

# POWER GENERATION

## GAS ANALYSIS MAGAZINE



ISSUE  
THREE - 2018

**SUPPORTING YOUR  
COMBUSTION AND  
EMISSIONS APPLICATIONS**

### PROCESS STUDY

Waste to energy using thermal conversion processes

### EXPERT FOCUS

A solution for SO<sub>2</sub> impact on COe sensors

### APPLICATION STUDY

Safety considerations in boiler conversions



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Servomex provides comprehensive support for customers in the power generation market.

At the US Business Center (USBC) in Houston, the core of this support is provided by our applications, customer support and service team experts.

Our featured expert is Field Applications Engineer Joshua Christian, who has been with Servomex for three years, bringing more than 14 years of extensive experience in the petrochemical industry to Servomex.

His role is to ensure that in-field installations support the technology and solutions that Servomex provides. He also inspects installations to ensure conformity to current regulations.

"The current standards that determine what is required in the field are constantly updated," Joshua explained. "I work with the new standards and bring them to the customers with considerations of how to best implement them with current and newer technologies."

A recognized industry expert, he sits on both the API-556 and API-560 standards committees for the American Petroleum Institute (API) trade association, focusing on instrumentation and control for fired heaters.

As part of our effort to provide great customer service, Servomex announces the addition of Robert Rankin, taking on the role of Customer Support Manager for the Americas. Robert brings his ability to build strong customer relationships with him after 19 years at Emerson Automation Solutions. He will oversee and continuously improve the expert in-house support group for our customers, assembling a world-class inside sales team.

Rounding out our Americas team is Christopher Galley, who joined Servomex as Service Manager for the Americas last year. Chris brings over 23 years of industry service and operational experience to the role, having worked for several industrial electronics and technology companies. With his ability to work quickly he is striving to make Servomex the leading expert when it comes to both Field and Depot service support.

To find out more about the support offered to power market customers by the USBC, contact:

[americas\\_service@servomex.com](mailto:americas_service@servomex.com) or  
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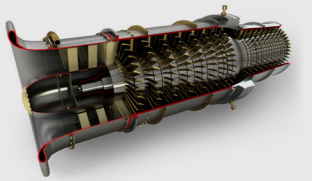
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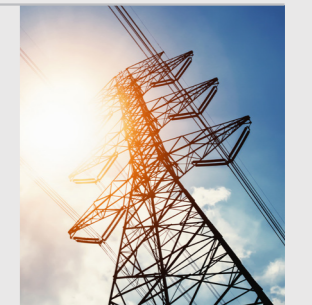
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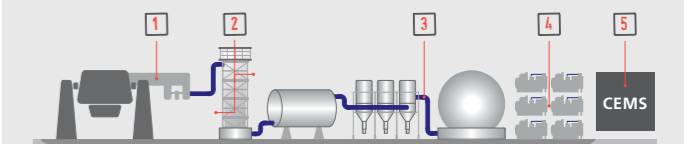
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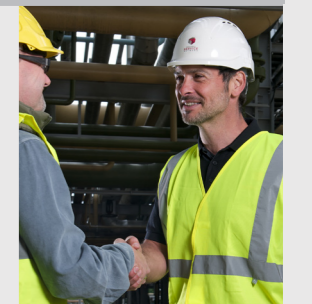
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## SERVICE FOCUS

The benefits of commissioning for your Servomex analyzer.



See our latest product ranges.  
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# SEE THE FULL PICTURE ONLINE

## AMMONIA SLIP CONTROL

See why the SERVOTOUGH Laser 3 Plus Ammonia TDL analyzer is the ideal solution for your DeNOx process



## SERVOTOUGH Laser 3 Plus

See the advantages of Servomex's latest product range as we introduce three new compact TDL analyzers



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SERVOMEX'S GLOBAL POWER SEGMENT MARKET MANAGER, DR. BARBARA MARSHIK, LOOKS AT DEVELOPMENTS IN THE POWER GENERATION MARKET ACROSS THE USA.

## SAFETY CONSIDERATIONS FOR PLANTS CONVERTING TO GAS

INCREASED OPERATIONAL COSTS, COMBINED WITH LOWERED EMISSION LIMITS, HAVE LED MANY POWER PLANT OPERATORS TO CONVERT FROM COAL TO NATURAL GAS FUEL. SERVOMEX FIELD APPLICATIONS ENGINEER JOSHUA CHRISTIAN AND DR. MARSHIK EXPLORE THE DRIVING FORCES BEHIND THIS SWITCH AND THE NEW SAFETY ISSUES THAT NOW CONFRONT PLANT OPERATORS AND TECHNICIANS.

## NATURAL GAS IS FUEL OF CHOICE

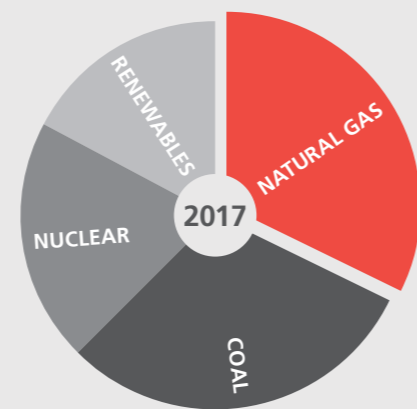
Even though the current United States administration is in the process of replacing and defunding the EPA Clean Power Plan to encourage new coal-fired plant builds, none of the new capacity brought on-line in 2017 was for coal. Natural gas combined cycle and renewable sources from wind and solar represented 39% and 53% of all the new plant build in the US respectively<sup>1</sup> and this continues to be the trend in 2018.

According to the US Energy Information Administration (EIA), natural gas displaced coal as the number one fuel of choice for electric power generation in 2016 and increased to 32% natural gas and 30%

coal in 2017, with the remainder as 20% nuclear and 17% renewables<sup>2</sup>.

Even though natural gas is on average the main fuel powering the US electrical grid, there has been a surge in the use of renewable sources as well. This increase has not been driven by fuel cost but by states looking to lower their overall emissions footprint. In fact, California has set a goal that by 2030, 50% of the state's electricity must come from a renewable source<sup>3</sup> and groups from several other states are pushing utilities to build cleaner renewable power plants in place of those running on fossil fuels.

US ELECTRICAL POWER GENERATION<sup>2</sup>



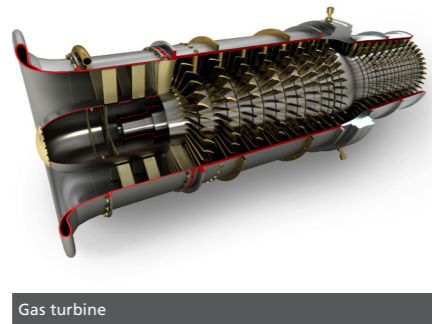
### CLOSURES AND CONVERSIONS

There is 11.4 GW of coal-fired power capacity scheduled to be taken off-line in 2018 as natural gas prices continue to remain low and higher efficiency appliances and processes continue to lower the demand for electricity<sup>4</sup>.

Many power utility companies continue to either close or convert older plants from coal to gas as the economics of maintaining older coal plants and meet regulatory emissions requirements are no longer economically feasible. As with any change, switching an electrical utility source away from coal to a cleaner source also brings new challenges.

Renewable energy sources like wind and solar are being used for baseload electrical grid service.

While providing a cleaner source of energy, they remain unpredictable and must be fortified with on-demand power from gas-fired turbines, coal-fired boilers, batteries and other sources to provide grid stability. Keeping the production stable can be quite challenging at times.



Gas turbine

### SAFETY MEASURES

Converting a power plant from coal to natural gas presents many new safety hazards regarding the handling and operation of the fuel. Even if personnel are properly trained in the use of natural gas, extreme care is still needed, as seen with the recent explosions that blew up several homes in the Merrimack Valley in Massachusetts while the pipelines were being worked on.

Challenges with the safe operation of plants begin with the operators as they migrate from a solid to gaseous fuel source – new safety measures and training are required. The utmost care must be taken during start-up/shutdown, operation and control, and having gas analyzers co-located on the plant equipment providing real-time feedback can save lives.

Regulatory requirements and fuel cost are the main drivers for any new boiler build or fuel conversion in the US power market. The conversion of boilers from coal-fired to natural gas-fired began in the early 1990s. However, it was not until the MATS (Mercury and Air Toxics Standards) ruling in November 2014, combined with low natural gas prices, that this change-over began in earnest.

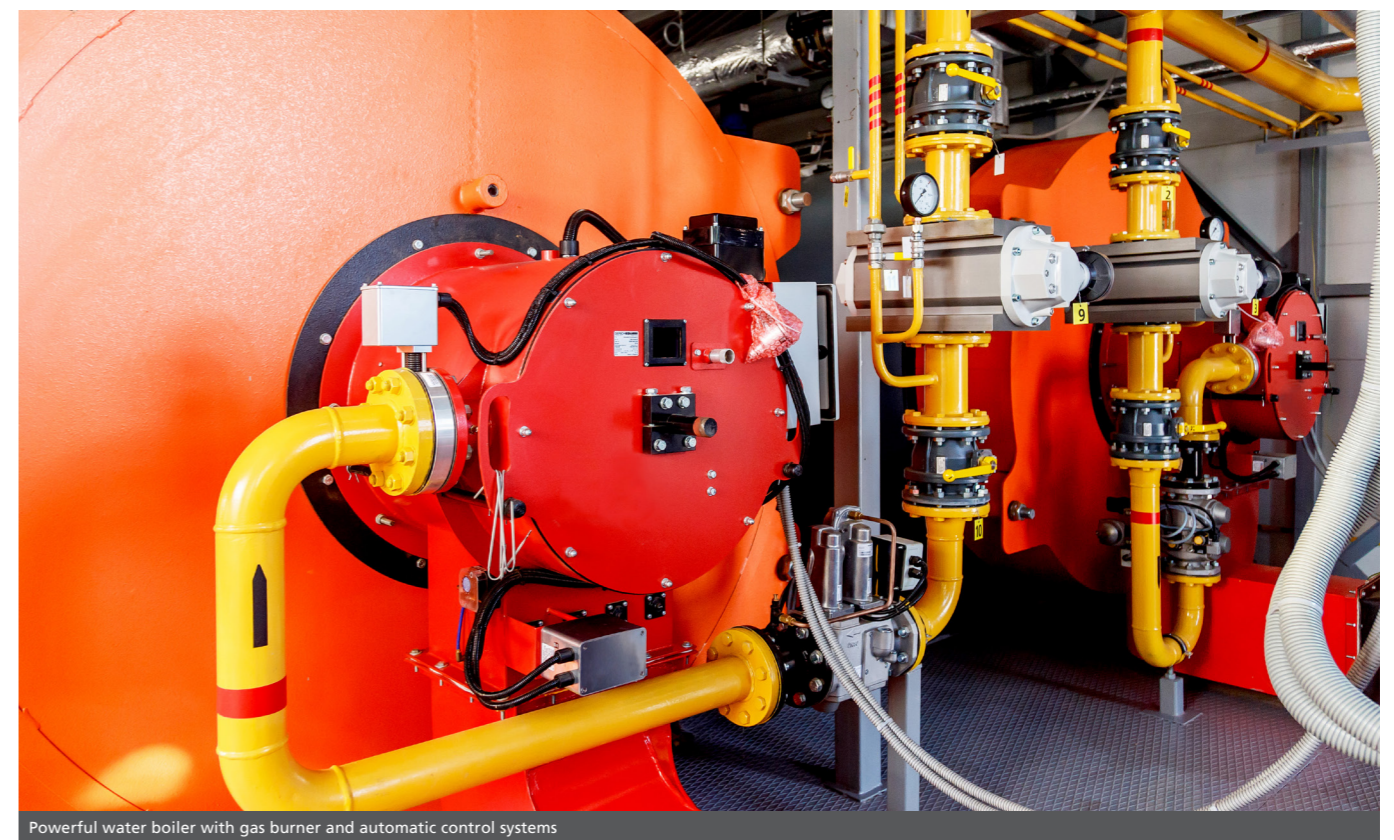
If the existing boiler can be retrofitted with any one or a number of new burner management and combustion control systems, exhaust gas recirculation, low NOx burners, or over-fire air equipment

to meet the regulatory requirements, then fuel conversion is not necessary.

While not all coal to natural gas fuel conversions are possible, the economics of converting older plants with less than 300 MW capacity or plants where the addition of emissions control equipment would be too expensive have led to the current conversion or decommissioning trend. Changing from coal to natural gas fuel requires major plant infrastructure changes in fuel handling, storage and distribution plus new pressure reduction, pipeline metering, and valving added to the boiler burners.

Natural gas conversion produces other unintended consequences for operational and maintenance personnel, including staff reductions (up to two-thirds due to lower fuel handling needs) and training on new hazards and safety management skills. This is especially critical if the plant is used for peaking power, which relies on strict capacity agreements, with stiff penalties if the plant is not producing when the demand is required. At this point, safety is of the utmost concern.

Continued on page 06.



Powerful water boiler with gas burner and automatic control systems

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<sup>1</sup> Today in Energy "EIA monthly survey tracks US power plant additions" <https://www.eia.gov/todayinenergy/detail.php?id=36513>

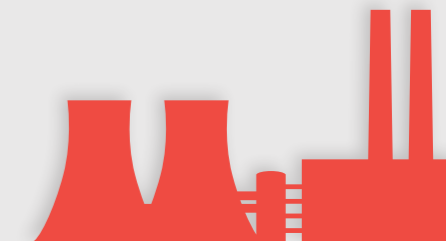
<sup>2</sup> FAQ "What is US electricity generation by energy source?" <https://www.eia.gov/tools/faqs/faq.php?id=427&t=3%22>

<sup>3</sup> "Natural gas killed coal – now renewables and batteries are taking over" <https://www.theguardian.com/environment/climate-consensus-97-per-cent/2018/jan/29/natural-gas-killed-coal-now-renewables-and-batteries-are-taking-over>

<sup>4</sup> "America's coal plants closing despite Trump" by L. Michael Buchsbaum Une 25, 2018 <https://energytransition.org/2018/06/americas-coal-plants-closing-despite-trump/>



# APPLICATION STUDY



## GUIDANCE FOR RISK MANAGEMENT

The US electrical generation utility industry takes guidance on the design and safe operation associated with boilers, turbines and combustion related equipment from the National Fire Protection Agency (NFPA) 85 "Boiler and Combustion System Hazards" code.

Petroleum production, refineries, petrochemical and chemical plants, however, are mandated by the US EPA under OSHA 29 CR,1910 and EPA 40 CFR Part 68 to provide a risk management program for the hazards and safe operation of all gas-fired heaters at the plant.

The American Petroleum Institute (API) provides recommended practices and guidance for best practices for instrumentation, control and protective system installations in API 556 and guidance on design, operation, and maintenance for fired heaters and other general refinery equipment in API 560 and for industrial fired boilers used in refineries and chemical plants in API 538.

Regardless of the industry the plant owner has the ultimate responsibility for safety and must decide where to take guidance from and then implement the practice.



## SAFETY ASSESSMENTS

Most explosions arise during either start-up or shutdown of a boiler or turbine due to unburned fuel arising from fuel-rich or flameout conditions. The lack of air in the combustion chamber - from insufficient air flow or too much fuel channeled to the burners - results in a sub-stoichiometric, fuel-rich situation leading to unexpected explosions.

Excess fuel can also accumulate in the combustion chamber, causing a burner flameout condition typically caused by an inexperienced operator attempting to relight the burner pilot or a leaky or open valve allowing fuel to accumulate.

For example, NFPA 85 recommends a minimum of five volumes of air to be flushed through a boiler or heat recovery

steam generating (HRSG) unit during start-up or shutdown to eliminate any retained fuel in the chamber. But unless a methane (CH<sub>4</sub>) detection system is present a fuel leak would not be caught. It would allow fewer flushings of the system while still decreasing the risk of explosions.

Many power plant owners are taking this one step further and producing a Risk Management Plan like those used in industrial process plants, following the guidelines laid out by the American National Standards Institute (ANSI) ISA-84.00.01-2004 (or IEC 61511 used in Europe).

A risk assessment is done to determine the severity versus the risk of the power plant operations and assign a probability

rating to the "fitness" of the installed or proposed monitoring equipment. The plant must then deploy and maintain Safety Instrumented Systems (SIS) to control any of the potential hazards. While SIS are not required in the power industry, some plant managers are expressing more interest due to the inherent hazards associated with the use of natural gas as a fuel.

The monitoring analyzer or system is assessed and assigned a Safety Integrity Level (SIL) rating ranging from 0 up to 4 (0 being the least reliable) based upon how it would perform if the hazard occurred and the plant needed to be shut down safely. Furthermore, any analyzer used for safety monitoring is not to be used simultaneously for process control.

## REDUCING THE RISKS

Safety risks are greatly reduced by placing a fast-responding analyzer, such as a SERVOTOUGH Laser 3 Plus Tunable Diode Laser (TDL) optimized for the measurement of both carbon monoxide (CO) and methane (CH<sub>4</sub>), directly in the combustion chamber. Having analyzers that can detect approaching hazardous situations, like too much unburned fuel and incomplete combustion, can prevent explosions and save lives. Having the ability to monitor CH<sub>4</sub> also provides a direct safety measurement of any residual fuel left in the chamber during times of maintenance.

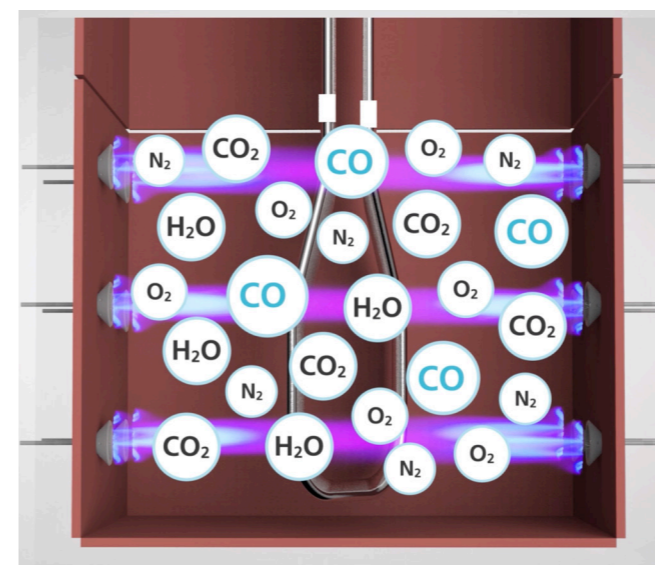
The addition of a Servomex Laser 3 Plus Oxygen (O<sub>2</sub>) analyzer to the dual CO+CH<sub>4</sub> TDL laser signal allows detection of fuel-rich and burner flameout conditions. When there is incomplete combustion (fuel-rich conditions) this produces concurrent high CO and low O<sub>2</sub> concentrations. Monitoring only the CO or the O<sub>2</sub> signal can lead to incorrect combustion control, potentially creating an even more hazardous environment.

A burner flameout condition is quickly detected by monitoring for rapid increases in O<sub>2</sub> and CH<sub>4</sub> (fuel) signals.

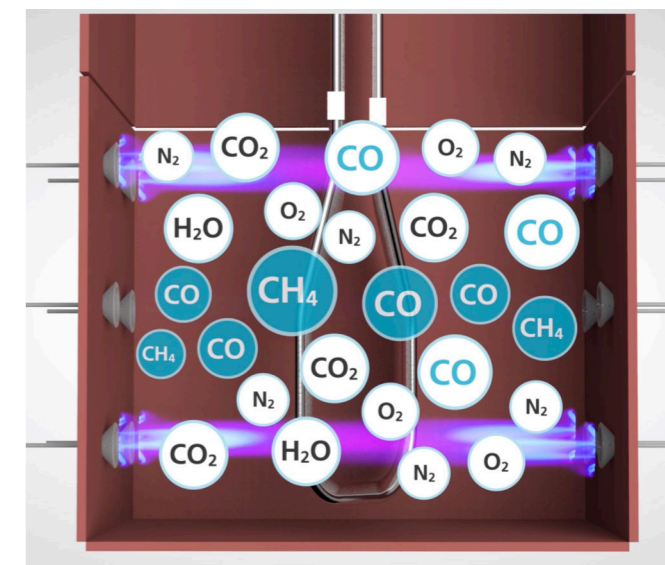
Focusing on O<sub>2</sub> alone can lead to improper diagnosis and explosions.

Servomex Laser 3 Plus analyzers provide the perfect tools for power plant operators looking for ways to reduce operational costs and risks, especially when switching from coal-fired to natural gas-fired fuel in boilers. The Laser 3 Plus analyzers are SIL 2 rated and are the perfect solution for combustion optimization or safety monitoring.

**SIL 2 RATED**



It is important to monitor for flame-out conditions, including high CO or CH<sub>4</sub> levels



Fuel-rich conditions can create a CH<sub>4</sub> pocket that is difficult to detect with single-point measurements



**Laser 3 Plus Combustion**  
optimized for



Watch the video on laser analysis in combustion safety at: [servomex.com/firedheaters](http://servomex.com/firedheaters)  
Or download our expert paper "Combustion Control in Fired Heaters" at: [servomex.com/combustioncontrol](http://servomex.com/combustioncontrol)





## SO<sub>2</sub> SCRUBBER MODULE SOLUTION FOR COMBUSTIBLE SENSORS

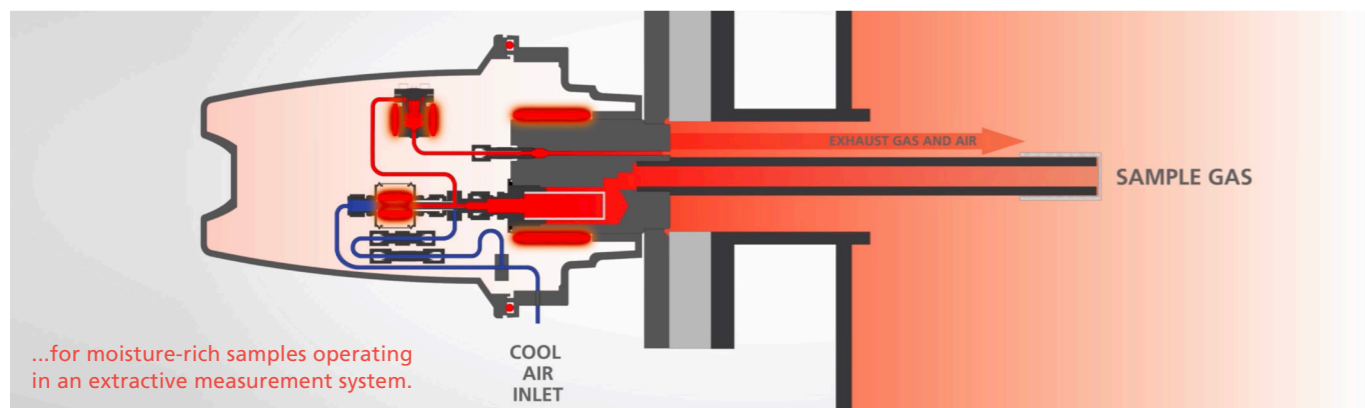
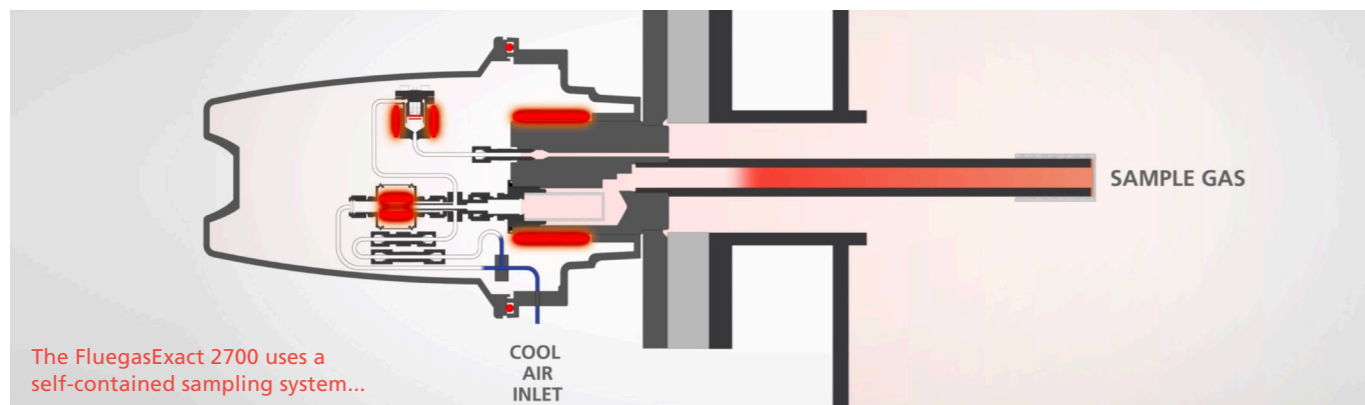


**THICK FILM CALORIMETRY SENSORS CAN BE ADVERSELY AFFECTED BY THE HIGH LEVELS OF SULFUR GENERATED BY LOW-GRADE COAL. KENNETH WONG, SERVOMEX'S SOUTHEAST ASIA TECHNICAL MANAGER FOR SYSTEMS DESIGN AND ENGINEERING, EXPLAINS HOW SERVOMEX CREATED AN INNOVATIVE SOLUTION TO SAFEGUARD ANALYZER OPERATION.**

Monitoring the fuel feed rate and the combustion process are the keys to increasing the efficiency while reducing costs and emissions in a boiler. Operating at or near the optimal combustion parameters requires fast and reliable monitoring of the change in oxygen (O<sub>2</sub>) and unburnt fuel.

The SERVOTOUGH FluegasExact 2700 uses Zirconia sensor technology to monitor O<sub>2</sub> levels in conjunction with a patented Thick Film Calorimetry (Tfx) sensor to detect unburnt fuel in the form of combustible (COe) gas components.

A Flowcube flow sensor can be placed before the O<sub>2</sub> cell, giving a highly reliable measurement of flow, enabling preventative maintenance. The signal response time ranges from 17 seconds up to 30 seconds depending upon the configuration using a unique low flow extractive sampling technique.



The FluegasExact 2700 is designed as a close-coupled extractive analyzer, with a probe inserted into the hot boiler or economizer section, and the actual sensors located just outside of the hot process wall in a temperature-controlled analyzer head.

The analyzer is unique in that only a small amount of the sample gas is extracted into the analyzer head, passing first through flow, then the O<sub>2</sub> and finally the Tfx COe sensor. Once the gas sample reaches the Tfx sensor, carbon monoxide (CO) and O<sub>2</sub> adsorb

onto the Tfx sensor, composed of a disk with four printed platinum resistive tracks, of which two are catalyst-coated. When the CO combusts on the sensor disk, the difference in the thermal response on the catalytic versus non-catalytic tracks are detected.

## THE IMPACT OF SULFUR ON Tfx SENSORS

Asian and Indian power plants commonly use lower grades of coal that can contain up to 8% sulfur. Sulfur released into the atmosphere creates acid rain, haze and many health-related issues and while reducing the use of sulfur-containing coal is desirable, the economic cost is the biggest driver. Unfortunately, sulfur deactivates or poisons the catalytic material used in emission-reduction processes, including those used for NOx reduction like Selective Catalytic Reduction (SCR) catalysts.

This same process that deactivates the SCR catalyst also deactivates catalyst-based sensors. The sulfur preferentially reacts with the metal catalyst, leading

to a layer of sulfur that prohibits CO from reaching the surface of the COe sensor. Without a means to remove the sulfur, the catalyst eventually becomes deactivated or poisoned.

A special sulfur-resistant Tfx sensor can be installed for exhaust gas streams that contain lower amounts of sulfur (<2%). The sensor is operated at a higher temperature, 400°C (752°F), promoting burn-off which keeps the sulfur from depositing permanently on the COe sensor. Additional combustion air is also supplied internally to dilute the amount of exhaust gas and therefore sulfur, that is seen by the sensor at any one time.

However, when lower grades of coal are used, neither of these options have had success long term, requiring the Tfx sensor to be replaced after only a few months on stream. **Continued on page 10.**



## BENEFITS OF THE SERVOTOUGH FluegasExact 2700:

- MEASUREMENT ASSURANCE/uptime
- LONG SENSOR LIFE (due to low flow extractive principle)
- EASE OF MAINTENANCE
- LOWER RESPONSE TO OTHER COMBUSTIBLE GASES SUCH AS METHANE
- RELIABILITY
- DIAGNOSTICS







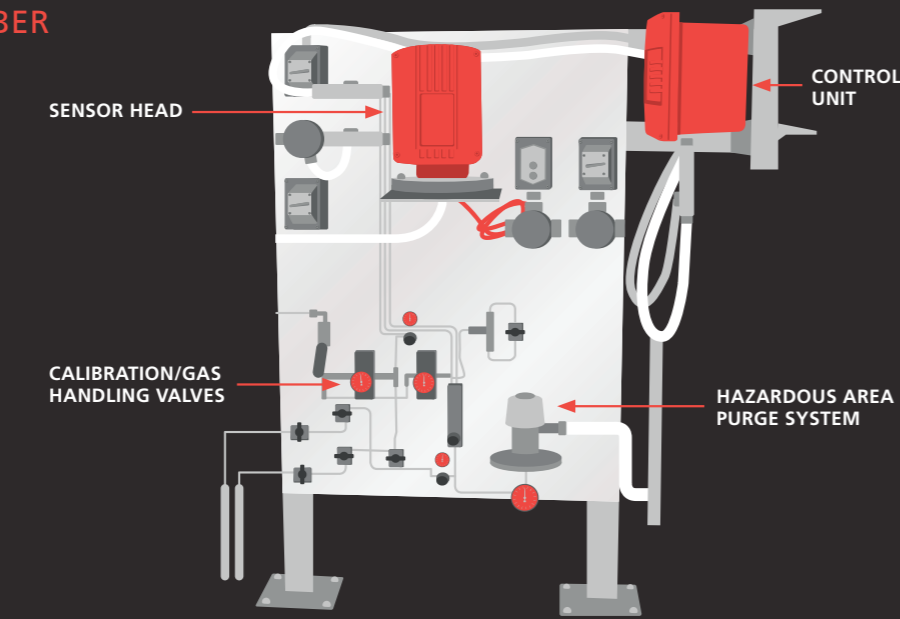
## DEVELOPING THE SO<sub>2</sub> SCRUBBER

A South East Asian operator at a power plant site generating >3000 MW was looking for a combustion control solution for several steam generation boilers at the plant.

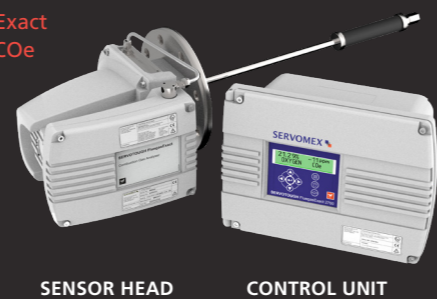
A SERVOTOUGH FluegasExact 2700 gas analyzer was equipped with an oxygen (O<sub>2</sub>) and combustion (CO<sub>e</sub>) sensor and optimized for high sulfur emissions. Because the plant also did not want to mount the sensor head directly on the boiler, a remote extractive system was designed and installed. This system was able to achieve a response time of under 40 seconds, even though the sensor head was 10 meters away.

The high-sulfur version of the CO<sub>e</sub> sensor was installed but it failed within two weeks due to the high-sulfur environment of the coal-fired boiler; the O<sub>2</sub> sensor continued to work.

Servomex created a new sulfur dioxide (SO<sub>2</sub>) scrubber and installed it on the inlet to the FluegasExact 2700 sensor head. Because this installation was on a remote extractive panel a heated line was required to keep the exhaust gas hot to avoid any condensation. The CO<sub>e</sub> sensor has been in continuous operation for over one year and because of the location of the scrubber at grade, it is easily maintained.



Remote mounting panel including a FluegasExact 2700 gas analyzer equipped with an O<sub>2</sub> and CO<sub>e</sub> sensor optimized for high sulfur emissions.



## CREATING A MORE COMPACT SCRUBBER

While the remote extractive system works well, there are many installations that require the FluegasExact 2700 sensor head to be mounted directly to the boiler or economizer wall avoiding a remote sampling system completely. A new compact version of the CO<sub>e</sub> sensor SO<sub>2</sub> scrubber was created that fits between the port flange on the boiler/economizer wall and the close-coupled head flange of the FluegasExact 2700. The addition

of the scrubber in this configuration adds less than three seconds to the total sample time of the analyzer (20-30 seconds total) without compromising the scrubber performance.

The compact SO<sub>2</sub> scrubber system has a screw-in membrane filter that removes condensed moisture prior to gas entering the sulfur absorber. The sulfur absorber must be replaced on a regular basis

(three to 12 months depending on the sulfur load). However, this is a simple replacement and does not require the probe to be removed from the boiler.

The compact scrubber systems were installed at another South East Asian power plant earlier this year and the CO<sub>e</sub> sensors continue to work well, even in these high-sulfur environments.

Existing systems can be retrofitted with this new compact scrubber design. For more information on the compact or remote extractive design please contact your local Servomex representative:

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[europe\\_sales@servomex.com](mailto:europe_sales@servomex.com)

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[MEI\\_sales@servomex.com](mailto:MEI_sales@servomex.com)

## WASTE TO ENERGY USING THERMAL CONVERSION PROCESSES

WITH EFFECTIVE GAS ANALYSIS, GASIFICATION AND PYROLYSIS CAN PROVIDE EFFICIENT PROCESSES FOR CREATING POWER FROM WASTE SOURCES. SERVOMEX'S GLOBAL BUSINESS DEVELOPMENT MANAGER, DR. STEPHEN FIRTH, EXPLAINS THE KEY MEASUREMENTS INVOLVED IN THIS APPLICATION.



Gasification and pyrolysis are two different processes used to turn residual waste into an energy resource or chemical product.

In gasification, waste is heated to produce synthesis gas (syngas), a fuel gas mixture mostly made up of hydrogen, carbon monoxide and some carbon dioxide. Syngas is a useful intermediate in the production of synthetic natural gas, and for the creation of ammonia or methanol.

Pyrolysis works by heating the waste in the absence of oxygen (O<sub>2</sub>), creating a char and a gas and/or liquid that can be used for electricity production or the manufacture of other fuels.

Gasification and pyrolysis can be combined into an advanced process that uses organic feedstocks to create a fuel-type syngas which is, in turn, combusted to provide renewable energy generation.

Gas analysis plays an important role in both processes, monitoring for O<sub>2</sub> in the gasifier to ensure an efficient reaction. A combustion control solution is also required to optimize the fuel-air ratio at several points in the process, including combined cycle power generation. In addition, emissions monitoring remains a key requirement.



**DID YOU KNOW...**  
According to 2016 statistics, China has 434 waste-to-energy plants, compared to 71 in the United States.

## SERVOMEX ANALYZER SOLUTIONS FOR GASIFICATION AND PYROLYSIS

### SERVOTOUGH Laser 3 Plus Process

High-sensitivity cross-stack TDL analyzer optimized for fast-response, accurate measurements of O<sub>2</sub> in hazardous conditions.



### SERVOTOUGH FluegasExact 2700

Advanced flue gas analyzer for combustion process analysis of O<sub>2</sub> and combustibles in challenging locations.



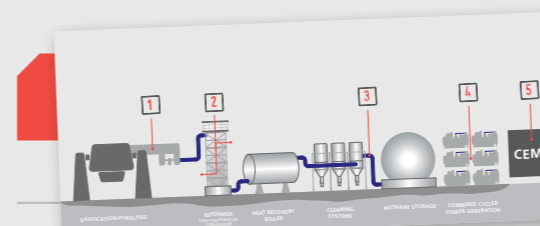
### SERVOTOUGH Oxy 1900

Safety-enhanced O<sub>2</sub> analyzer designed to deliver accurate Paramagnetic measurements in hazardous or demanding applications.



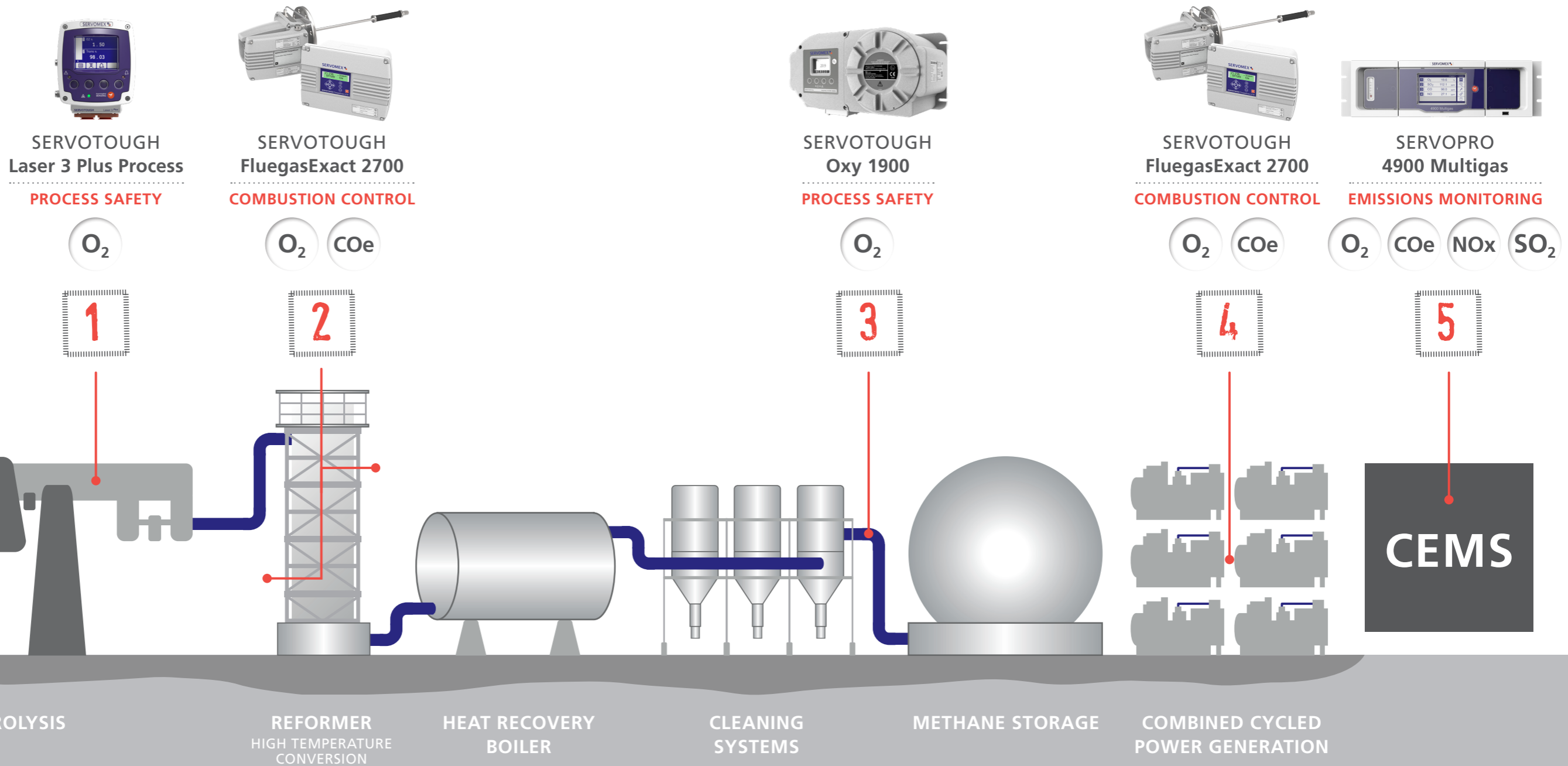
### SERVOPRO 4900 Multigas

High-performance CEMS analyzer certified for multi-gas measurements of flue gases, O<sub>2</sub> and pollutants in regulatory environments.



See our analyzers across the process **OVERLEAF**





For this application, Servomex offers a comprehensive range of process safety, combustion control and continuous emissions monitoring system (CEMS) measurements.

The application commences with the gasification/pyrolysis process, where waste material is heated to produce a rich mixture of gases including carbon monoxide (CO), hydrogen (H<sub>2</sub>) and hydrocarbons.

Any presence of oxygen (O<sub>2</sub>) is a potentially dangerous flammability risk, so the in-situ

O<sub>2</sub> safety measurement provided by the **SERVOTOUGH Laser 3 Plus Process (1)** is critical. The waveform-specific scanning of Tunable Diode Laser (TDL) technology means the signal is unaffected by cross-interference of other gases, especially important as the composition of the gas mixture is constantly changing. As the process is full of particulates with a high dust load, these are removed from the optics through use of a nitrogen purge gas.

The higher hydrocarbons present in the mixture generated are converted to lower hydrocarbons in the high-temperature combustion processes in the reformer. Combustion efficiency across the burner is provided by **SERVOTOUGH FluegasExact 2700 analyzers (2)**, which enable the precise control of O<sub>2</sub> and combustibles (COe) at high temperatures.

The heat created in the reformer is removed by a heat recovery boiler, and the gas mixture cleaned, with the resulting output designated for storage or for burning in a combined cycle boiler.

The methane present is liquified through cooling (-150°C) and passed into storage.

Once again, the presence of O<sub>2</sub> presents a flammability risk, so a SIL-compliant measurement of O<sub>2</sub> in the 1-2% range is made by the **SERVOTOUGH Oxy 1900 (3)**. The remainder of the mix is then fed into the combustion process of a combined cycle boiler, where again the **FluegasExact 2700 (4)** provides precise measurements

of O<sub>2</sub> and CO for effective combustion control. Finally, the residual gases are vented into the atmosphere, where the **SERVOPRO 4900 Multigas (5)** is able to provide simultaneous 0-100 parts per million CEMS measurements for O<sub>2</sub>, CO, nitrogen oxides (NOx) and sulfur dioxide (SO<sub>2</sub>).

Find out more at [servomex.com](http://servomex.com) or contact your nearest business center





## HIGH-PERFORMANCE EMISSIONS ANALYSIS

THE SERVOPRO 4900 Multigas DELIVERS ADVANCED CONTINUOUS EMISSIONS MONITORING (CEMS) IN A NEXT-GENERATION DIGITAL PLATFORM.

### THE 4900 Multigas MEASURES:

CRITERION POLLUTANTS:

NO, SO<sub>2</sub>, CO

GREENHOUSE GASES:

CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>

DILUTION/REFERENCE GASES:

O<sub>2</sub> or CO<sub>2</sub>



Servomex offers the most compact high-performance multi-gas monitoring solution for flue gas emissions monitoring, measuring criterion pollutants, greenhouse gases and reference oxygen for both continuous monitoring or mobile laboratory / stack testing applications.

Compact and robust, the 4900 Multigas requires minimal rack space and is easily integrated into any data acquisition system, reducing installation time and cost. It is the best space-saver on the market with up to three gas transducers housed in a standard 19" (48.26cm) rack mountable chassis only 3U (5.25" or 13.335cm) high!

The 4900 Multigas is highly configurable with a combination of reliable, highly linear, ultra-stable digital sensing transducer technologies – including Paramagnetic and Infrared based non-dispersive and Gas Filter Correlation.

Capable of measuring any combination of nitric oxide (NO), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), oxygen (O<sub>2</sub>), carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>) with outstanding accuracy.

There is also a configurable version of the analyzer for those applications that require MCERTS/QAL1 certification.

The highly successful SERVOPRO 4900 analyzer has been fully updated to conform to the new European Union standards and provided with a fresh interface for easier navigation and control of the analyzer. It is fully backwards-compatible with existing 4900 installations, delivering the same key measurements alongside significant improvements in communications and control.

These enhancements include an intuitive, icon-driven touchscreen interface which enables easy user interaction and device configuration. There are up to four analog and eight digital inputs, four analog outputs individually selectable as mA or voltage, 32 alarms and 32 relays available. Updated digital protocols include RS232/RS485 Modbus and PROFIBUS, with Modbus TCP/IP to be released in Q4 2018.

Optimized for applications where accurate emissions analysis is a regulatory requirement, such as CEMS or mobile

laboratories / trailers, the 4900 Multigas is ideal for industrial processes including power generation, refining, incineration and manufacturing.

### KEY APPLICATIONS

- UTILITY BOILERS ..... ✓
- WASTE INCINERATORS ..... ✓
- CHEMICAL INCINERATORS ..... ✓
- CREMATORIA ..... ✓
- MOBILE LABS/TRAILERS ..... ✓
- EMISSIONS DESTRUCTION OR REMOVAL EFFICIENCY ... ✓



## DELIVERING PEACE OF MIND TO YOUR ANALYZER SET-UPS



MARK CALVERT, SERVOMEX'S SERVICE MANAGER FOR THE EMEA REGION, EXPLAINS THE BENEFITS OF COMMISSIONING FOR YOUR ANALYZER OR SYSTEM.

Correct installation and configuration of your analyzer is essential to ensure it provides optimum performance and that it meets your compliance and operational needs from the outset.

Servomex's highly trained commissioning engineers provide a fast, seamless and comprehensive service that supports

your process. They will assess installation suitability and commission your analytical equipment to perform safely, accurately and reliably.

This delivers optimum performance from your analyzer or system, and qualifies the analyzer for an additional warranty period.



COMMISSIONING



### A customized solution

An engineer will provide a fully customized commissioning program that meets your compliance and operational needs. They will then hand over control to your in-house technicians with a face-to-face training session.

### Return on your investment

Commissioning ensures you get the best return from your analyzer. It helps avoid costly process inefficiencies and ongoing maintenance costs caused by incorrectly installed equipment.

### Optimize your performance

An analyzer commissioned by Servomex eliminates the operational errors caused by incorrect installation. This avoids the dangers of compromised plant safety, and ensures analyzer operation is tailored to suit your process requirements.

### Health Check protection

You can protect your analyzer for two years by purchasing a Servomex Health Check with your Commissioning package. We will validate your analyzer's performance after the first year of installation, and provide you with a further 12-month warranty.

Commissioning by one of Servomex's highly-trained engineers can avoid the problems an incorrectly installed system can bring, ensuring customers have someone present on site with the knowledge, experience and expertise when it counts.

This means customers can achieve maximum levels of performance, reliability and, often, cost saving from their analyzer from day one.

Servomex Service Network offers your business a full range of service products developed to ensure optimum process performance. Contact your local Servomex Business Center today to find out more and protect your investment.

COMMISSIONING

SERVICE CONTRACTS

ON-SITE SERVICE SUPPORT

HEALTH CHECK

SPARES

SERVICE CENTER SUPPORT

RENTAL EQUIPMENT

TRAINING

Get peace of mind for your process today: [servomex.com/service](http://servomex.com/service)



# POWER PRODUCT GUIDE

Power generation is a demanding and competitive industry – producing energy for a global market is a complicated balancing act between process efficiency, emissions control, safety requirements and cost control.

Servomex offers a comprehensive gas analysis that enables the world's power producers to optimize their processes, meet legally binding emissions targets and raise profitability.

By working with industry regulators, Servomex ensures its gas analyzers meet the global compliance standards and the specific demands of power generation applications throughout the world.

Supported by a global service and support network, Servomex analyzers are used with confidence in power stations, incinerators and co-generation plants internationally.

For the full range of Servomex analyzers, visit [servomex.com/gas-analyzers](http://servomex.com/gas-analyzers)

## SERVOTOUGH Oxy 1800

SAFE AREA

### ACCURATE AND STABLE SAFE AREA O<sub>2</sub> ANALYZER

Designed to reliably measure percent O<sub>2</sub> in many safety-critical industrial applications, the Oxy 1800 is a stable, accurate and highly specific O<sub>2</sub> analyzer for safe area use.



### FEATURES AND BENEFITS

- Internal/external use (IP66/NEMA 4X rated)
- Special version for solvent-bearing samples
- Range of alarm outputs aids integration with other systems

### APPLICATIONS

- Waste water treatment
- Food storage
- Marine inerting applications
- Inert blanketing

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	 PROCESS CONTROL  SAFETY

PARAMAGNETIC

## SERVOTOUGH Oxy 1900

HAZARDOUS AREA

### AWARD-WINNING PARAMAGNETIC DIGITAL O<sub>2</sub> ANALYZER DESIGNED FOR HAZARDOUS AREA USE

Offering industry-standard features alongside revolutionary, value-added options, the Oxy 1900 O<sub>2</sub> gas analyzer sets new standards of flexibility, stability and reliability from a single, cost-effective unit.



### FEATURES AND BENEFITS

- Can be used in Safe Area to Zone 1/Div 1 hazard-rated locations
- Heated sample cell allowing simplified sample system requirements
- Unique Servomex Flowcube flow sensor technology for improved safety

### APPLICATIONS

- Process control
- Safety-critical oxidation, such as ethylene oxide and propylene oxide purity
- Flare stack analysis
- Vapor recovery

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	 PROCESS CONTROL  SAFETY

PARAMAGNETIC

## SERVOTOUGH OxyExact 2200

HAZARDOUS AREA

### HIGH-SPEC PROCESS O<sub>2</sub> ANALYZER OFFERS SAFE OR HAZARDOUS AREA CONTROL WITH UP TO SIX TRANSMITTERS

The OxyExact 2200 high-specification O<sub>2</sub> analyzer offers an unrivaled combination of precision, flexibility and performance for optimum process and safety control. The OxyExact can be configured with a safe or hazardous area control unit with up to six transmitters.



### FEATURES AND BENEFITS

- Zone 1 certified to ATEX Cat 2, IECEx and FM/CSA Class 1 Div 1
- Three enclosure systems allow sampling of any flammable gas up to 100% O<sub>2</sub> and pressures of up to 40psi
- High-temperature version eliminates the need to condense hot sample prior to analysis

### APPLICATIONS

- Oxidation control reactions
- EO, PTA and EDC manufacturing
- Catalyst regeneration
- Solvent recovery

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	 PROCESS CONTROL  SAFETY

SENSING TECHNOLOGY  
PARAMAGNETIC

## SERVOTOUGH SpectraScan 2400

HAZARDOUS AREA

### REVOLUTIONARY INLINE REAL-TIME ANALYSIS OF HYDROCARBON COMPONENTS C1-C6

A real time optical analyzer utilizing the Precise field-proven optical bench, the SpectraScan 2400 delivers a breakthrough capability in the continuous analysis of light hydrocarbons C1-C6.



### FEATURES AND BENEFITS

- North American Cat 1, Div 2 ATEX Cat 3 IECEx Zone 2
- Tunable band-pass filter enables simultaneous scanning of selected wavelength bands for gases including methane, ethane, propane and iso-butane
- Unique tunable filter process with Infrared photometer technology delivers industry-leading interference compensation

### APPLICATIONS

- BTU/Wobbe content measurement
- Gas turbine, engines, fuel cells
- Flare stack monitoring

GAS	MEASURES	APPLICATION
CO CARBON MONOXIDE	% PERCENT	 PROCESS CONTROL  QUALITY
CO <sub>2</sub> CARBON DIOXIDE	CV CALORIFIC VALUE	
C1-C6		
H <sub>2</sub> S HYDROGEN SULFIDE		

SENSING TECHNOLOGY  
SPECTROSCOPIC

## SERVOTOUGH SpectraExact 2500

HAZARDOUS AREA

### RUGGED PHOTOMETRIC GAS ANALYZER FOR DEMANDING PROCESS APPLICATIONS

Servomex's iconic industry-leading Photometric analyzer delivers flexible single and multi-component gas analysis capability for corrosive, toxic and flammable sample streams. The SpectraExact 2500's reliable, accurate and stable real-time online process analysis makes it ideal for a range of process, combustion and emissions gas analysis applications.



### FEATURES AND BENEFITS

- IECEx and North American hazardous area approvals
- Easy integration with DCS – from 4-20mA to Modbus TCP
- Sample cell and electronics segregated – for easy maintenance and safe operation

### APPLICATIONS

- Water in EDC/solvents
- Ethylene production
- TDI production
- Chlorine production

GAS	MEASURES	APPLICATION
TOXIC	% PERCENT	 PROCESS CONTROL
FLAMMABLE	ppm TRACE	
CORROSIVE		

SENSING TECHNOLOGY  
GAS FILTER CORRELATION INFRARED



# SERVOTOUGH FluegasExact 2700

HAZARDOUS AREA

## ADVANCED FLUE GAS ANALYZER FOR HIGH-TEMPERATURE MEASUREMENT OF O<sub>2</sub> AND COMBUSTIBLES

Designed to measure O<sub>2</sub> and CO<sub>e</sub> in flue gases for improved combustion efficiency and reduced emissions, the FluegasExact 2700 gas analyzer is designed to suit the most demanding needs of combustion efficiency applications in the power generation and process industries.



### FEATURES AND BENEFITS

- ATEX Cat. 3, IECEx Zone 2 & North America Class I, Div 2
- Unique Flowcube flow sensor technology enables positive flow conditions to be validated
- Sulfur-resistant combustibles sensor enables sensor to operate at elevated sulfur levels

### APPLICATIONS

- Process heaters
- Utility boilers
- Thermal crackers
- Crematoria & incinerators

GAS	MEASURES	APPLICATION
O <sub>2</sub>	% PERCENT	COMBUSTION
CO <sub>e</sub>	ppm TRACE	COMBUSTIBLES
		PROCESS CONTROL

SENSING TECHNOLOGY: CALORIMETRY, ZIRCONIA

# SERVOTOUGH LaserSP 2930

HAZARDOUS AREA

## HIGH-SENSITIVITY CROSS-STACK TDL ANALYZER

A high-performance gas analyzer designed for continuous in-situ monitoring, the LaserSP 2930 delivers a fast response time and highly stable performance. Suitable for measuring a range of gases including HCl, HF, H<sub>2</sub>O, H<sub>2</sub>S, HCN, and other hydrocarbons, the LaserSP is ideal for a wide range of process, combustion control and emissions applications.



### FEATURES AND BENEFITS

- Designed for Zone 1 and Zone 2 hazard rated (gas/dust) locations
- In-situ with no sample conditioning delivers reliable operation
- Wavelength Modulated Spectroscopy provides wide dynamic range and lowest cross-interference

### APPLICATIONS

- Emission control systems for CEMS
- Combustion control systems for process heaters and crackers
- Ammonia slip control in DeNOx plants

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	PROCESS CONTROL
	ppm TRACE	EMISSIONS

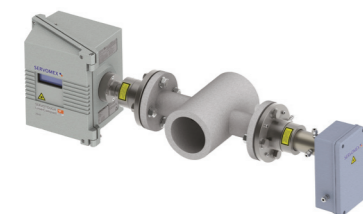
SENSING TECHNOLOGY: TUNABLE DIODE LASER

# SERVOTOUGH LaserCompact 2940

HAZARDOUS AREA

## SHORT PATH LENGTH TDL ANALYZER

Optimized for measurement across pipes and along short measurement cells and able to measure through very thin nozzles, reducing or even eliminating consumption of purge gas, the LaserCompact 2940 delivers the fast response time, highly stable performance and minimum sample conditioning advantages of TDL technology.



### FEATURES AND BENEFITS

- ATEX, IECEx and North American hazardous area approvals. ATEX Cat 3 (Gases) and Cat 2 (Dusts) IECEx Zone 2 and Zone 21. CSA Divisions and Zones (Gas and Dust)
- Line width correction delivers accurate measurement with variations in matrix
- In-situ with low purge gas consumption

### APPLICATIONS

- Chemical reactor – inert gas control
- Moisture in VCM
- Natural gas contaminants – H<sub>2</sub>O, CO<sub>2</sub>, H<sub>2</sub>S

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT	PROCESS CONTROL
	ppm TRACE	QUALITY

SENSING TECHNOLOGY: TUNABLE DIODE LASER

# SERVOTOUGH LaserExact 2950

HAZARDOUS AREA

## EXTRACTIVE TDL TRACE MULTI-GAS ANALYZER, DESIGNED FOR MEASURING TRACE GASES OFFLINE

Specifically designed for extractive trace analysis applications, the LaserExact 2950's TDL technology offers unsurpassed low ppb detection limits for most gases, making it ideal for the measurement of trace gases offline.



### FEATURES AND BENEFITS

- Zone 2/Div 2 hazard-rated locations and use without purge
- Advanced multipass cell delivers ppb or low ppm detection limits
- Innovative PeakLock pattern recognition line tracking eliminates drift over extended operational periods

### APPLICATIONS

- Refinery monitoring: H<sub>2</sub>S and CO<sub>2</sub> (during natural gas refinement)
- HF and HCl impurity monitoring in process gas
- Monitoring H<sub>2</sub>S during biogas production
- H<sub>2</sub>O and H<sub>2</sub>S in natural gas

GAS	MEASURES	APPLICATION
MULTIPLE	ppb ULTRA TRACE	PROCESS CONTROL
	ppm TRACE	QUALITY

SENSING TECHNOLOGY: TUNABLE DIODE LASER

# SERVOTOUGH DF-140E

HAZARDOUS AREA

## RELIABLE RESULTS IN A TESTING RANGE OF ENVIRONMENTS

The DF-140E allows for reliable oxygen measurement in a wide variety of environments, including outdoors and in explosive environments with a NEMA 7 remote sensor enclosure. Using the revolutionary non-depleting E-Sensor, the DF-140E delivers reliable readings without frequent recalibration and periodic sensor replacement.



### FEATURES AND BENEFITS

- Long-term reliability and stability with minimal maintenance
- Durability – can be used in Class 1, Div 1 or 2 areas
- STAB-EL option allows for accurate measurement in the presence of acid gases

### APPLICATIONS

- Reactor process control
- Pressure swing absorber nitrogen skids
- Blanketing and inerting

GAS	MEASURES	APPLICATION
O <sub>2</sub>	ppm TRACE	PROCESS CONTROL
OXYGEN		QUALITY

SENSING TECHNOLOGY: COULOMETRIC

# SERVOTOUGH DF-320E

HAZARDOUS AREA

## HIGH-RELIABILITY TRACE AND PERCENT O<sub>2</sub> MEASUREMENTS IN HAZARDOUS AREA LOCATIONS

Designed for use in harsh and hazardous areas, the DF-320E uses Servomex's unique, non-depleting Coulometric sensor technology to give highly stable O<sub>2</sub> measurements, making it ideal for applications including hydrogen, propene and polyethylene production, oil refining and petrochemical process monitoring.



### FEATURES AND BENEFITS

- Ideal analytical solution for applications including H<sub>2</sub>, C<sub>3</sub>H<sub>6</sub> and PE production, oil refining, and petrochemical process monitoring
- Microprocessor-driven for easy configuration and maintenance
- Coulometric sensor delivers accurate results with no sensor drifting, false low readings, or frequent calibration requirements

### APPLICATIONS

- Hydrogen production
- Polypropylene production
- Polyethylene production
- Oil refining
- Petrochemical applications

GAS	MEASURES	APPLICATION
O <sub>2</sub>	ppb ULTRA TRACE	PROCESS CONTROL
OXYGEN	ppm TRACE	QUALITY

SENSING TECHNOLOGY: COULOMETRIC



# SERVOTOUGH DF-340E

HAZARDOUS AREA

## HIGH-SENSITIVITY TRACE/ PERCENT COULOMETRIC OXYGEN ANALYZER CERTIFIED FOR HAZARDOUS AREA USE

Designed for heated or external locations, the DF-340E remains stable in changing sample and flow rate conditions, and is designed to provide measurements of trace or percent level oxygen in pure gas streams and multi-gas backgrounds. It is ideal for upset-prone conditions.



### FEATURES AND BENEFITS

- Coulometric sensing ideal for upset-prone applications and compensates for sample and flow rate fluctuations
- Suitable for outdoor installation, with NEMA 4-rated sensor enclosure options
- Multiple background gas stream monitoring, with simplified ongoing maintenance requirements

### APPLICATIONS

- Pressure swing absorber N<sub>2</sub> skids
- Reactor process control
- Blanketing and inerting
- Oil refinery monitoring
- Petrochemical process monitoring

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	ppb ULTRA TRACE ppm TRACE	PROCESS CONTROL QUALITY

SENSING TECHNOLOGY: COULOMETRIC

# SERVOTOUGH Laser 3 Plus Process

HAZARDOUS AREA

## THE WORLD'S SMALLEST TDL GAS ANALYZER, OPTIMIZED FOR PROCESS O<sub>2</sub> MEASUREMENTS

All the benefits of Servomex's TDL technology in a small, light unit offering unparalleled installation flexibility plus cost and performance benefits. Optimized for the fast, accurate and responsive measurement of process oxygen in hot or hazardous conditions.



### FEATURES AND BENEFITS

- High safety integrity utilizing Servomex's own line lock cuvette technology
- ATEX, IECEx and North American hazardous area approvals. Approved for process Zone 2. SIL 2 assessed and CE marked
- Quick and easy installation by one person with on-board display negating the need for laptop configuration
- Suitable for a range of combustion and process control applications

### APPLICATIONS

- Oxidation control
- Inerting
- Safety monitoring
- Flare gas monitoring
- Combustion control (<500°C)
- Coal to chemical

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT ppm TRACE	PROCESS CONTROL COMBUSTION

SENSING TECHNOLOGY: TUNABLE DIODE LASER

# SERVOTOUGH Laser 3 Plus Ammonia

HAZARDOUS AREA

## WORLD-LEADING NH<sub>3</sub> MEASUREMENT, OPTIMIZED FOR AMMONIA SLIP DeNOx APPLICATIONS

This TDL analyzer specifically optimized for ammonia slip measurement provides all the benefits of Servomex's TDL technology in a compact, light unit, offering unparalleled installation flexibility plus cost and performance benefits.



### FEATURES AND BENEFITS

- High measurement reliability utilizing Servomex's own line lock cuvette technology
- ATEX, IECEx and North American hazardous area approvals
- A compact analyzer specifically optimized for the fast, accurate and responsive measurement of NH<sub>3</sub>
- Ideal for slip ammonia application on power plants and fired heaters

### APPLICATIONS

- Process heaters
- Incinerators
- Power stations
- Furnaces

GAS	MEASURES	APPLICATION
NH <sub>3</sub> AMMONIA DeNOx	ppm TRACE	PROCESS CONTROL EMISSIONS

SENSING TECHNOLOGY: TUNABLE DIODE LASER

# GAS DETECTION OxyDetect

SERVOMEX

## NON-DEPLETING PARAMAGNETIC OXYGEN MONITOR DESIGNED FOR LIFE SAFETY APPLICATIONS

Life safety monitor designed for safe area or hazardous area environments, utilizing superior performance of non-depleting Hummingbird Paramagnetic O<sub>2</sub> sensing technology.



### FEATURES AND BENEFITS

- IP66 (indoor use only)
- The most reliable O<sub>2</sub> detector on the market
- No more false readings or false alarms caused by depleting cell technologies
- SIL 2 approval

### APPLICATIONS

- Pharmaceutical plants
- Helium production and storage
- Semiconductor facilities
- Laboratories & universities

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	SAFETY

SENSING TECHNOLOGY: PARAMAGNETIC

# SERVOTOUGH Laser 3 Plus Combustion

HAZARDOUS AREA

## THE REVOLUTIONARY COMPACT COMBUSTION ANALYZER OPTIMIZED FOR CO, O<sub>2</sub>, OR CO + CH<sub>4</sub> MEASUREMENTS

Containing all the benefits of Servomex's TDL technology in a light, compact unit, with unmatched installation flexibility plus cost and performance benefits, this analyzer is optimized for fast, accurate and responsive measurements in combustion and process control, making it a must for safety applications.



### FEATURES AND BENEFITS

- High safety integrity utilizing Servomex's own line lock cuvette technology
- Compact size means quick and easy installation by one person with on-board display negating the need for laptop configuration
- ATEX, IECEx and North American hazardous area approvals. Approved for process Zone 2. SIL 2 assessed and CE marked
- Optimized for combustion processes

### APPLICATIONS

- Process heaters
- Incinerators
- Power stations
- Furnaces

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	PROCESS CONTROL
CO CARBON MONOXIDE	ppm TRACE	COMBUSTION
CO+CH <sub>4</sub> CARBON MONOXIDE + METHANE		

SENSING TECHNOLOGY: TUNABLE DIODE LASER

# SERVOPRO 4900 Multigas

SAFE AREA

## AN ADVANCED DIGITAL MULTI-GAS CEMS ANALYZER

Specifically designed for Continuous Emissions Monitoring (CEMS) of flue gas, the SERVOPRO 4900 Multigas provides up to four simultaneous gas stream measurements. It combines Servomex's leading-edge sensing technologies with a modern digital platform for next-generation performance.



### FEATURES AND BENEFITS

- A comprehensive solution for CEMS analysis of multiple flue gas components
- Low maintenance and cost of ownership
- Advanced digital communications including Ethernet, Modbus TCP/IP and PROFIBUS

### APPLICATIONS

- Utility boilers
- Chemical incinerators
- Crematoria
- Mobile labs

GAS	MEASURES	APPLICATION
MULTIPLE	% PERCENT ppm TRACE	EMISSIONS

SENSING TECHNOLOGY: GAS FILTER CORRELATION, INFRARED, PARAMAGNETIC



# SERVOPRO NOx

SAFE AREA

## CHEMILUMINESCENCE DETECTOR (CLD) ANALYZER FOR KEY EMISSIONS APPLICATIONS INVOLVING ULTRA-LOW NO, NO<sub>2</sub> AND NOx

Utilizing Chemiluminescence detection technology to measure NO or NO/NO<sub>2</sub>/NOx concentrations in industrial gas and vehicle emission applications, the versatile SERVOPRO NOx can be calibrated for four measurement ranges starting from ultra-low to high ppm and is easy to install and operate.



### FEATURES AND BENEFITS

- Multiple-range NOx emissions monitoring solution with a fast response
- Non-depleting light-based measurement and electronic flow control keeps costs low
- Heated version available for wet to dry conversion option
- EPA 1065/1066 and LD Euro 6, HD Euro V1 compliant

### APPLICATIONS

- Continuous emissions monitoring (CEMS)
- Scrubber efficiency
- Turbine/generator feedback control
- SCR/SNCR feedback control

GAS	MEASURES	APPLICATION
NO NITRIC OXIDE	ppm TRACE	PROCESS CONTROL
NO <sub>2</sub> NITROGEN DIOXIDE		EMISSIONS
NOx NITROGEN OXIDES		QUALITY

**SENSING TECHNOLOGY**  
CHEMILUMINESCENCE

# SERVOPRO SO<sub>2</sub>

SAFE AREA

## USES PROVEN PULSED UV FLUORESCENCE TECHNOLOGY TO DELIVER A PRECISE AND RELIABLE MEASUREMENT OF ULTRA-LOW SULFUR DIOXIDE IN EMISSIONS AND AMBIENT AIR

For industrial applications that require ultra-low emissions monitoring of sulfur dioxide, this robust analyzer is designed to slot seamlessly into rack systems, making it easy to integrate with existing emissions monitoring systems to provide unrivaled performance.



### FEATURES AND BENEFITS

- Ultra-long-lasting UV light source
- Removable flash memory stores up to 10 years of data
- Operation over wide temperature range reduces cost of ownership

### APPLICATIONS

- Continuous emissions monitoring (CEMS)
- Ambient air monitoring

GAS	MEASURES	APPLICATION
SO <sub>2</sub> SULFUR DIOXIDE	ppm TRACE ppb ULTRA TRACE	PROCESS CONTROL
		EMISSIONS
		QUALITY

**SENSING TECHNOLOGY**  
UV FLUORESCENCE

# SERVOPRO HFID

SAFE AREA

## HIGH-PERFORMANCE FAST ANALYSIS OF TOTAL HYDROCARBONS, METHANE AND NON-METHANE HYDROCARBONS

Using a highly sensitive Flame Ionization Detector (FID) for measuring volatile hydrocarbon concentrations in industrial or vehicle emission applications, the HFID utilizes an internally heated oven set to 190°C to maintain the sample gas above its dew point, for optimum performance in total hydrocarbon analysis (THC). Can be equipped with a non-methane cutter for additional CH<sub>4</sub> and non-methane hydrocarbon (NMHC) reporting.



### FEATURES AND BENEFITS

- Four user-definable measurement ranges, reconfigurable in the field
- High-accuracy, gas-selective FID technology for maximized uptime
- Heated oven for maximum stability and "hot/wet" sampling
- EPA Method 25A compliant
- EPA 1065/1066 and LD Euro 6, HD Euro V1 compliant

### APPLICATIONS

- Continuous emissions monitoring (CEMS)
- VOC abatement
- Scrubber efficiency
- Compliance monitoring and testing

GAS	MEASURES	APPLICATION
THC TOTAL HYDROCARBONS	ppm TRACE	PROCESS CONTROL
CH <sub>4</sub> METHANE		EMISSIONS
NMHC NON-METHANE HYDROCARBONS		QUALITY

**SENSING TECHNOLOGY**  
FLAME IONIZATION DETECTOR

# SERVOFLEX Micro i.s. 5100

PORTABLES

## INTRINSICALLY SAFE ANALYZER MEASURES OXYGEN, CARBON MONOXIDE OR CARBON DIOXIDE

Designed for the measurement of toxic and flammable gas samples, the intrinsically safe Micro i.s. 5100 is a unique analyzer certified to Zone 0 and Zone 1 and suitable for measuring percent levels of O<sub>2</sub>, CO and CO<sub>2</sub>.



### FEATURES AND BENEFITS

- Intrinsically safe design to ATEX and IEC standards ensures safety operation in hazardous environments
- Ergonomic design ensures easy operation on the move
- Available in non-pump or pump versions with optional sample conditioning kit

### APPLICATIONS

- Hazardous area combustion optimization
- Refineries – catalytic cracker regeneration
- Process monitoring
- Inerting applications

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	COMBUSTION
CO CARBON MONOXIDE		PROCESS CONTROL
CO <sub>2</sub> CARBON DIOXIDE		SAFETY

**SENSING TECHNOLOGY**  
PARAMAGNETIC INFRARED

# SERVOFLEX MiniMP 5200

PORTABLES

## BENCHTOP ANALYZER OFFERING SINGLE OR DUAL MEASUREMENTS OF OXYGEN AND CARBON DIOXIDE

The only truly portable battery-powered gas analyzer with MCERTS certification, the MiniMP 5200 is designed to offer single or dual measurement of O<sub>2</sub> and CO<sub>2</sub> by utilizing Servomex's advanced Paramagnetic and Infrared sensing technologies.



### FEATURES AND BENEFITS

- EN15267-3 (MCERTS V3.3, Annex F) makes the MiniMP ideal for source testers that require reference O<sub>2</sub> analysis for CEMS verification
- Li-ion battery system offers unique true portability
- Non-depleting sensor design ensures long service with minimal calibration

### APPLICATIONS

- Laboratories and research
- Air separation and gas bottling plants
- Transfilling
- Combustion analysis

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	EMISSIONS
CO <sub>2</sub> CARBON DIOXIDE		PROCESS CONTROL
		QUALITY

**SENSING TECHNOLOGY**  
PARAMAGNETIC INFRARED

# SERVOFLEX MiniHD 5200

PORTABLES

## PORTABLE GAS ANALYZER FOR MEASUREMENT OF COMMON GAS MIXTURES

Designed for use in field locations or light industrial applications, the MiniHD 5200 portable gas analyzer is a rugged, heavy duty analyzer designed to accurately measure the levels of O<sub>2</sub>, CO and CO<sub>2</sub> within common gas mixtures. The MiniHD 5200 utilizes Servomex's non-depleting Paramagnetic and Infrared sensors to give dependable and accurate results.



### FEATURES AND BENEFITS

- Robust IP65 construction meets the demanding needs of field location analysis
- Long life Li-ion rechargeable batteries and range of sampling options ensure ease of use
- Accurate measurement of O<sub>2</sub>, CO and CO<sub>2</sub> levels with no background interference

### APPLICATIONS

- Physiology studies
- Universities
- Combustion optimization
- Medical gas verification

GAS	MEASURES	APPLICATION
O <sub>2</sub> OXYGEN	% PERCENT	COMBUSTION
CO CARBON MONOXIDE		PROCESS CONTROL
CO <sub>2</sub> CARBON DIOXIDE		SAFETY

**SENSING TECHNOLOGY**  
PARAMAGNETIC INFRARED

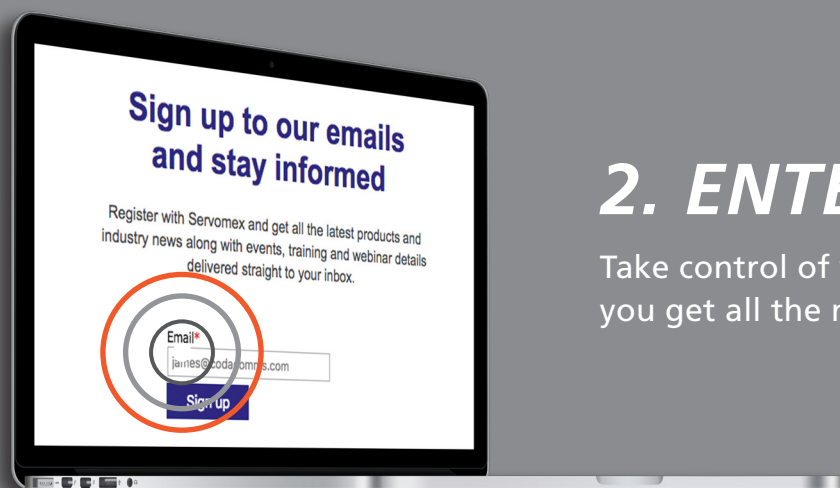
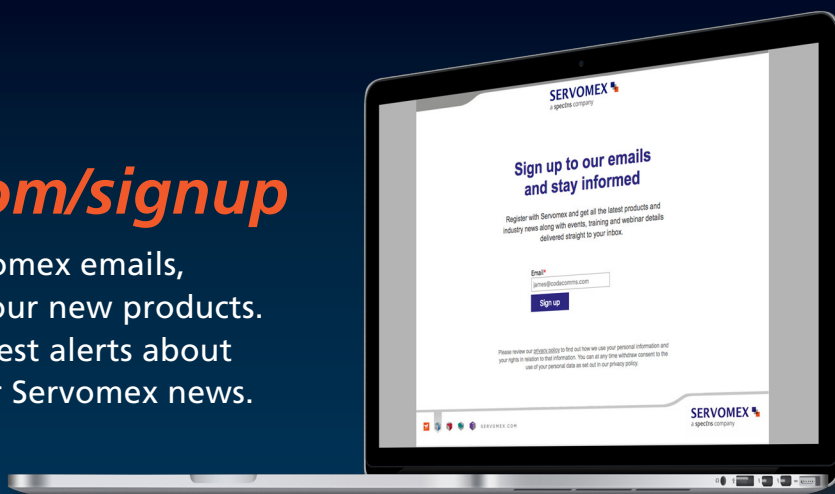


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