

# Using the Biotector TOC Analyzer for Condensate Return Applications

## The Application

Condensate return applications are common for the Biotector TOC Analyzer. Biotector has successfully made condensate measurements in oil refineries, petro-chemical and corn wet milling plants. Condensate is critical to processes which require very high temperatures. When steam flows out from the boiler it passes through a series of heat exchangers that heat the process liquid. This can also be a point where organic contamination is introduced into the condensate return system.

## The Problem

Occasionally, the process liquid "breaks through" into the condensate return system; this almost always happens at the heat exchanger. If this contaminated condensate is sent back to the boiler, you could start to see a variety of problems such as reduced efficiency or possible failure of the boiler if allowed to operate for extended periods of time in a break through condition.

There are very specific costs associated with dealing with contaminated condensate, such as:

- Cost of lost or contaminated process liquid when break through occurs
- Cost of losing previously treated boiler water
- Cost of new make-up water
- Cost of boiler fuel (coal, bio-fuel or gas) to heat new make-up water
- Cost of chemical treatment of make-up water
- Cost of waste treatment of diverted and contaminated condensate water.

When break through is detected, the boiler operator will typically divert the potentially contaminated condensate away from the boiler by sending it to the sewer. The new water (make-up water) coming into the boiler system must be chemically treated and then heated from its ambient temperature to the required steam temperature. This requires much more energy than just maintaining the temperature of returned condensate. Increased water and fuel usage has the largest impact on operating cost.



## APPLICATION NOTE: BOILER CONDENSATE RETURN

Clean condensate is treated water (demineralized, deaerated and deionized). The water used must be pure, which means no suspended solids, organics or minerals can be present in the system. As contaminated condensate is run through the boiler and converted to steam, it leaves behind solids which coat the tubes and begin to insulate them. To prevent this situation, operators have developed methods of minimizing the potential for contamination or slowing the process down:

- Diverting a majority (if not all) of the return condensate to a drain to avoid introducing contamination into the boiler.
- Blowing down the boiler (emptying it of most of the condensate) on a regular basis to remove the solids that have potentially collected in the boiler.

Both of these methods are very inefficient ways of dealing with the issue of contamination. Every gallon of condensate requires a gallon of make-up water that needs to be chemically treated and then heated to the required steam temperature to be made available for use in the boiler.



### The Solution

The Biotector TOC Analyzer can be effectively integrated into a boiler protection program with no disruption to the normal operation of the system. Operating costs, as well as unplanned maintenance work, can be greatly reduced by continuously monitoring the quality of the return condensate. Knowing the quality of the condensate (typically 100 ppb to 5 ppm) removes the need to flush potentially good condensate which typically occurs if facilities cannot verify if it is clean.

Fines can be avoided by reducing the amount of water going to the sewer that would ultimately need to be treated by the local municipality. The greatest cost savings is in the energy of fuel saved by not having to heat make-up water to the required temperature to be able to be used for process control.

The Biotector has the ability to transmit a signal to the control system to notify operators of an excursion. This allows the operator to divert the contaminated condensate away to avoid damaging the boiler. The condensate system can be returned to normal once the contamination has been cleared from the system.

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