

Improving dissolved oxygen control through on-line monitoring

Improving boiler feedwater quality



Using ABB's Navigator 500 to achieve enhanced dissolved oxygen treatment effectiveness through on-line boiler feedwater monitoring

Measurement made easy

Well-balanced water chemistry is vital for optimizing the efficiency steam raising and distribution plant

Introduction

Extensive on-line chemical monitoring of both the water/steam cycle and water treatment plant on modern power stations is now a very well established practice. This enables careful control of the water chemistry, to achieve peak efficiency and minimize down time due to excessive boiler corrosion or scaling.

Achieving well-balanced water chemistry is vital to optimizing the efficiency and availability of boiler plant in power station applications. If the plant chemistry is allowed to vary from specified limits, expensive plant outages can occur, potentially incurring costs of over \$1,000,000 per day.

Accurate and reliable monitoring of water quality across a range of parameters is therefore critical in ensuring continuous and efficient operation of power generating equipment.

The application

Accurate measurement of dissolved oxygen is essential for efficient, cost-effective operation of boiler plant with minimum downtime. In its dissolved form, oxygen is highly corrosive to most metals, especially the mild steel used for boiler tubes.

The presence of even small quantities of dissolved oxygen in boiler water can severely impair a boiler's operation, causing corrosion of its vital components and significantly reducing its working life. One particular problem is the occurrence of pitting in the boiler tubes and surface. A form of localized corrosion, pitting can quickly cause extensive damage to a specific point or area. This is made worse in situations where high levels of highly corrosive chloride are also present.

This is especially magnified in boilers with high chloride levels. Also an oxidizer, chlorides are another major cause of corrosion in power applications; when acting with excessive oxygen levels, they can attack already weakened parts of the boiler.

To minimize damage caused by corrosion, it is therefore necessary to reduce dissolved oxygen to the lowest possible level, typically in the order of five parts per billion or less.

The challenge

Ideally, oxygen levels in boiler feedwater can be substantially reduced by an efficient deaeration process. A mix of returned condensate from the steam turbine and make-up water is relayed via an extraction pump to the deaerator, which heats the mixture under vacuum. This process can typically reduce dissolved oxygen concentrations from several parts per million to just a few parts per billion.

However, the risk of oxygen ingress through the extraction pump glands or via leaks in the deaerator means that dissolved oxygen levels can still remain above desirable levels even after deaeration. For this reason, some form of secondary treatment is administered to further reduce levels, typically involving the addition of oxygen scavenging chemicals such as hydrazine or sodium sulfite.

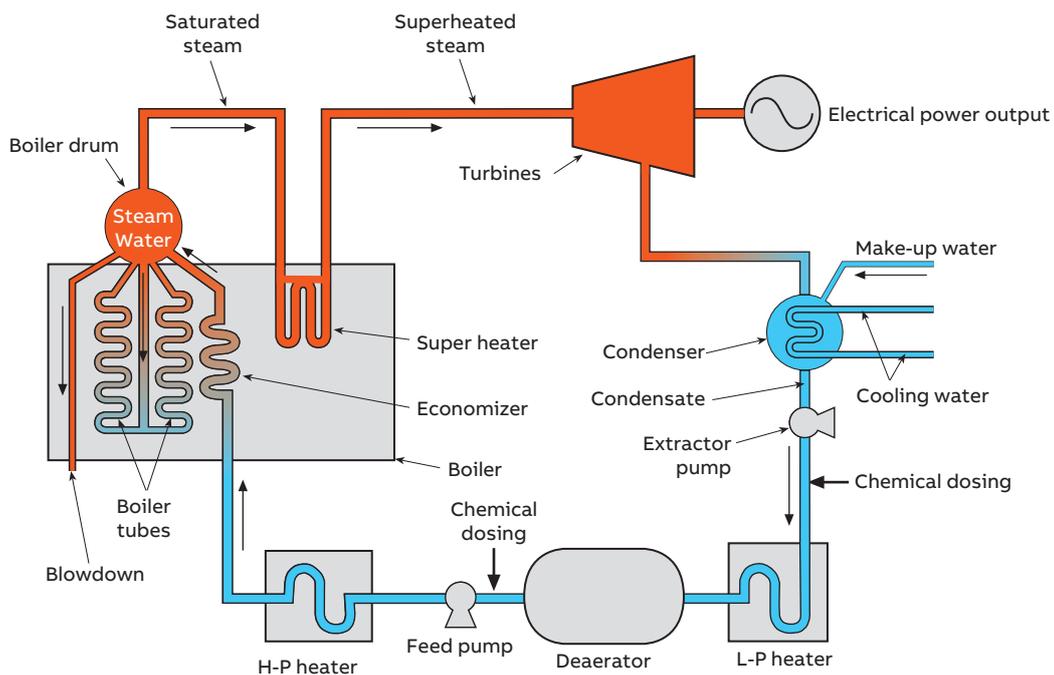
The solution

Monitoring should be performed wherever there is a risk of oxygen ingress into the boiler feedwater. An effective monitoring system measures dissolved oxygen at key points including the extraction pump discharge, the de-aerator inlet and outlet and the economizer or boiler inlet.

Monitoring at the extraction pump discharge helps to identify whether oxygen has entered water from leaks in the condenser or through the extraction pump glands.

The deaerator efficiency can be measured by monitoring at both the deaerator inlet and outlet. Any discrepancies in oxygen levels helps to reveal the existence of any leaks in the deaerator casing, glands or fittings.

Where hydrazine or alternative oxygen scavenging chemicals are used, operators can assess the efficiency of their dosing regime by measuring for dissolved oxygen at the economizer or boiler inlet, with any fluctuations able to be addressed by increasing or reducing the dose quantities.



An effective monitoring system involves measuring dissolved oxygen at key points prior to the boiler

What can ABB offer?

The dramatic variations in oxygen levels during the load cycle of a plant, combined with the different levels required for different boiler chemistry regimes, require an analyzer that offers a fast response across both high and low dissolved oxygen concentrations.

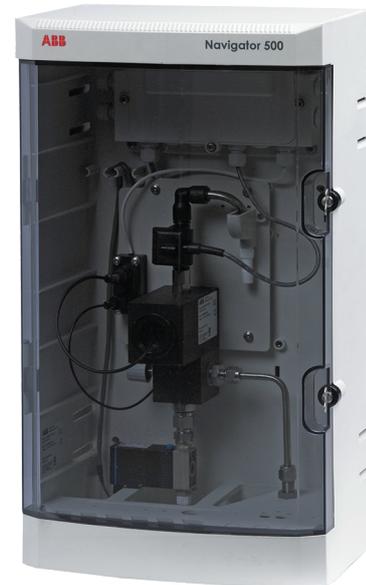
ABB's Navigator 500 Low Level Dissolved Oxygen on-line analyzer uses a galvanic-type sensor to accurately measure dissolved oxygen levels in process feed water. Accurate and reliable, it requires no maintenance and can monitor dissolved oxygen concentrations up to 20 parts per million.

The Navigator 500 Low Level Dissolved Oxygen is part of ABB's Navigator 500 analyzer family, which brings a compact, reliable and accurate range of instruments for high purity water treatment and boiler chemistry monitoring applications. Providing continuous on-line monitoring of boiler feedwater quality, the Navigator 500 Hydrazine, Dissolved Oxygen and Sodium analyzers help ensure optimum efficiency of both boiler plant and ancillary equipment throughout the steam distribution loop.

A key feature across the range is its separate sensor and transmitter section design. All analysis and signal conditioning is conducted within the sensor section and transmitted digitally to the transmitter. Each transmitter can collect data from up to four sensing systems. This enables monitoring at multiple points without the cost associated with purchasing and installing separate transmitters. The four transmitter inputs can be used to collect signals on one parameter or can be mixed and matched, with multiple parameters being fed to one unit.

The transmitter is also available with the option of digital communications, including Ethernet capability, enabling data to be relayed to a central control room.

ABB's Navigator 500 and 600 on-line analyzers provide complete monitoring of all the key boiler chemistry parameters.



ABB's Navigator 500 low level dissolved oxygen analyzer

Navigator 500 Low Level
Dissolved Oxygen



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