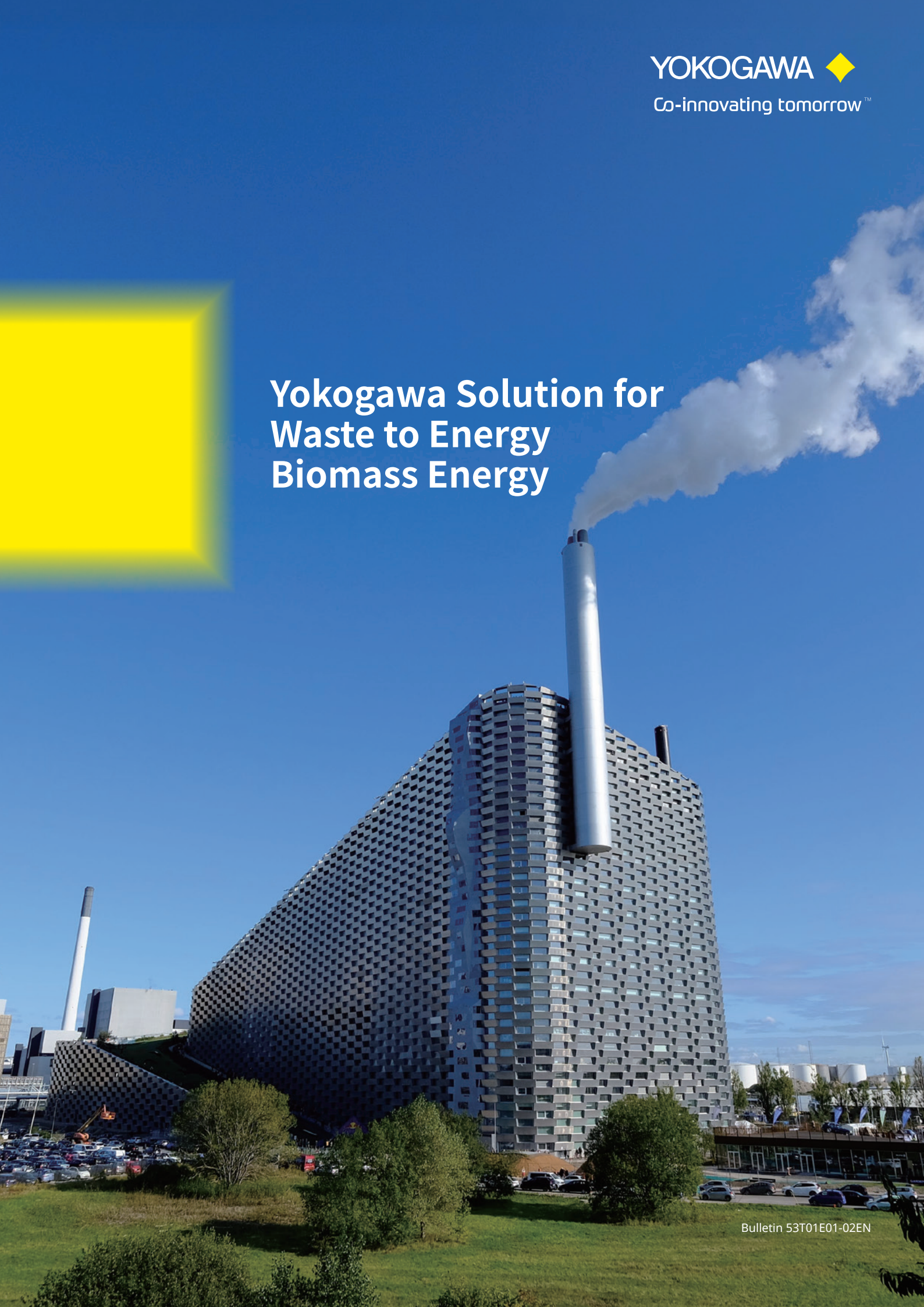
YOKOGAWA

Co-innovating tomorrow™

# Yokogawa Solution for Waste to Energy Biomass Energy



Bulletin 53T01E01-02EN

# Solution Overview

## Plant Operation

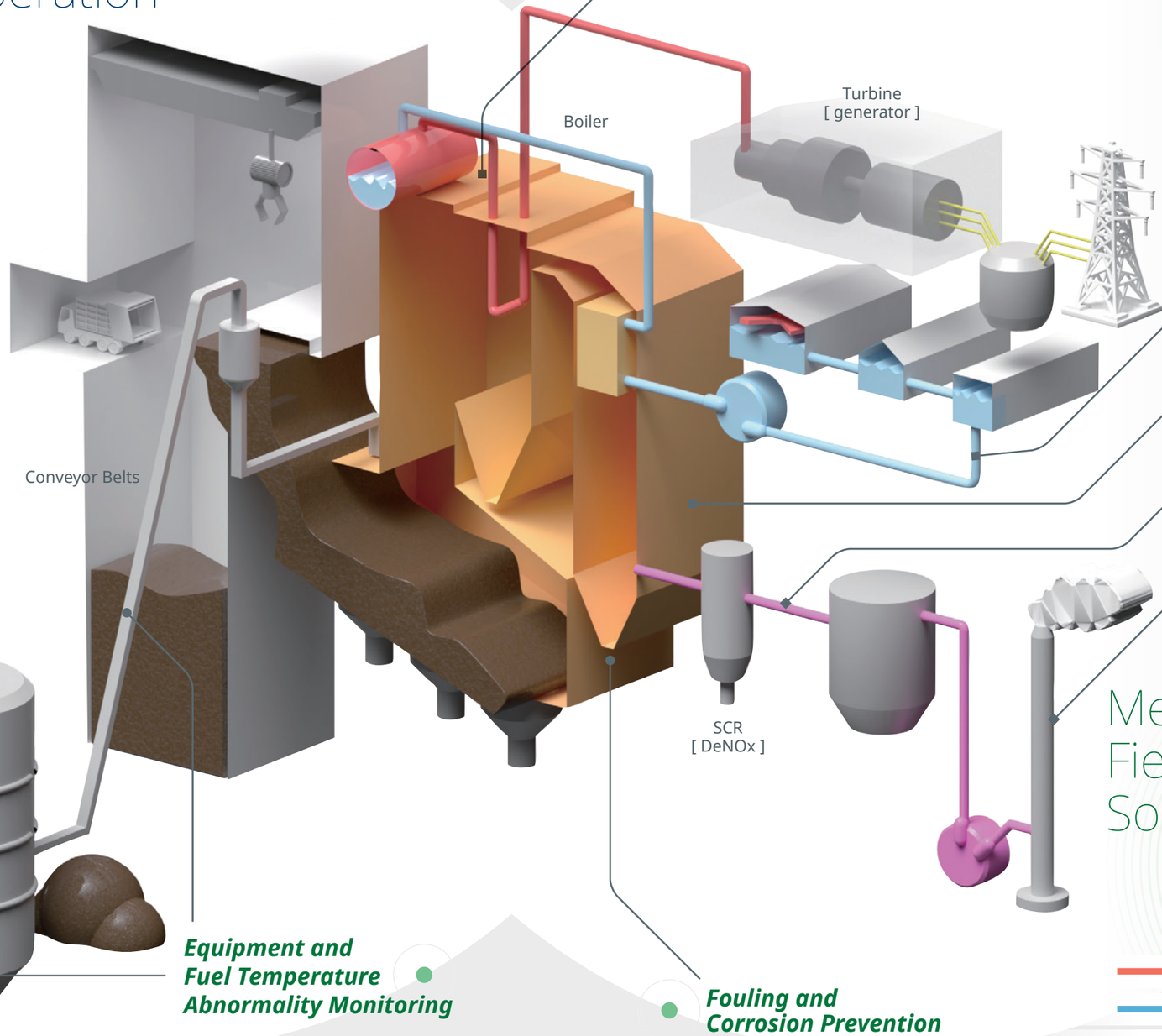
- ***Plant Audit***
- ***Plant Control and Safety Management***

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- ***Steam and Water Analysis System (SWAS)***
- ***$O_2$/CO Measurement***
- ***Ammonia Slip Measurement***
- ***Flue Gas Emission Monitoring***

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- ***Equipment and Fuel Temperature Abnormality Monitoring***

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- ***Fouling and Corrosion Prevention***

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## Measurement & Field Sensing Solutions

- Steam
- Water
- Gas
- Electricity

# Plant Operation

## Plant Audit

Struggling with inefficiencies, emissions challenges, or capacity limits in your waste-to-energy or biomass plant? Our Plant Audit provides a second opinion through a deep dive into your plant's operations, uncovering actionable opportunities to enhance efficiency, boost capacity, and meet environmental standards.



## Plant Control and Safety Management

With Yokogawa's deep expertise and track record of more than 150 waste-to-energy/incineration plants and more than 100 biomass power plants worldwide, CENTUM distributed control system (DCS) is a trusted solution. It is suitable not only for conventional waste fuel firing furnaces but also for gasification processes including direct melting furnaces. The plant operation is even more secure with ProSafe-RS safety instrumented system (SIS). ProSafe-RS is SIL2/SIL3 certified by TÜV and incorporates Yokogawa's own pair-and-spare technology just like its DCS. It is widely used in applications of burner management, boiler protection, turbine protection and emergency shutdown.





**Distributed Control Systems**

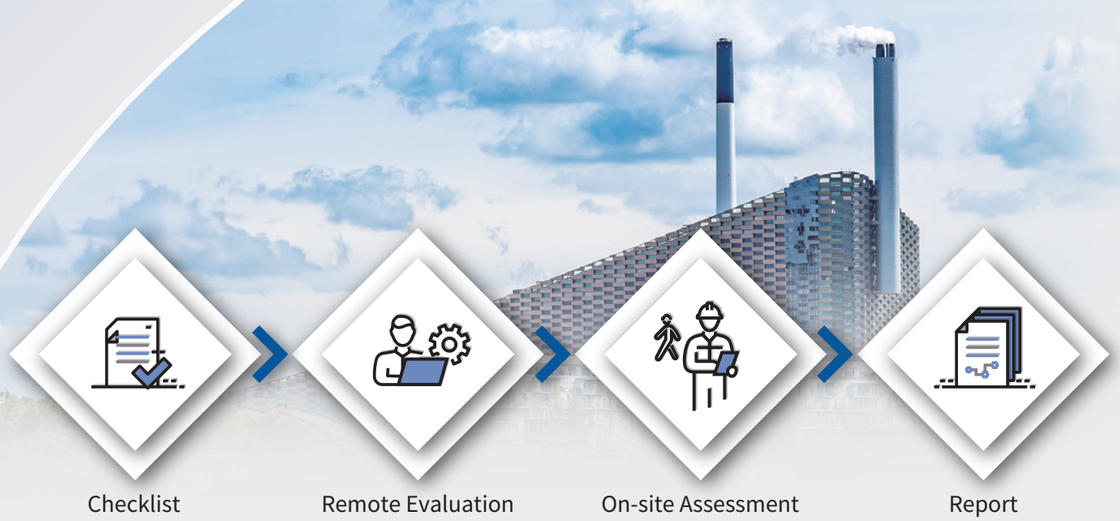


**Safety Instrumented Systems**



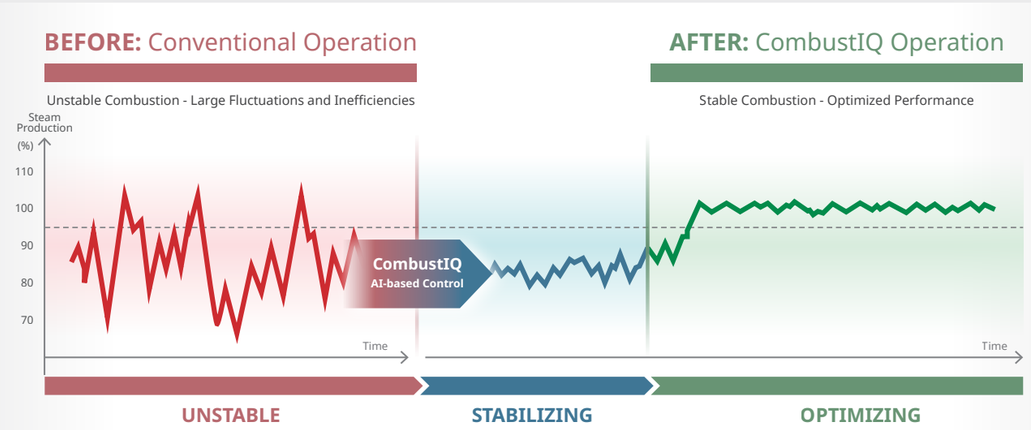
**Edge Controllers / PLCs**






## High-Level Combustion Control

CombustIQ, Dublix Technology's advanced combustion control solution, learns from the best operators and reacts correctly 24/7 to deliver stable, optimized combustion and superior plant performance.




**Proven results that directly improve plant performance up to.....**

+5%
**Waste Processing Capacity**

-40%
**Steam Fluctuation Range**

+5%
**Energy Production**

**CombustIQ stabilizes combustion, optimizes performance, and sustains value—24/7.**

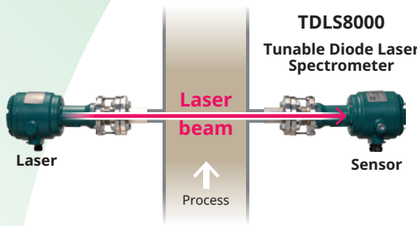
## $O_2$/CO Measurement

Accurate and responsive oxygen measurement is essential for efficient combustion control in WtE plants. Yokogawa's in-situ zirconia oxygen analyzers ZR22G/ZR802G provide reliable performance with easy sensor replacement, a lead-less electrode design, and a protective coating that enhances sensor durability.

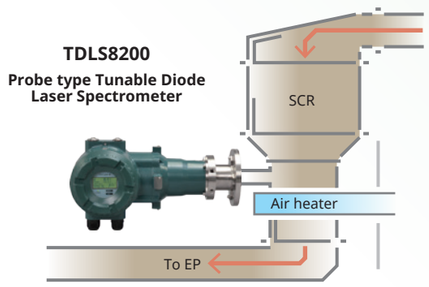
For applications with high dust concentrations that can affect zirconia sensor performance, Yokogawa's Tunable Diode Laser Spectrometer (TDLS) offers a robust alternative. Utilizing a contactless laser measurement principle, the TDLS enables near real-time measurement of $O_2$, CO, and $CH_4$ while minimizing maintenance requirements.



ZR22G ZR802G
Zirconia Oxygen Analyzer




## Ammonia Slip Measurement




$NH_3$ is injected into flue gas as part of the DeNOx process and must be monitored downstream to minimize ammonia slip and ensure efficient operation. Conventional measurement methods typically rely on extractive sampling systems or measurements taken after the bag filter due to the harsh conditions immediately following the DeNOx equipment. Yokogawa's TDLS enables direct, in-situ $NH_3$ measurement in high-temperature, dusty, and corrosive environments, providing fast response times and minimizing measurement delays for improved process control.

## Flue Gas Emission Monitoring

Continuous Emission Monitoring Systems (CEMS) are mandatory in many countries to meet regulatory requirements. Leveraging its expertise in sensors and analyzers, Yokogawa offers a comprehensive CEMS solution featuring our infrared gas analyzer to monitor CO, $CO_2$, NO, $SO_2$, $CH_4$ and $O_2$ concentrations in the flue gas, helping the user comply with environmental regulations.



CEMS



IR800G
Infrared Gas Analyzer

## Steam and Water Analysis System (SWAS)

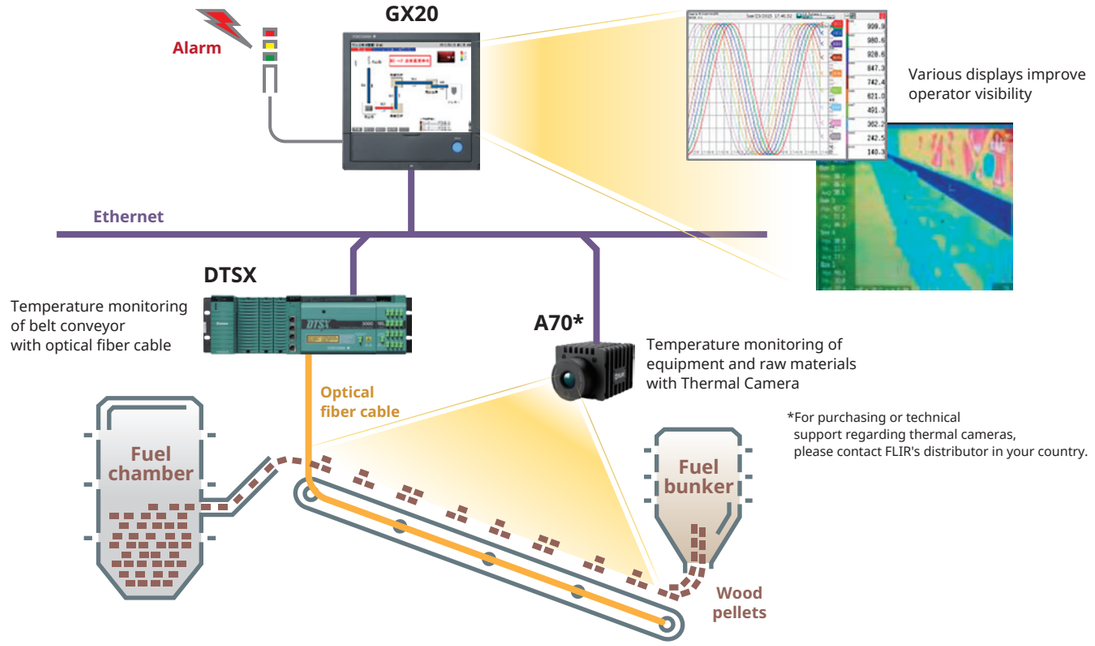


SWAS

In steam-generation applications, the quality of steam is crucial as any contaminants could adversely affect the performance of a high-pressure boiler, steam turbine or even the associated auxiliaries, posing a major threat to the functioning of the system. Yokogawa offers a SWAS solution tailored for each user to analyze the quality of steam and water.

## Equipment and Fuel Temperature Abnormality Monitoring

Continuous temperature monitoring of belt conveyors are essential for preventing accidents. By combining contact and non-contact measurement, Yokogawa's solution enables wide range temperature data recording, along with thermal image display and alarm notifications when needed.




*For purchasing or technical support regarding thermal cameras, please contact FLIR's distributor in your country.

## Pressure and Flow Measurement

EJX S Series



### Pressure Transmitter

Yokogawa's Differential Pressure Transmitter is used to measure liquid, gas, or steam pressure. Featuring Yokogawa DPharp sensor technology, it delivers measurements accurately, quickly, and reliably.

VY Series



### Vortex Flowmeter

Yokogawa's Vortex Flowmeters VY Series is utilized to enable remote maintenance and self-diagnosis, to easily check the health of your equipment at any time. The unique structure provides robustness and long-term stable measurement.

ADMAG AXG



### Magnetic Flowmeter

ADMAG AXG is a high-quality and highly reliable magnetic flowmeter, enhanced by Yokogawa's proprietary dual frequency excitation method.



# Water Jet Boiler Cleaning

**Less Water. More Uptime. Maximum Efficiency.**

JetClean delivers powerful, on-line boiler cleaning with minimal water and maximum reach. Its unique rotating nozzle ensures deep, efficient cleaning during operation – reducing fouling, extending run times, and cutting maintenance effort.

**Less Water Consumption**
Significantly less water than conventional cleaning methods.

**Higher Boiler Efficiency**
Keeps heat transfer surfaces clean for maximum efficiency.

**Online Cleaning During Operation**
No boiler shutdown required. Clean while you produce.

**Reduced Maintenance Cost**
Fewer shutdowns and lower maintenance effort.



The water-to-steam expansion provides a pressure wave, which is highly efficient to remove the fouling on the boiler surface. The system improves the efficiency of the furnaces and reduces the frequency of off-line maintenance. In addition, JetClean improves heat exchange efficiency which decreases the flue gas temperature at boiler outlet typically by 60 ℃ also reducing boiler corrosion.

**60℃**
**LOWER FLUE GAS TEMPERATURE**

**2.7×**
**LONGER OPERATING PERIODS***



# Fouling and Corrosion Prevention

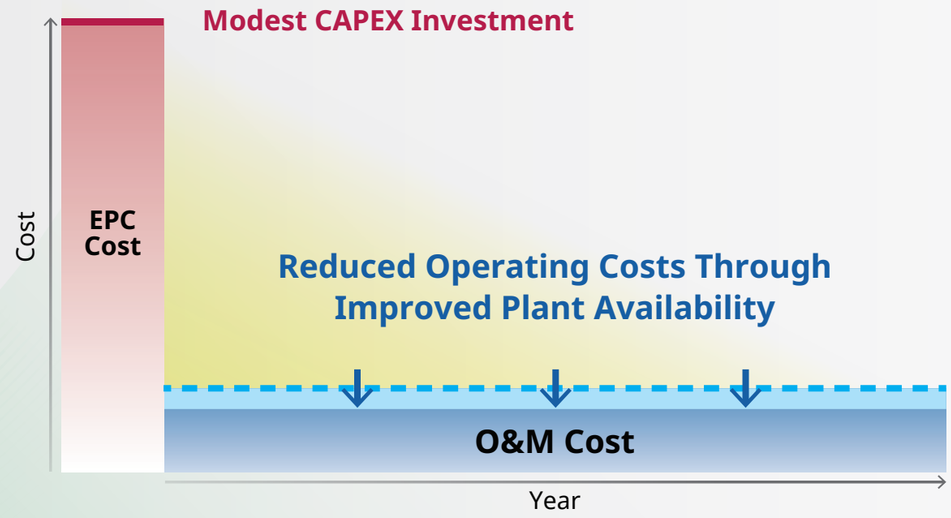
**Advanced Fouling and Corrosion Prevention for Reliable Boiler Operation**

Boiler fouling and high-temperature corrosion can reduce plant efficiency, increase maintenance costs, and limit operational performance. SulfGen addresses these challenges.
SulfGen weakens boiler deposits and suppresses the formation of corrosive, low-melting-point chloride compounds, high-temperature corrosion.
By making deposits easier to remove, the system simplifies cleaning and improves overall boiler reliability.
The Sulfation delivers improved boiler protection, reduced maintenance effort, and enhanced operational performance for long-term plant reliability.



# OPEX Optimization

Yokogawa helps customers optimize OPEX and maximize plant profitability. Although the solution requires only a modest CAPEX investment, it delivers sustainable long-term value by reducing operational costs and improving plant availability.



# Industrial Automation and Control Business

## Energy & Sustainability

We provide products, services, and solutions that span every level of activity, from the collection of data generated in the field to the optimization of corporate management.

IT
Information Technology

OT
Operational Technology

### Level 4 Corporate Management

- Corporate Strategy Planning
- Production Planning Optimization
- Feedstock Purchasing Optimization
- Supply chain and logistics optimization
- ERP
- Energy and carbon management optimization

### Level 3 Manufacturing Execution Control

- Production Management and Optimization
- Advanced Control and Optimization
- Quality Management and Optimization
- Asset Lifecycle Optimization
- Safety Management Smart Maintenance
- Operational Risk Management

Security

AI Utilization

Collaborative Information Server

**Yokogawa Cloud** Industrial Cloud Applications and Solutions

### Level 2 Production Control and Safety system



Distributed Control Systems



Safety Instrumented Systems



Edge Controllers / PLCs

### Level 1 Data generation and collection



Field Instruments

Wireless transmitters
Pressure/temperature transmitters

Coriolis/magnetic/Vortex/
Variable Area Flowmeters



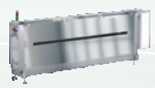
Process Analyzers
Process Gas Chromatographs



IIoT Wireless Sensors



Data Acquisition Systems
Paperless Recorders
Data Loggers



Film/Sheet Thickness Gauges



Distributed Temperature Sensors

For our customers, we present solutions that resolve issues and maximize value over the entire lifecycle of their business assets.

Consulting → Design & engineering System Integration → Installation → Training → Lifecycle services



OpreX™

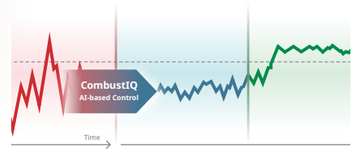
**OpreX is the comprehensive brand for Yokogawa's industrial automation and control business.**

DUBLIX TECHNOLOGY
A Yokogawa Company

**Dublix is Yokogawa's comprehensive brand for boiler optimization and performance improvement solutions.**

## CombustIQ

High Level Combustion Control




## SulfGen

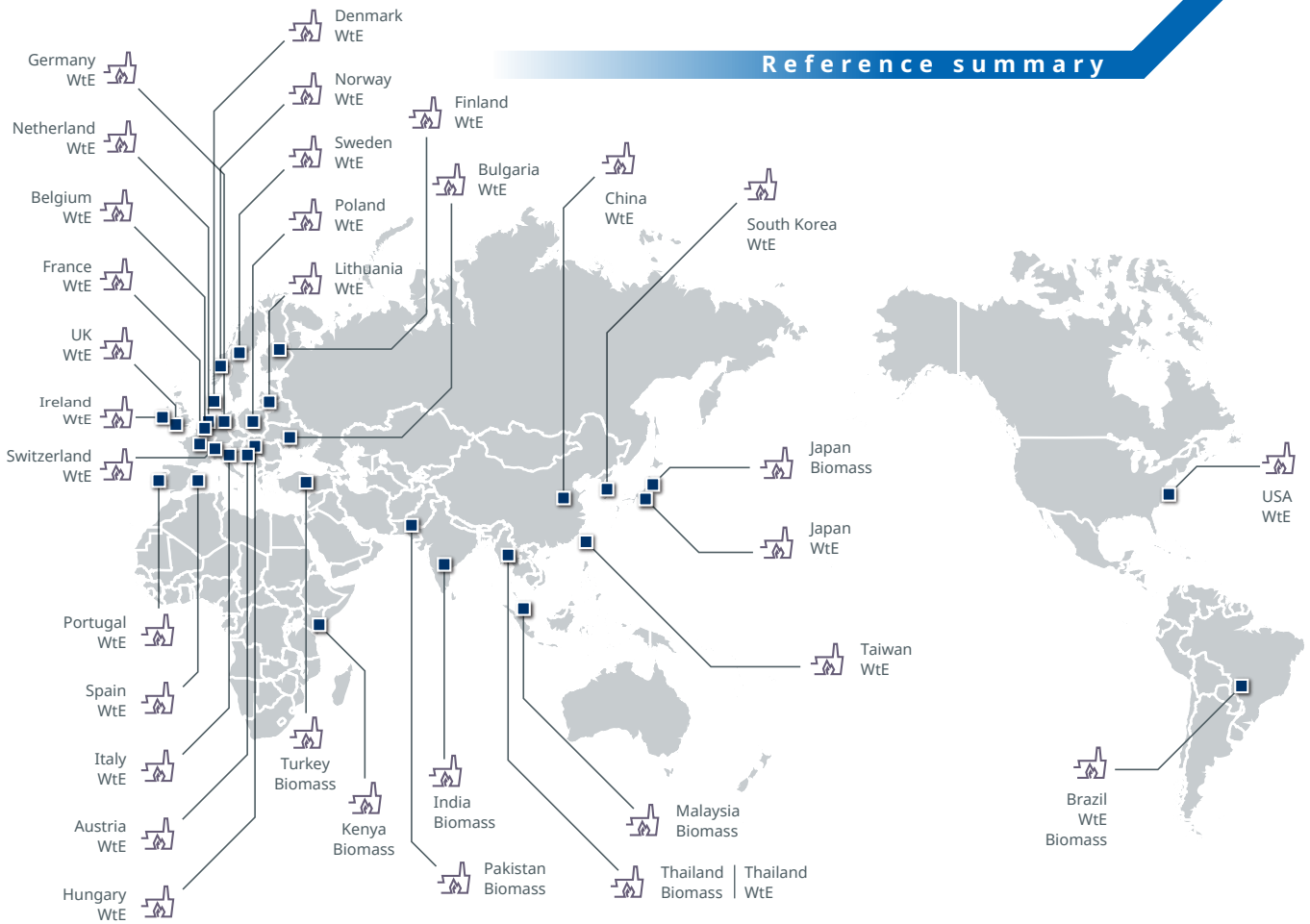
Fouling and Corrosion Prevention



## JetClean

Water Jet Boiler Cleaning








OpreX™ Through the comprehensive OpreX portfolio of products, services, and solutions, Yokogawa enables operational excellence across the enterprise.

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