Overview and Problems
Best Solution for Automatic Boiler Control

NOx, SO2, and CO2 in order to ensure low emission operation.

A simple construction employs a built-in sensor to measure the steam mass flow with stable operation.

We want you to explore Yokogawa’s sensors and controllers in order to increase the efficiency and environmental performance of your boilers, and ensure their safe and stable operation.

Increasing Efficiency and Lowering Emissions of Boilers
In order to ensure the air and fuel are combusted at an optimal ratio, the waste of fuel is eliminated, and the exhaust gas is cleaned, real-time monitoring of the oxygen concentration of combustion gases is required. Equipped with an oxygen sensor unit with a longer life span, the Zirconia Oxygen Analyzer ZR series are capable of measuring an oxygen concentration with high reliability. The Stack Gas Analyzer monitors exhaust gas components such as NOx, SO2, and CO2 in order to ensure low emission operation.

Safe and Stable Operation
A single-loop controller can be used to properly distribute control functionality. Offering the advantages of flexibility of building distributed control systems, simple maintenance, compatibility with conventional systems, and the like, the YS1000 Series of Single-loop Controllers are ideal for safe and stable operation at low costs.

Monitoring the Drum Level and Steam Flow Rate in Accurate at Any Condition
In order to ensure highly efficient and safely operated boilers, it is also indispensable to accurately monitor the drum level and steam flow rate. The EJA and EJX Series of Differential Pressure Transmitters are capable of measuring the drum level with high stability even in actual applications at high temperatures and high pressures. The DY Series MV TYPE of Vortex Flowmeters with a simple construction employ a built-in sensor to measure the steam mass flow with high reliability.

Why Buy Yokogawa?
Yokogawa offers a wide variety of sensors and controllers that are used to monitor and operate boilers, and contributes to increasing the efficiency and environmental performance of boilers, as well as ensuring their safe and stable operation.

We want you to explore Yokogawa’s sensors and controllers in order to increase the efficiency and environmental performance of your boilers, and ensure their safe and stable operation.

Essential Equipments for Industries
Boilers are used in a broad range of industries such as electric power, pharmaceuticals, chemicals, ceramics, and paper and pulp. Amid the rising energy costs, tightening environmental regulations, and increasing awareness of safety as of late, the needs for high efficiency operation, low emission operation, and safe and stable operation of boilers are growing.

Combustion Control

Overview and Problems
• Perform safe and stable control at low cost
• Lower levels of emission output

Solution
• Simple programming by Function Block wiring method
• Cascade primary direct control
  - Stable level control when boiler is started
• Cross limit control calculation
  - Air and flow are calculated so that air flow always exceed fuel flow to prevent incomplete combustion and explosion
• Feed forward control
  - The main steam pressure and feed water level are controlled quickly in response to changes in the main steam flow

Benefits
• Reduced debugging time
• Improvement of the reliability of programs
• Safe and stable control at low cost

Drum Level Measurement

Overview and Problems
• Drum level measurement
• High stability measurement required under large static pressure change

Solution
• Field proven silicon resonant sensor guarantees long term stability
  - EJA: 0.1 % of URL 7 years
  - EJX: 0.1 % of URL 10 years
Under all conditions (temperature, static and over pressures)

Benefits
• Long term high stability measurement is realized under actual plant conditions

Drum Level

- EJX
- EJA

Combustion Control

- PV
- SV

- Air and flow are calculated so that air flow always exceed fuel flow to prevent incomplete combustion and explosion

Benefits
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• Improvement of the reliability of programs
• Safe and stable control at low cost

Drum Level Measurement

- DY MV TYPE

Benefits
• Installation cost reduction
• High accuracy to suit the environmental regulations
• Preventive maintenance

Benefits
• Cell life prediction
• Long life sensor with molecular bonding and special coating

Exhaust Gas Analysis

- EJX EJA

Benefits
• Multiple points of measurement
• No moving parts in the sensor
• Simultaneous measurement of up to five components, NOX, SO2, and CO2 in order to ensure low emission operation.

Exhaust Gas Analysis

- ZR22G/S

Benefits
• Installation cost reduction
• High accuracy to suit the environmental regulations
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Benefits
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Emission of Boilers
Increasing Efficiency and Lowering Emissions of Boilers

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- EJX
- EJA

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- PV
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Technologies Commit Users’ Benefits

Our Goal
Our shared goal is customer satisfaction through operational excellence. Yokogawa has brought true innovations to industry. We are committed to ensuring accuracy, reliability, and safety of your production system throughout your business life cycle. Our comprehensive solutions and expertise help you achieve more results with less total costs of ownership. Below key technologies shall aim for your operational excellence.

DY Key Technology
*Spectral Signal Processing (SSP)*-
Spectral Signal Processing (SSP) technology is built into the powerful electronics of the digital YEWFLO vortex flowmeter, enabling new functions. SSP analyses the fluid conditions inside the digital YEWFLO vortex flowmeter and uses the data to automatically select the optimum adjustment for an application, providing features never seen before in vortex flowmeters.

EJA/EJX Silicone Resonant Sensor
By micro-machining the resonators directly within the single crystal silicon material, we are able to derive the maximum benefits from the elasticity of the single crystal silicon material while enhancing sensitivity and repeatability. The properties of the resonators remain constant over time. This makes DPharp the ideal pressure sensor for harsh industrial automation environments. DPharp delivers stability, repeatability and reliability that you can rely on.

YS1000 Dual CPU
With dual-CPU construction, manual control capability and display continues even if an abnormality occurs on one of the CPUs. If controller self-diagnostics detects a control circuit failure, the controller can suspend analog/digital output, switch to manual mode and allow manual control by operator.

Zirconia Oxygen Analyzers
- Get a long service life and stable operation with a Zirconia sensor
- Sensor replacement is easy
- A molecular bonding method completes installation of platinum electrodes, and its inherent connection prevents separation of platinum from the Zirconia element.
- A lead-less electrode design eliminates electrical disconnection.
- Special coating protects the platinum and prevents the sensors from deteriorating.
- No special tool is required for cell replacement.
Sensors and controllers for the efficiency and environmental performance of boilers are essential in ensuring low-emission operation. We want you to explore Yokogawa’s sensor and controller solutions for the efficient operation of boilers, contributing to increased efficiency and safety.

**Overview and Problems**
- Flow measurement for utility steam
- Conventional orifice flowmeter requires complicated, high-cost installation and is not accurate.

**Solution**
- Inline flowmeter
- Built-in temperature sensor, Digital YEWFLO MV type
- Steam mass flow measurement without additional temperature sensor/transmitter and flow computer
- Accuracy 2% of reading

**Benefits**
- Low installation and operational costs
- Safety operation to reduce leakage points
- Save energy by accurate measurement

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**Steam Flow Measurement**

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**Diagram of Steam Flow Measurement**
- (Boiler master)
  - Main steam pressure control
- Air flow control
- Fuel flow control
- Feed water level control
- Exhaust gas oxygen concentration control
- Feed gas
- Exhauster

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**Diagram of Combustion Control**
- Air pollution control by continuous emissions monitoring
- No moving parts in the sensor
- High accuracy to suit environmental regulations
- Stable, long-term measurement

**Benefits**
- High maintenance frequency
- Long life sensor with molecular bonding and special coating

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**Diagram of Exhaust Gas Analysis**
- High installation cost for multipoint measurement
- Solution
- Overview and Problems
- Solution
- Benefits

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**Diagram of Air Flow Control**
- Large combustion facilities
- Air pollution control by continuous emissions monitoring
- No moving parts in the sensor
- High accuracy to suit environmental regulations
- Stable, long-term measurement

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**Diagram of Fuel Flow Control**
- High maintenance frequency
- Long life sensor with molecular bonding and special coating

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**Diagram of Feed Water Level Control**
- High installation cost for multipoint measurement
- Solution
- Overview and Problems
- Solution
- Benefits

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**Diagram of Exhaust Gas Monitor**
- High maintenance frequency
- Long life sensor with molecular bonding and special coating

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**Diagram of Oxygen Control**
- High maintenance frequency
- Long life sensor with molecular bonding and special coating

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**Diagram of Combustion Control**
- Air pollution control by continuous emissions monitoring
- No moving parts in the sensor
- High accuracy to suit environmental regulations
- Stable, long-term measurement

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**Diagram of Solvent Control**
- High maintenance frequency
- Long life sensor with molecular bonding and special coating
**Combustion Control**

**Overview and Problems**
- O₂ control for optimum combustion
- Short sensor life by clogging

**Solution**
- Long life sensor with molecular bonding and special coating
- Cell life prediction

**Benefits**
- Fuel cost reduction
- Preventive maintenance
- Protect the environment, CO₂ reduction

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**Exhaust Gas Analysis**

**Overview and Problems**
- Air pollution control by continuous emissions monitoring
- High maintenance frequency

**Solution**
- Simultaneous measurement of up to five components, NOₓ, SO₂, CO, CO₂, O₂
- Sample conditioning system designed to reduce maintenance
- No moving parts in the sensor

**Benefits**
- Stable, long-term measurement
- High accuracy to suit the environmental regulations
For Your Operational Excellence

**Temperature Transmitter**

YTA Series/YTMX580
- High resolution, high stability and high versatility
- Dual compartment housing for harsh environments
- SIL2 safety as standard feature
- Fieldbus communication capability

**Pressure Transmitter**

DPharp EJA/EJX Series
- Best installed performance
- Compact and rugged design
- Multi-sensing digital sensor
- SIL2 as standard
- Fieldbus communication capability

**Direct In Situ Zirconia Oxygen Analyzers**

ZR402/ZR202
- Measurement with probe directly inserted into furnace or boiler
- Integrated and separate types available
- Also can be used as a high temperature humidity analyzer
- Fully field-repairable probe
- HART communication
- Explosion proof (FM, CSA, ATEX) (ZR22S, ZR202S)

**Averaging Converter**

AV550G
- Capable of accepting inputs from up to 8 oxygen detectors and 8 individual outputs are available
- Averaging of multiple point oxygen measurements is ideally suited for combustion control

**DigitalYEWFLO Vortex Flowmeters**

- Best-in-class accuracy
- Superior stability though the unique digital electronics SSP technology
- Complete range for temperature and pressure
- Multivariable availability with optional temperature sensor
- Fieldbus communication capability

**Stack Gas Analyzing System**

SG750
- A complete self standing cabinet including an infra-red analyzer and a sample conditioning system
- Simultaneous measurement of up to five components, NOₓ, SO₂, CO, CO₂, O₂

**Single Loop Controller**

YS1000 Series
- Two programming method
- High reliability
- Compact and light weight
- Expandable I/O
- Compatible with YS170 and SLPc

**Multi Protocol / Function Adapters**

FN310/FN510
- Enhancing Field Wireless product portfolio
- FN310: HART (4-20 mA), Modbus (Sencom)
- FN510: DI/DO, AI (4-20 mA), Pulse
- Compact and low cost design
- Full battery powered solution available

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VigilantPlant is Yokogawa’s automation concept for safe, reliable, and profitable plant operations. VigilantPlant aims to enable an ongoing state of Operational Excellence where plant personnel are watchful and attentive, well-informed, and ready to take actions that optimize plant and business performance.

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