
ABB MEASUREMENT & ANALYTICS

Measurement made easy for power plants



Expertise in measurement technology

Delivering increased productivity

As a leading supplier to the power industry, ABB provides the measurement and analytical technology needed to operate power generation plants safely, productively, profitably and in an environmentally friendly way.

With proven high accuracy and reliability, ABB's measurement and analytical products combine high performance with the lowest cost of ownership, giving customers predictable and safe operation.

ABB's global reach means it can provide equipment and expertise wherever it is needed. Customers anywhere in the world can rely on on-time delivery and expert support for their equipment and systems, enabling them to get their installation on-line as quickly as possible and to keep it running.

ABB and its heritage companies have been leaders in innovation and technology for more than 100 years.

Aztec

Bailey

BOMEM

Bush Beach Engineering
Limited

**FISCHER
& PORTER**

Hartmann & Braun

K-TEK

Kent

LGR
Los Gatos Research
A MEMBER OF THE ABB GROUP

Pressductor®

SENSYCON

Schoppe & Faeser

Spirit
A MEMBER OF THE ABB GROUP

Taylor

TBI-Bailey

TORBAR
FLOWMETERS LTD

TOTALFLOW
MEASUREMENT & CONTROL SYSTEMS



Trusted measurement solutions

Serving the power generation industry

World-class measurement solutions for the power generation industry worldwide

ABB provides an extensive selection of proven measurement and analytical products and solutions for power generation industry applications. Using ABB's measurement products, power plant operators can maximize the efficiency of their assets and comply with local and international legislation. They receive access to data on many critical measurements needed, from combustion performance and water chemistry through to stack emissions.

Certified to leading global standards including TUV, NACE, ATEX, FM, FMC, IECEx, CSA, SAA, GOST, UL, TIIS and INMETRO. ABB's measurement products provide safe, efficient performance throughout the entire power generation cycle.

For more information, please visit
www.abb.com/measurement

ABB's portfolio includes a comprehensive selection of sensors, transmitters and related equipment for:

- Water quality analysis
- Pressure measurement
- Temperature measurement
- Level measurement
- Flow measurement
- Emissions monitoring
- Gas analysis
- Combustion efficiency
- Data collection and analysis
- Valve automation
- Damper control

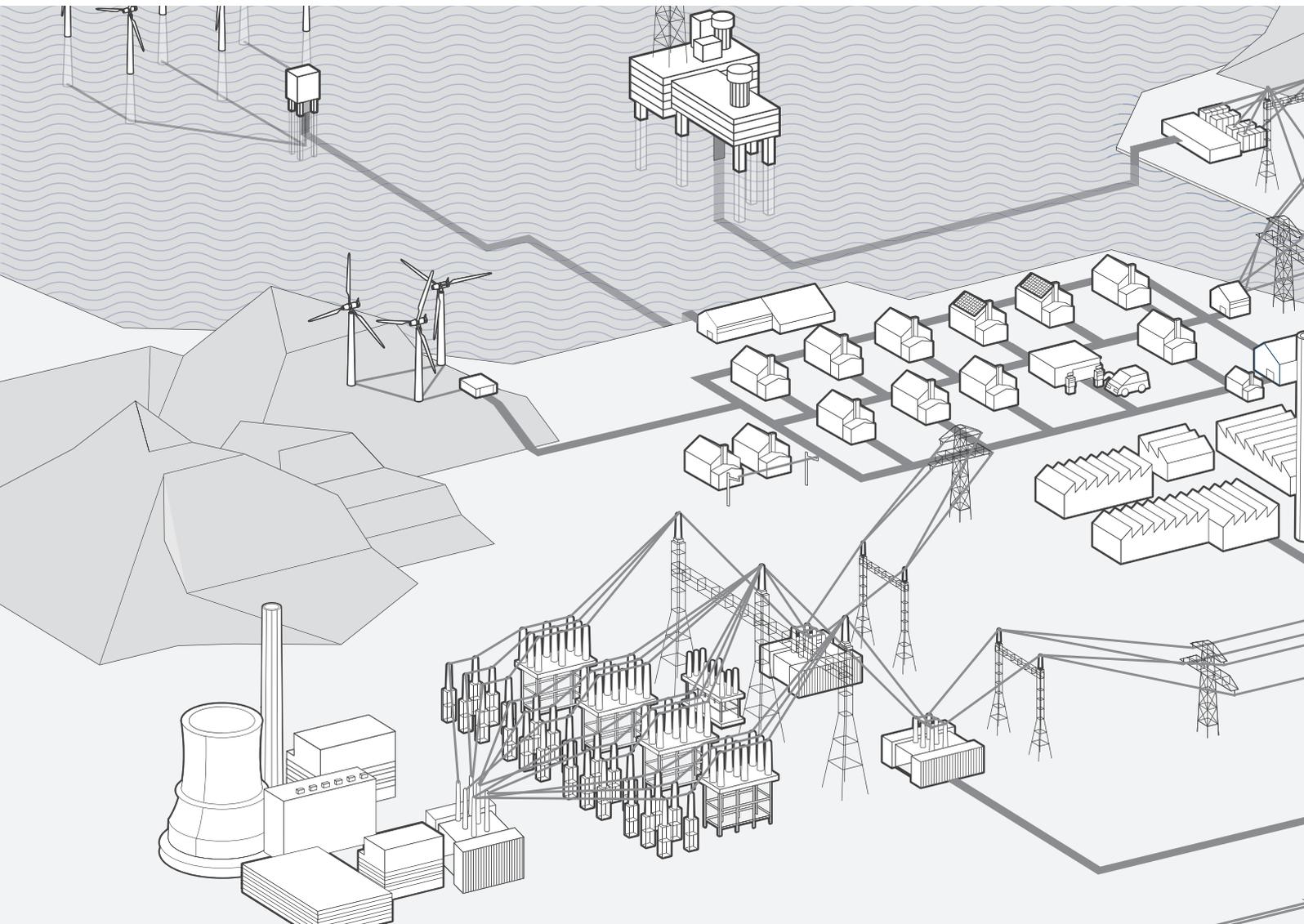
Measurement solutions from ABB are used extensively in a variety of different power generation applications

- Thermal power
- Combined cycle power plants
- Waste to energy and biofuels
- Solar thermal energy



Measurement and analytical products for power

Accurate and reliable operation



Thermal and combined cycle power plants

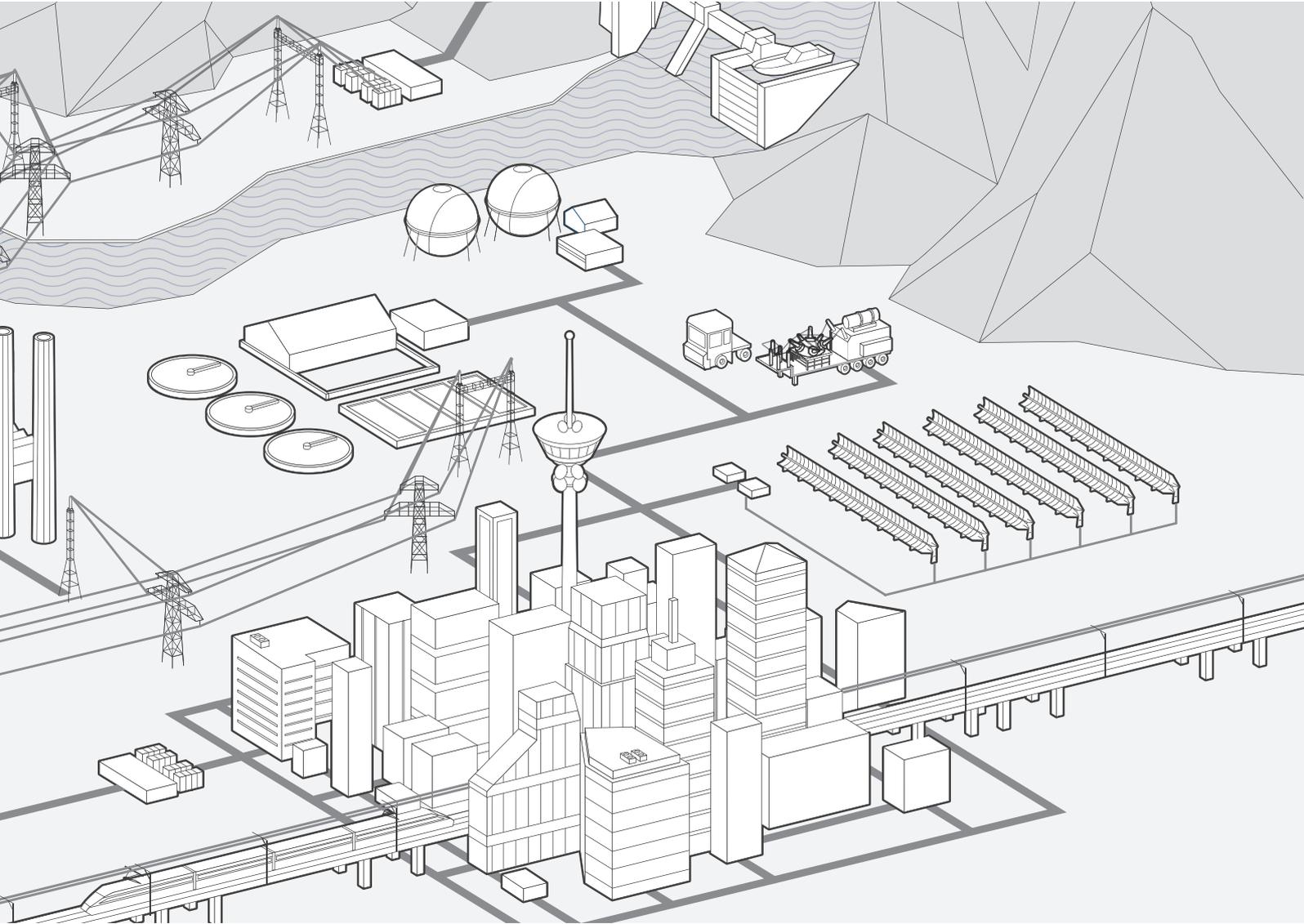
These plants use steam to propel a turbine which drives a generator to produce electricity. In a thermal power process, the steam is produced directly for this purpose. In a combined cycle process, where natural gas is first used to drive a gas turbine, the steam is generated by recovering the heat from the gas turbine exhaust and is then used to drive a steam turbine to produce additional electricity. ABB's measurement and analytical products are widely used in both processes. Applications include monitoring and regulating boiler feedwater quality, flow measurement, measuring pressure and temperature in the combustion processes and the calorific value of incoming natural gas, through to analyzing the quality and quantity of stack gas emissions.

Nuclear power plants

Nuclear power generates electricity using steam produced from the heat of fission in the nuclear reactor. In the same way as any thermal power process, the steam propels a turbine which in turn drives a generator to produce electricity. ABB supplies a range of measurement products for use in the non-critical areas of nuclear power stations. Examples include flowmeters to measure water and steam distribution, complete analytical systems to monitor steam condensate quality, data acquisition and recording of parameters, SIL-rated pressure transmitters as well as hydrogen purity and purge gas monitors for measuring hydrogen used to optimize generator efficiency.

Measure where it matters

Protecting the environment



Waste to energy and biomass power plants

In a waste to energy process, heat is produced from the incineration of waste, which is then used to produce steam. A key concern surrounding the operation of waste to energy plants is controlling the gas emissions and level of particulate matter produced by the incineration of waste. These include ash, heavy metals and acid gases, all of which need to be carefully monitored and regulated. As well as instruments for optimizing the combustion and electricity generation processes, ABB's measurement products portfolio includes a wide range of gas analyzers which can offer continuous rate measurement of individual key pollutants within the gaseous emissions from waste to energy plants.

Thermal solar power plants

Solar thermal energy is created by generating heat from solar energy. An increasing number of solar thermal energy power stations are being built worldwide as nations seek to reduce their dependence on fossil fuels, reduce their carbon footprint and create alternative sources of energy. In a solar thermal energy process, solar energy collected by high temperature collectors is used to heat water and generate steam, which can then be used to generate electricity in the same way as in any other thermal power process. ABB's measurement products play a key role in thermal solar power applications, measuring a variety of parameters including temperature, flow, pressure and water quality.

Accurate measurement

Reliable performance



01

—
01 AZ20 combustion
gas oxygen analyzer

—
02 Accurate
measurement of
multiple chemical
parameters

—
03 Accurate pressure
measurement for up
to 600 bar (8,706 psi)

—
04 Contrac actuator
on an air damper

Deriving combustion efficiency by monitoring flue gas emissions

Efficient combustion of a fuel in any industrial process is essential in cutting operating costs whilst reducing pollution to enable compliance with environmental legislation.

The challenge of finding the right air/fuel mix

The ratio of air to fuel is a critical factor in efficient combustion. Where there is just sufficient oxygen to ensure complete combustion, this ratio is known as the stoichiometric mixture, and lambda equals one. This is a theoretical value which cannot normally be achieved in industrial combustion processes. Values for lambda of around 1.1 and above are more usual.

Controlling the air supplied to the combustion process is a fine balancing act. Insufficient air will mean incomplete combustion of fuel, resulting in fouling of heat transfer surfaces and emissions of soot, smoke and carbon monoxide. If air levels are too high, heat efficiency is reduced as the extra air carries more heat away in the flue gas, reducing overall boiler efficiency.

The solution is to measure your flue gas oxygen

The level of oxygen present in the combustion waste gas is a key indicator of the amount of excess air supplied to the process. Oxygen measurement is therefore critical when optimizing combustion control for maximum efficiency.

ABB's AZ20 combustion gas oxygen analyzers accurately measure the combustion gas oxygen content, with versions available for applications from -20 to 800°C (-4 to 1472°F). The analyzers can be used in conjunction with ABB's Sensyflow thermal mass flowmeters to regulate the amount of air supplied to the burner.

Controlling boiler chemistry for maximum steam quality

Achieving optimum performance of a coal-fired power plant requires careful monitoring of water and steam quality.

The challenge of controlling chemical contamination in the boiler

Multiple chemicals need to be monitored and controlled for optimum steam raising efficiency. Dissolved oxygen in the feedwater can cause pitting in the boiler, reducing its operating life. Dosing the feedwater with hydrazine reduces oxygen to form nitrogen and water. Excess hydrazine is wasteful and costly, whereas too little is unable to adequately control dissolved oxygen levels. At high temperatures and pressures, it forms ammonia, which raises the feed water pH level, increasing the risk of corrosion. Silica can hamper heat transfer efficiency and increase the risk of turbine malfunction by its precipitation on the blades. Sodium is a key parameter measured on the boiler. A highly sensitive on-line sodium monitor is needed to measure sodium levels in critical dissolved compounds.

The solution is to measure multiple chemical parameters

ABB's solution includes pH analyzers for monitoring feed water acidity or alkalinity and conductivity analyzers to measure ionic content. By indicating the level of contamination, these can be used to dictate the type and duration of treatment. ABB's Navigator 600 Silica accurately monitors concentrations from 0 to 5000 ppb and substantially cuts the costs and maintenance associated with silica monitoring. ABB's 8037 and 9438 on-line analyzers are used to monitor sodium and dissolved oxygen respectively. ABB's equipment can also be used to reduce iron levels to help minimize boiler corrosion.



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Tighter control and safety with temperature and pressure measurement

Pressure and temperature are two of the most widely measured parameters in a power plant. Ensuring that processes remain within set temperatures and pressures can have a major impact on optimizing efficiency.

The challenge of maximizing boiler operation without compromising safety

Increases of 10°C (50°F) in temperature can double the speed of the chemical processes taking place in a boiler. If left uncontrolled, these accelerated processes can drastically reduce both the efficiency and the overall operational life of the boiler plant. Exceeding the design temperature by just 10°C (50°F), for example, can significantly reduce boiler tube life. With boiler plant operating at pressures up to 600 bar (8,706 psi), it is also important for both safety and efficiency that equipment is maintained within its operational limits.

The solution is to measure temperature and pressure around the steam loop

Suitable for applications up to 1,800°C (3,272°F) and 600 bar (8,706 psi), ABB's temperature and pressure measurement products are deployed around the steam loop. Typical measurement points include the stack, boiler, boiler drum, deaerator plant, steam line, generator and cooling water system. ABB supplies a wide range of temperature transmitter and sensor options, including thermocouples and thermowells for accurate measurement. ABB's pressure measurement portfolio includes differential pressure transmitters used both to measure pressure and other parameters such as mass flow, particularly ideal for the low conductivity conditions inherent in power applications.



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Maintaining the right air/fuel mix through effective damper control

Striking the right balance of air and fuel in the combustion process can have a major impact on power station energy efficiency and effective heat-rate. It is therefore important to achieve precise regulation of the final control elements handling the mix of fuel and air in order to optimize performance.

The challenge of optimizing combustion

Striking the right balance can be difficult. An insufficient supply of air will result in incomplete combustion. If air levels are too high, heat efficiency is reduced because the extra air carries more heat away in the flue gas, resulting in a lower overall boiler fuel-to-steam efficiency. The ideal situation is to achieve a fuel to air ratio that minimizes excess air as far as possible. However, operating at this point can present the risk of a plant running outside of its design parameters, where there may be too little air for excessive air designs or excessive air for low air designs.

The solution is close control with Contrac actuators

ABB's Contrac actuators offer the solution. Continually energized, Contrac actuators offer best in class accuracy and speed. Their high responsiveness and positioning accuracy of ± 0.05 % helps operators to achieve the optimum ratio of fuel, air and operating pressure, dramatically improving the fuel efficiency of their processes. Through enhanced combustion efficiency, Contrac actuators can also help to reduce CO₂ and NO_x emissions.



04

Proven measurement technology

In control of the process

—
01 ABB's gas chromatographs for natural gas composition analysis

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02 Gas analyzers installed in an analyzer house

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03 Accurate level control for maximum boiler efficiency

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04 ABB swirl meters help to reduce steam losses and save costs

Measuring calorific values of gas

Calorific value is the amount of heat energy released by burning a single kilogram of a given fuel. As each fuel has its own specific calorific value, measuring the values of fuels in a power generation process is an ideal way of assessing combustion efficiency. In coal-fired processes, it can also be a useful indicator of pollution, as lower calorific values tend to be linked to higher ash levels.

The challenge

Calculating the calorific value of a sample of natural gas requires information on the composition of the gas. Though natural gas is largely composed of methane, it also contains variable amounts of other gases such as ethane, butane and propane, as well as non-combustible gases like nitrogen and carbon dioxide.

The solution

ABB's PGC1000 field mounted gas chromatograph provides the ideal solution for analyzing the composition of natural gas in combined cycle power plants. A sample of gas is drawn from the gas stream from the combustion process which is then passed to the PGC1000 for analysis. This sample is first treated before being tested using a chromatographic process which separates the constituent gases to assess the overall calorific value of the gas. Data from the analyzer is then used to inform other devices in the combustion process, such as ABB's flow computer units, to help achieve optimum combustion conditions.

Optimizing combustion and reducing emissions through continuous monitoring

Gaseous emissions from the stack are one of the biggest sources of pollution produced from a typical power plant. Among the pollutants of most concern are NO_x, SO₂ and CO. With strict legislation governing emissions from power plant, continuous emission monitoring systems (CEMS) are required to measure the emissions directly.

The challenge of reducing pollution

Modern combined cycle power plants meet emission rules by applying optimized combustion technologies and employing sophisticated flue gas cleaning lines. In waste to energy processes, plant operators must use Continuous Emissions Monitoring Systems (CEMS) with the highest levels of availability. In extreme cases, failure of a CEMS can require a plant shut down, resulting in potential loss of revenue.

The solution is continuous emissions monitoring

Using only proven analytical methods, ABB's CEMS gas analyzers can help energy plant operators to comply with local legislation wherever they are. The modular Advance Optima system and the EasyLine series can be equipped with infrared or ultraviolet photometric analyzers and with a paramagnetic analyzer or electrochemical cell for measuring NO, NO₂, SO₂, CO, CO₂ and O₂. These analyzers are also the heart of the turn-key system solution ACX, ABB's complete system for extractive continuous gas analysis. For incineration processes, ABB's ACF-NT Fourier Transform Infra-Red (FT-IR) spectrometer based turn-key system can be used. Both methods extract a sample of representative gas from the process, usually the final stack, to a floor-mounted, accessible and weather-proofed analyzer cabinet.





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Saving fuel through effective feedwater preheating

Feedwater heaters pre-heat feedwater before it passes to the steam drum or boiler to be converted to steam.

The challenge of maximizing boiler efficiency

The feedwater heater is a series of tubes carrying feedwater through a tank shell, into which steam is injected to heat the water. The steam condenses in the shell, creating a liquid level of condensate. The level is controlled to create a seal and prevent steam blow-through. Maximum thermal transfer occurs when the largest tube area is exposed to the steam without allowing steam blow-through condensate drains from the shell through the normal drain. When the tubes become submerged, heat is transferred to the condensate. Even a small increase in condensate level greatly reduces boiler fuel efficiency.

The solution is accurate level control

ABB's Magwave dual chamber level measurement system provides dependable, accurate measurement. The Magwave has two tightly integrated but independent chambers. In the primary chamber, level is indicated based on specific gravity. An externally mounted magnetic gauge visually indicates the level. In the secondary chamber, the MT5000 series guided wave radar provides continuous level measurement output and enables accurate level measurement even with changes in feedwater temperature. If redundant output is desired, the patented AT200 magnetostrictive transmitter can be fitted to the primary chamber. Both the MT5000 and AT200 are SIL2/3 certified. ABB's solution typically allows users to manage level measurement with their control system to a set point of nine inches, achieve a 5°C (8°F) differential on their heaters and improve efficiency by six percent, saving fuel costs.

Flowmeters reduce steam losses by over 10 %

Installation costs and accuracy are amongst the most important factors to consider when choosing a technology to measure steam flows. Many technologies may be unsuitable because their upstream and downstream piping requirements may reduce meter performance.

The challenge of accurately measuring steam flows

In steam applications, measuring mass rather than volume can more accurately indicate the amount of energy moving around the system. Traditional differential pressure meters need additional equipment including line pressure transmitters, temperature sensors and a flow computer to produce mass readings for steam.

The solution is ABB's swirl flowmeters

Swirl meters have virtually zero maintenance requirements and offer greater accuracy, especially where flow varies significantly. Swirl meters offer accuracies of $\pm 0.5\%$ of reading over the entire flow range. Furthermore, the turndown is up to ten times that of an orifice plate. ABB's swirl flowmeters need just three pipe diameters upstream and one downstream, eliminating pipework modifications normally required to read accurately in lower flow situations. The meters also have built-in temperature sensors and automatically compute reading to indicate steam usage in pounds. ABB's swirl meters can help pinpoint system leaks and faulty steam traps, minimizing both energy and overall operating costs. In a recent application, installing ABB swirl meters not only cut installation costs, but also reduced steam losses to less than 5%, with the steam plant recovering over USD 1.25M in increased billing.

Putting the environment first

Sustainable power generation

— 01 The control system for plant-wide control of any process

— 02 Power and automation solutions for solar power technologies

— 03 ABB service includes workshops and training

— 04 Measurement and analytical products service is available worldwide

Optimizing control of waste-to-energy and biofuel power plants

Waste-to-energy is the process of extracting energy in the form of electricity or heat from the incineration of a waste product, often biological in origin. Most waste-to-energy processes produce electricity directly through combustion. Alternatively, they can produce combustible fuels such as methane, methanol or synthetic fuels, either through thermal or non-thermal processes. Biofuels include fuels derived from biomass conversion, as well as solid fuels, liquid fuels and certain biogases.

The challenge of maximizing control and minimizing environmental impact

One of the major challenges is achieving a higher ash quality through the use of optimized combustion control, allowing the plant operator to ensure that the ash meets environmental standards for disposal in landfill. Flue gas treatment systems enable modern plants to remain below the emission limits.

The solution is a control system offering a plant-wide overview

ABB supplies its System 800xA or Symphony Plus control platforms as a complete solution for the control of waste to energy power plants. Offering an easy-to-use and consistent user interface, they provide simple plant and enterprise-wide access to information while offering fast analysis of process disturbances.

Maximizing generating efficiency in solar thermal system installations

Solar thermal energy (STE) uses thermal collectors to harness solar energy to produce heat. High temperature collectors, which absorb and concentrate sunlight using mirrors or lenses, are generally used for electric power generation. The latest technology is based on heat storage using molten salt as heat transfer fluid, to allow steam production even at night. In a solar thermal energy process, solar energy is used to heat water and generate steam, which can then be used to feed the turbines and generate electricity in the same way as in any other thermal power process.

The challenge of getting the most energy from sunlight

To enable the maximum efficiency of the plant, the transfer fluid pressure, temperature and flow needs to be measured reliably even at 550°C (1,022°F). In installations using 'heat storage' tanks, accurate pressure measurement is also important. In these installations, the steam is maintained at temperatures of around 285°C (545°F) by allowing the steam to condense and then 'flash' back to steam when the pressure is lowered.

The solution is a complete solar energy system

ABB's measurement and analytical products can play a key role in maximizing the efficiency of thermal solar power installations, through accurate measurement of parameters including flow, temperature and pressure. ABB's expanded offering also includes complete power and automation solutions for all the main concentrating solar power technologies – parabolic trough, power towers, integrated solar combined cycle, heliostat solar concentrators, stirling solar dish systems as well as combined solar-biomass.

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Services for measurement products

Performance optimization

The constant demand for power calls for maximum uptime and availability of a power plant. Where your plant instrumentation is concerned, ABB can help you to manage and maintain your equipment, from installation and commissioning through to lifecycle maintenance and eventual replacement. Through its range of instrument maintenance services, ABB helps you to optimize plant productivity and performance in accordance with the relevant standards and legislation.

Help when you need it

- Expert instrument and analyzer technicians that are available onsite during planned or unplanned outages to bring your plant back online fast

Repair services

- Both on site and/or at ABB's workshops where required

Start-up and commissioning services

- Covers ABB's flowmeters, pressure and temperature transmitters, level products, actuators and positioners, I/P transducers, controllers, recorders, water quality analyzers and gas analyzers

Lifecycle services

- Full support throughout the product lifecycle, from pre-purchase through to upgrade and/or retrofit
- Covers ABB's actuators and positioners, water and gas quality analyzers, flowmeters, pressure and temperature transmitters, recorders and controllers

Calibration services

- Both on-site or at factory
- Covers ABB's flowmeters, water quality analyzers, pressure and temperature transmitters, valve actuators and positioners, emissions monitoring systems, gas analyzers

DID YOU KNOW

ABB offers custom designed, engineered and pre-assembled water and steam monitoring systems plus professional commissioning and installation services. Each system can be tailored to meet individual specifications, reducing installation time, testing and commissioning while increasing ease of operation and efficiency.



Measurement solutions 1/4

A comprehensive portfolio

Did you know? ABB is a world leader in the design, supply and lifecycle management of power and automation technologies for power generation applications.

Plant components	Pressure		Temperature		Value automation					
Measurement type	Pressure transmitter	Differential pressure transmitter	Temperature sensor	Temperature transmitter	Actuator	Positioner	PositionMaster	Pneumatic actuator	Pneumatic actuator	Positioner
Product series	26X	266	TSx	TTx	Contrac	TZID	EDP300	UP	LP	AV
Product image										
Fuel system	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coal bin										
Coal mill					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feed storage										
Fermenter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
Gas storage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
Solid dosage										
Water treatment	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Deaerator										
Boiler feed water	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>					
Boiler drum	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>					
Boiler outlet					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Steam line	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>					
Cooling water system	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>					
Generator	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>					
Turbo generator					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gas turbine outlet					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condenser	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
Gas cleaning system	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						
FGD*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
ESP**or fabric filter										
DeNOx					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer outlet										
Residuals storage			<input type="checkbox"/>	<input type="checkbox"/>						
Air preheater					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stack***	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						

* Flue gas desulphurization, ** Electrostatic precipitator, *** Continuous emission monitoring

Measurement solutions 2/4

Serving the steam loop

Did you know? ABB manufactures and supplies a wide range of chemical analyzers that is used to eliminate the issues associated with poor boiler chemistry and therefore helps to avoid corrosion, impaired efficiency and unplanned shutdowns.

Plant components	Flow							Level				
Measurement type	Torbar	ProcessMaster	WaterMaster	Vortex/Swirl	VA meters	Coriolis mass flow meter	Flow Nozzle	Radar	Ultrasonic	Magnetic level	Laser	Magnetostrictive
Product series	FPD	FEP	FEW	FSV/FSS	Various	FCB	PTC-6	MT5000	KMICRO	KM26	LM80	AT
Product image												
Fuel system	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Coal bin								<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Coal mill									<input type="checkbox"/>		<input type="checkbox"/>	
Feed storage								<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>
Fermenter				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
Gas storage	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Solid dosage								<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Water treatment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Deaerator					<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Boiler feed water	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Boiler drum								<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Boiler outlet				<input type="checkbox"/>								
Steam line	<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>		
Cooling water system	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				
Generator												
Turbo generator							<input type="checkbox"/>					
Gas turbine outlet												
Condenser	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Gas cleaning system	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>
FGD*		<input type="checkbox"/>						<input type="checkbox"/>				
ESP**or fabric filter					<input type="checkbox"/>							
DeNOx					<input type="checkbox"/>							
Economizer outlet												
Residuals storage								<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Air preheater				<input type="checkbox"/>								
Stack***	<input type="checkbox"/>											

* Flue gas desulphurization, ** Electrostatic precipitator, *** Continuous emission monitoring

Measurement solutions 3/4

Extensive know-how and global reach

Did you know? ABB's offering for solar thermal energy applications includes patented high-precision programmable logic controllers for parabolic troughs, dishes or collectors, control systems for thermal storage tanks and electrical balance of plant for the power block.

Plant components	Recorders and controllers						Analytical instruments water					
Measurement type	Controllers and A/M stations	Paperless recorders	Stripchart recorders	Circular Chart Recorders	Conductivity	pH	Dissolved oxygen	Hydrazine	Chloride to Residual Total Chlorine	Phosphate	Silica	Sodium
Product series	CM	SM	SR	C1900	AX400	AX400	943	AHM550	AW400	AW600	AW600	ASO500
Product image												
Fuel system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
Coal bin												
Coal mill		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
Feed storage												
Fermenter												
Gas storage												
Solid dosage												
Water treatment	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>					
Deaerator							<input type="checkbox"/>					
Boiler feed water	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
Boiler drum	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Boiler outlet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
Steam line	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>						
Cooling water system	<input type="checkbox"/>											
Generator												
Turbo generator												
Gas turbine outlet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
Condenser	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						
Gas cleaning system						<input type="checkbox"/>						
FGD*					<input type="checkbox"/>	<input type="checkbox"/>						
ESP**or fabric filter												
DeNOx	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
Economizer outlet												
Residuals storage												
Air preheater	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
Stack***												

* Flue gas desulphurization, ** Electrostatic precipitator, *** Continuous emission monitoring

Measurement solutions 4/4

The ideal partner for power generation

Did you know? ABB has been supplying technology for large-scale carbon capture and storage projects since 1996.

Plant components	Analytical instruments gas									
Measurement type	Hydrogen purity (Katharometer)	Zirconia oxygen	Combustibles oxygen plus combustibles	Emissions and process control solution (e.g. SOx, NOx, CO, CO2, VOC, O2)	Emissions and process control solution (e.g. SOx, NOx, CO, CO2, VOC, HCl, HF, NH3, O2, H2O)	Calorific Value, Wobbe Index, SG	Extractive gas analyzers (Uras, Limas, Magnos, Caldos, Fidas, MultiFID)	In-situ gas analyzer	Extractive gas analyzers (Uras, Limas, Magnos, Caldos, Fidas)	Ex version of Uras, Magnos, Caldos
Product series	AK100	AZ20	AZ40	ACX	ACF	PGC1000	AO2000	LS25	EL3000	EL3060
Product image										
Fuel system						<input type="checkbox"/>				
Coal bin		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Coal mill		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	
Feed storage										
Fermenter							<input type="checkbox"/>		<input type="checkbox"/>	
Gas storage						<input type="checkbox"/>				
Solid dosage										
Water treatment										
Deaerator										
Boiler feed water										
Boiler drum										
Boiler outlet		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Steam line										
Cooling water system										
Generator	<input type="checkbox"/>						<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Turbo generator	<input type="checkbox"/>						<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Gas turbine outlet		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	
Condenser										
Gas cleaning system		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
FGD*		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	
ESP**or fabric filter		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
DeNOx				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Economizer outlet		<input type="checkbox"/>	<input type="checkbox"/>							
Residuals storage							<input type="checkbox"/>		<input type="checkbox"/>	
Air preheater		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	
Stack***		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

* Flue gas desulphurization, ** Electrostatic precipitator, *** Continuous emission monitoring

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