C
Digital Outputs	Four (4) 12 VDC for valve operations: Scrubber (if required), Process/Val, Val 1, Val 2 5 SPDT (Form C) Dry Contacts: Common Fault, Val 1 Active, Val 2 Active, Val Fail, One user assignable DO to standard alarms
LCD Display	Concentration, Cell Pressure and Temperature, Diagnostic Data

Physical

Controller Enclosure	NEMA 4X – 304 stainless steel <i>standard</i>
Controller Dimensions	343 mm H x 305 mm W x 165 mm D (13.5" H x 12" W x 6 7/16" D)*
Weight Approximately	13.1 Kg (28.6 lbs)*
Sample Cell Dimensions	28m Herriott cell, 559 mm H x 127 mm W (22" H x 5" W)
Sample Cell Construction	316L Series Polished Stainless Steel Standard - SilcoNert® coated
Number of Sample Cells	1 (Single Channel SS2100) or 2 (Dual Channel SS2100)
Dimensions with Sample System	1678 mm H x 613 mm W x 427 mm D (66" H x 24-1/8" W x 16-13/16" D)
Weight with Sample System	68 Kg (150lbs)

Area Classification

Certification	CSA Certified for Class I, Div. 2, Groups ABCD T3C Ex II 2G Ex d IIB+H2 T5; Tamb : -20 ÷ +60 °C
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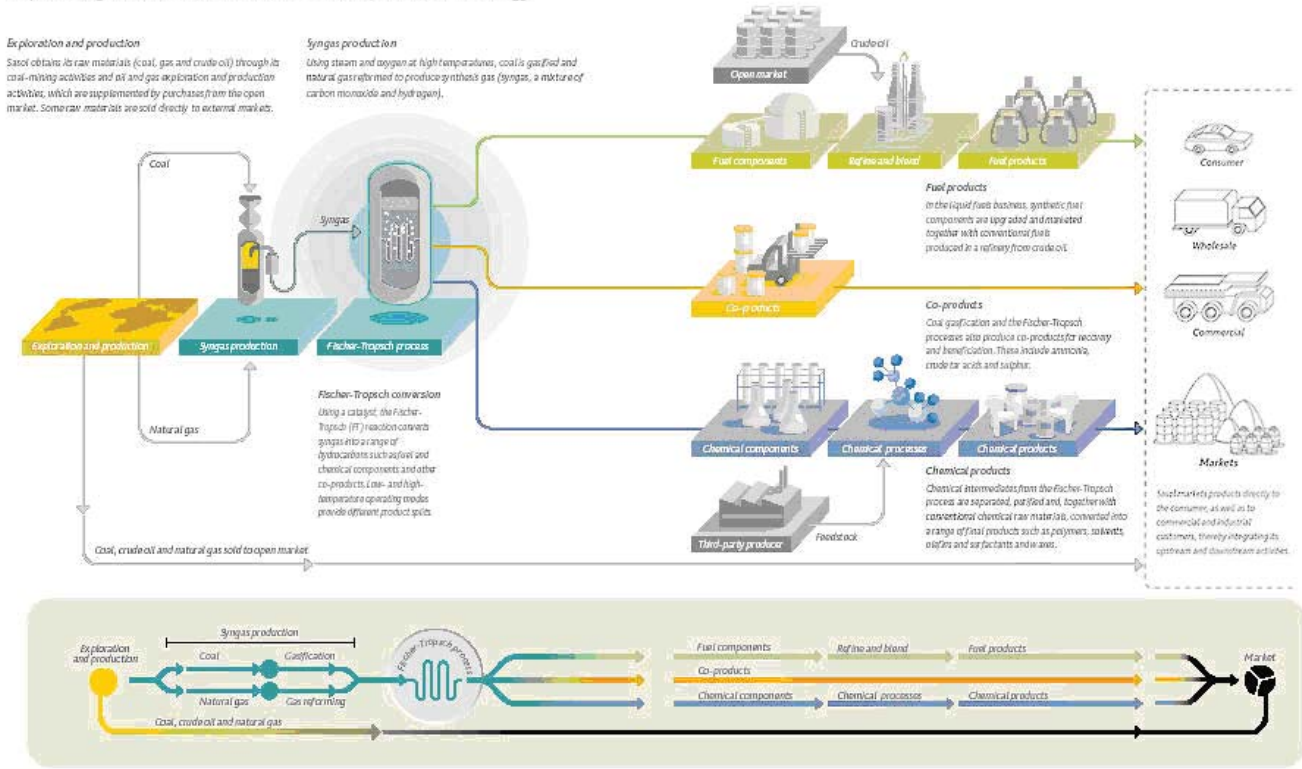
* Application specific; consult factory.



SYNTHOL PROCESS FLOW

sasol's integrated business model

exploiting the benefits of fischer-tropsch technology



ANALYZER

The Analyzer Scope consists of the Electronic controller, cell, and 1m long interconnecting cable. The customer or analytical systems integrator is responsible for providing a sample conditioning system and/or cell enclosure that maintains the sample and cell at a constant temperature (generally 50°C +/- 0.2°C) that is above the hydrocarbon and moisture dew points of the process stream. The sample flow, sample pressure, and temperature specifications listed above must be maintained at all times. Any departure from these specifications must be approved by SpectraSensors.

VALIDATION

Validation of low level (<10 ppm) water measurements is essential, but also extremely difficult, as certified blends at such low levels are not readily available. Some have attempted to put permeation devices, but these require regular maintenance to prevent drying out, and there is no independent way to verify the accuracy of the permeation device. SpectraSensors employs a dilution system that dilutes a relatively high concentration certified standard of H₂O, in Methane using dried sample gas. Thus the validation is accurate and traceable.

TYPICAL STREAM COMPOSITION FOR SYNTHOL REACTOR TAIL GAS BEFORE DRYERS:

Component	Unit	Typical Concentration	Min. for Application	Max. for Application
Water (H ₂ O)	ppmv	10	0.05	100
Carbon Dioxide (CO ₂)	ppmv	100	2	1000
Hydrogen (H ₂)	Mole %	43.5	35	55
Nitrogen (N ₂)	Mole %	0.55	0.2	1
Carbon Monoxide (CO)	Mole %	2.85	2.2	3.4
Argon (Ar)	Mole %	3.4	4.29	5.2
C2's	Mole %	38.3	31	47
C3's	Mole %	2.2	0.4	3.4
C4's	Mole %	0.3	0.2	2
C5's	Mole %	0.1	0.02	0.2
C6's	Mole %	0.02	0.01	0.1
Total	Mole %	100		

The background stream composition must be specified for proper calibration and measurement performance. Specify the Normal composition, along with the minimum and maximum expected values for each component, especially water, the measured component. Other stream compositions may be allowable with approval from SpectraSensors.

RELAY CONTROL AND COMMUNICATIONS

All SS2100 Process Analyzers are supplied with 9 relays:

- o Four (4) are 12 VDC powered and provided for driving switching valves associated with Process, Validation 1 and Validation 2 and a scrubber (for differential systems only).
- o Five (5) SPDT (Form C) dry contact digital outputs are provided for common fault, Val 1 active, Val 2 Active, Validation Fail, and one (1) user-assignable DO to any standard alarm, such as high concentration, high cell pressure, low cell temperature, high cell temperature, low sample flow, etc. depending on the application.

Data Output is via 4-20 mA Isolated Analog Output.

Serial Communication via Modbus protocol is provided. See Modbus specifications for details.

MEASUREMENT SOLUTION

Proper sample conditioning is essential to an accurate and reliable measurement. SpectraSensors provides standard and custom engineered Measurement Solutions for all applications. Standard features include:

Inlet Pressure Relief Valve	Automatic Valve for Validation Gases
Inlet and Outlet Shut-off Valves	Cell Flow Rotameter and Control Valve
Sample Filter	Outlet Pressure Gauge
Sample Bypass Pressure Gauge	Cell Outlet Non-return Valve
Bypass Flow Rotameter and Control Valve	