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Analytical Products and Solutions

Smart Sample System Interface (SSSI)

Intelligent Sample Conditioning Systems for the Maxum Gas Chromatograph (GC) Platform

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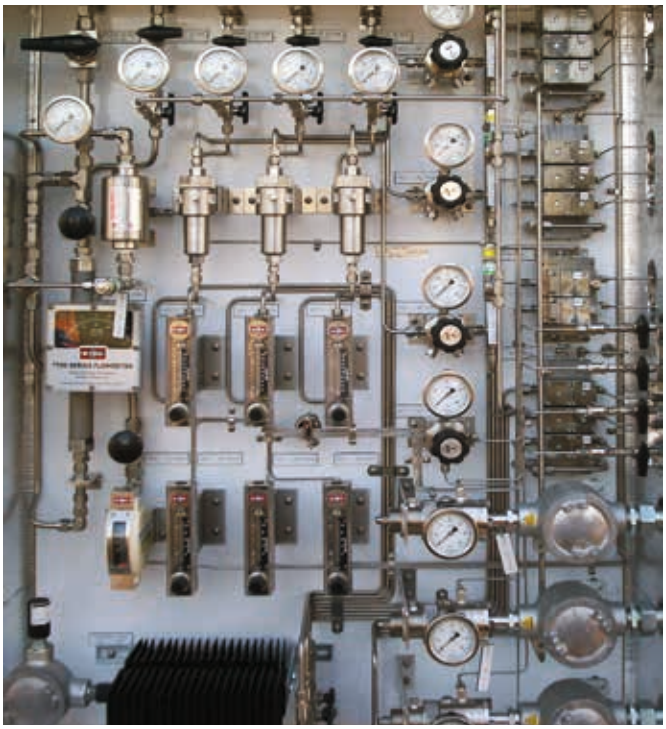
Bringing Analytical Sample Conditioning Systems into the Digital Era

Reliable sample conditioning system performance is critical for process analyzer operation as the analyzer must have a clean, timely and properly conditioned process sample in order to do the measurement. Unfortunately, due to the challenge of extracting and delivering the sample from the process to the analyzer, the maintenance of the sample conditioning system is often much higher than the analyzer itself. This results in the need for technicians to manually inspect the sample system's pressure and temperature as well as monitoring for the plugging of filters and leaking of valves.

To minimize the demands on the analyzer technician's time, Siemens has developed a Smart Sample System Interface (SSSI) that automatically collects this key operating information for the sample system and transmits that information to remote maintenance workstations. The SSSI continuously gathers the "live" status of the sample system by interrogating "smart" temperature, pressure and flow sensors. The SSSI then transmits this information to the electronics of the Maxum GC using a single cable connection that can be intrinsically safe if required.

The ability to have the sample system condition inspected remotely improves the utilization of a plant's analyzer technician time. The data from the SSSI can even be integrated into the Maxum network software, Analyzer System Manager (ASM), for automatic statistical monitoring of the data for higher analyzer in-service time with lower overall maintenance requirements.



Sample systems play a critical role to ensure the reliable operation of the process analyzer. Yet, traditional designs still demand routine "walk-by's" to confirm it is operating properly.

Improved measurement validity and reliability

By automating the monitoring of critical operational aspects of the sample system, the conditioning of the sample for the analyzer is greatly improved. Subsequently, higher reliability and measurement confidence of the analyzer system is achieved.

- Normal, periodic walk-by inspections only observes the system at specific times – perhaps once per day and often less. Breakdowns due to filter blockage, flow problems or leakage are not observed until the reading itself is lost from the analyzer. With SSSI, all critical maintenance elements are observed continuously – typically at least one reading on every analysis cycle. This means that changes can be detected and reported for immediate attention. For example, chronic slow fouling of a filter can be easily identified due to the continuos monitoring.
- Continuous data validation is possible on critical or quality – mandated measurements with all readings accessible remotely. This data can be logged and viewed on the Maxum Workstation at any time. Additionally, all data is compatible with data processing by appropriate software such as the Siemens Analyzer System Manager (ASM). The ASM software can continuously monitor the sample system condition and alarm automatically if conditions change.

Reduced installation and engineering costs

Smart sampling system designs can reduce a customer's total system installation and engineering costs

- All connections from the GC electronics to the sampling system – whether electronic or pneumatic – are eliminated and replaced with a single serial electrical communication cable. This cable is suitable for Division 2 installation directly and can alternately be Intrinsically Safe making it suitable for external mounting without conduit.
- Analog electrical connections to GC can be eliminated since all the electrical sensor signals are coupled to the GC through the serial bus.
- Installation is dramatically simplified with only one signal cable controlling everything including stream switching.

Embedding smart sample system capability into process analyzers systems dramatically reduces the man-hours consumed by maintenance technicians performing "routine" walk-by inspections just to confirm the system is working.

Building blocks of a Smart Sample System Design

GC Components – Physical and Functional Explanation

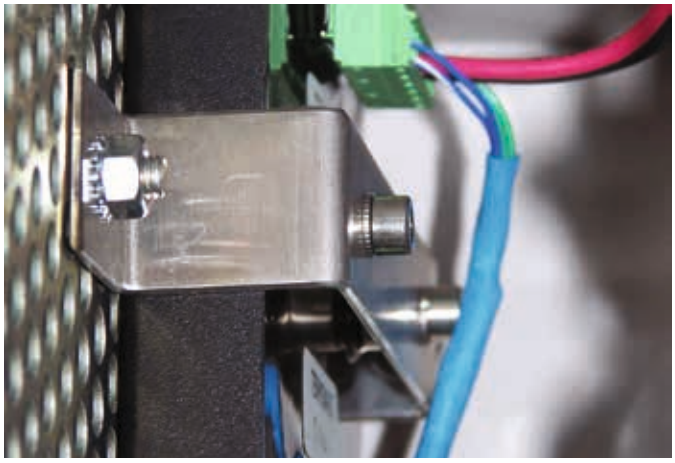
The heart of the SSSI product is the communication bus that links the smart devices in the sample system with the Maxum electronics. This bus is the same I²C bus that is already part of a Maxum GC that now can be "extended" down to the sample system. The I²C cable is certified to meet Division II area classifications and can be set up in an Intrinsically Safe configuration for Division I areas. An external electrical junction box is provided for a convenient way to connect the interconnecting cable to the SSSI bus and route it to the SCS.

SCS Components

The I²C bus is used to connect to one or more of the smart sensors specifically designed for use in sample systems:

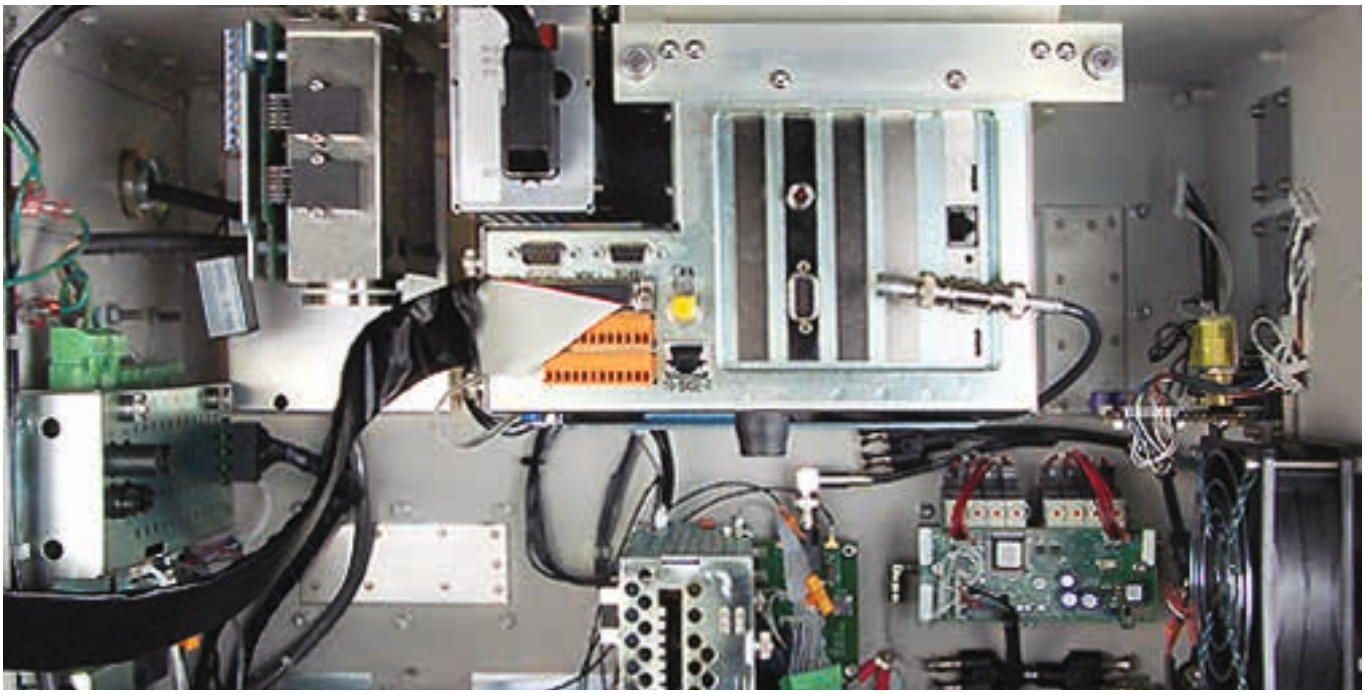
- Siemens Remote Valve Control Module (RVCM)
- Siemens Pressure – Temperature Transmitter (PTX)
- Siemens Flow – Pressure – Temperature Transmitter (DMT)

These smart sensors can be used in traditional sample systems or sample systems based on the ISA SP-76 standard as well as retrofitted into most existing Maxum GC systems if desired.



The smart sample system interface connects to the existing Maxum I²C bus through a simple connection module.

A choice of power supplies are available to power the devices connected to the I²C bus including an Intrinsic Safe version of desired.



The Smart Sample System Interface connects to the I²C bus built into all Maxum Process Gas Chromatographs and automatically integrates the information into the Data Tables of the GC.

The Remote Valve Control Module simplifies analyzer stream switching including calibration and validation streams by replacing individual control tubing between the GC and sample system with a single cable.

The PTX confirms sample temperature and pressure integrity of the sample line it is connected to.

The DMT provides precise sample flow and temperature measurements as well as confirming the pressure drop across filters.

Smart sample system components can be added to conventional sample system designs as well as the new ANSI/ISA-76 based modular sample systems.

Take control of the performance of your analyzer's sample system

Track

Rather than wasting valuable technician's time doing needless walk-by inspections of the sample system's condition, the SSSI smart sensors monitor in real time key temperature, pressure and flows.

- Track the life of sample system filters
- Track the calibration sample pressure and flow
- Track the sample return back pressure

Predict

By tracking the real performance of the analyzer's sample system, preventative maintenance schedules can be established to minimize interruptions to the analyzer's performance.

- Predict filter plugging before it impacts sample flow
- Predict when calibration bottles are going to start running low
- Predict when back pressure upsets prevent sample flow

Optimize

Having actual performance data for the sample system enables system designs to be optimized as well as balancing the technician's time where and when it is genuinely needed.

- Optimize technician inspection schedules for analyzers
- Optimize calibration and validation bottle purchases
- Optimize sample system designs for minimum maintenance

Taking control of your plant-wide analyzer system

Siemens Analyzer System Manager (ASM) is a software-based tool that automatically monitors and reports the performance of all types of process analytical instrumentation used in a plant. Initially developed for the Siemens' line of process Gas Chromatographs, the ASM architecture allows for inclusion of any analyzer via industry standard communication protocols.

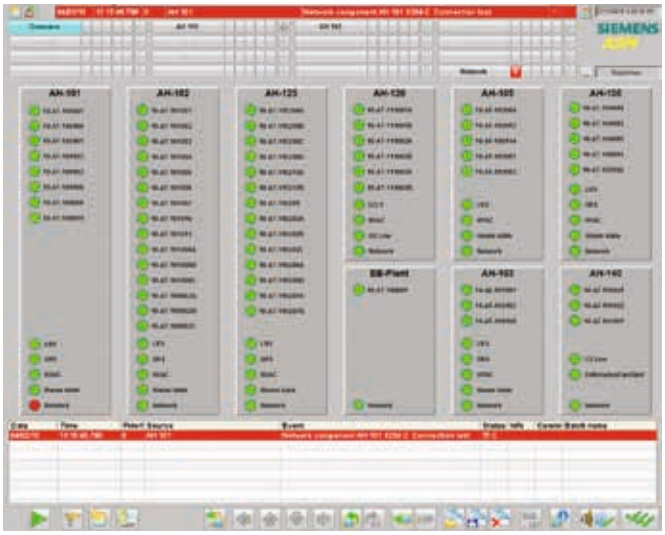
The ASM software gathers the operational data of the process analyzers and reports relevant analyzer performance information, including availability, reliability, validation and calibration results. Providing consistent information on analyzer performance allows the quick identification of operational problems often before they impact the analyzer's measurement performance.

A "dashboard" overview of the plant's analytical system uses a Green/Yellow/Red alarming scheme to alert the user to the current condition of the analyzers. The user can then use the drill-down navigation graphical interface to quickly access each level down to a single analyzer for a more detailed inspection. Each overall view shows relevant current and historical operating information in easy-to-understand graphic displays.

The ASM software can also receive information from Smart Sample System components that can be used as Key Performance Indicators (KPIs) critical for maintaining optimum performance of the plant's analyzer system.

- Data confirming representative process samples are being analyzed
- Data ensuring calibration / validation samples are valid
- Data projecting routine maintenance functions such as filter replacement

The ASM software takes these KPIs and generates trend displays, summary reports and preventative maintenance requirements in an easy-to-understand format.



Smart Sample Systems add to the bottom line

Scheduled routine maintenance is effective, but underutilizes the maintenance technician's time. Significant man-hours are being consumed by walk-by inspections. In some situations, walk-by inspections consume 25-40% (= $20k-$40K/year) of a technician's time to simply confirm the sample system is working properly. This hidden cost of maintenance is the loss of value associated with the underutilization of a skilled resource. The impact of this over the life of a single gas chromatograph can be seen in the chart below.

Item	Count over 15 yrs	$ per unit	$ per 15 yr life (St'd SCS)	$ per 15 yr life (Smart SCS)
GC — Base Cost	1	$50,000	$50,000	$50,000
Sample Conditioning System — Base Cost	1	$20,000	$20,000	$20,000
Probes	1	$2,000	$2,000	$2,000
Equip Analyzer with SSSI components	1	$15,000		$15,000
Installation of Analyzer System on site	1	$50,000	$50,000	$50,000
Consumable items for SCS (filters, minor repairs)	1	$5,000	$5,000	$5,000
Calibrations gas for GC	1	$30,000	$30,000	$30,000
Carrier gas for GC	1	$7,500	$7,500	$7,500
Maintenance Labor for exchanging gas cylinders once per month at 2 hours at $125 per hour	1	$45,000	$45,000	$45,000
Maintenance Labor for GC: 3 days labor at $1000 per day - per year	1	$45,000	$45,000	$45,000
Maintenance Labor for SCS: 4 days labor at $1000 per day - per year	1	$60,000	$60,000	$60,000
Inspection of SCS: Two times per week at 1 hour per inspection (including entering plant) at $125 per hour	1560	$125	$195,000	
Inspection of SCS: One times per month at 1 hour per inspection (including entering plant) at $125 per hour	180	$125		$22,500
TOTAL 15 YEAR LIFE COST			**$509,500**	**$352,000**
Net Savings				**$157,500**

Savings In Total Cost of Ownership 31%

**Note, component carries Intrinsic Safety certifications as indicated. Entity parameters and other component information necessary to use this component in a complete system as also indicated. However, complete system design, system safety certification or other system suitability for installation in any particular instance is the responsibility of the system designer and system owner. Intrinsic Safety certification is valid only when the system configuration is consistent with the entity parameters and other conditions specified in the applicable certificate(s).*

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