Technical Article
Boiler Blowdown

Boilers require periodic blowdown in order to maintain effective operation, provide for good equipment life, and reduce maintenance time and expense. In this sense, "blowdown" refers to the removal of boiler water in order to maintain an acceptable level of Total Dissolved Solids (TDS). Blowdown has an economic impact because the water that is removed has been heated from the inlet temperature to the steam saturation temperature and the energy used to heat this water, of course, comes from the fuel burned in the boiler. In most cases, blowdown with a Clayton Steam Generator is significantly less than with conventional boilers and this reduction can result in equally significant fuel savings.

Dissolved solids are primarily introduced into the boiler through make-up water but some solids are also introduced through chemical treatment or, in upset conditions, through condensate. Dissolved solids that are brought into the boiler water tend to stay in the boiler water – they are not removed with the steam – and thus the level of solids, usually expressed in parts per million (ppm), in the boiler water increases (concentrates) over time.

As mentioned previously, blowdown is the process of removing boiler water that has approached a maximum acceptable level of concentration. When this happens the water that is blown down is replaced by make-up water that has a much lower TDS level. This dilutes, or lowers, the concentration in the boiler water. The higher the TDS level in the blowdown water the lower the amount of water that must be removed in order to dilute the remaining water to any given level.

The amount of water that must be blown down for any given application depends upon:

- The TDS level in the make-up water – the higher the level the greater the amount of blowdown.
- The amount of make-up water vs. the amount of condensate returned – the greater the percent of make-up the greater the amount of blowdown.
- The maximum acceptable TDS level in the boiler water – the lower the level the greater the amount of blowdown.
- The TDS in the blowdown water – the higher the TDS, the lower the amount of blowdown.
- The average load level for the boiler (BHP or lbs of steam per hour).

As can be seen from the above, applications with high make-up levels, high TDS in the make-up water and extended operation at high load levels result in high levels of blowdown and, thus, have a high economic impact.

The TDS of the blowdown water is significant because the higher the TDS, the lower the volume of water that must be removed in order to remove the same amount of solids, in terms of pounds, and achieve the same level of concentration after dilution with make-up water.

Clayton Steam Generators provide a fuel savings, from reduced blowdown, because of two factors:

- First, since the Steam Generator is a forced circulation boiler it can tolerate relatively high TDS levels in the feedwater – as high as 8550 ppm.
- Second, water that is blown down is separator trap return water that has been concentrated in the separator by a factor of, typically, 4 to 5 times.

Considering these two factors, blowdown water for a Clayton Steam Generator, typically, has a concentration of 24,000 to 40,000 ppm. That compares to typical values for conventional boilers in the range of 2,500 to 3,500 ppm. Since our blowdown water has TDS concentrations that are 7 to 16 times higher than conventional boilers, the volume of blowdown water with Clayton is 1/7th to 1/16 that of a conventional boiler. As will be shown, this can amount to a major savings in fuel cost.

Clayton INDUSTRIES

Your Single Source For Steam Technology Since 1930

In addition to the factors that determine the volume of blowdown water, the economic impact, depends upon:

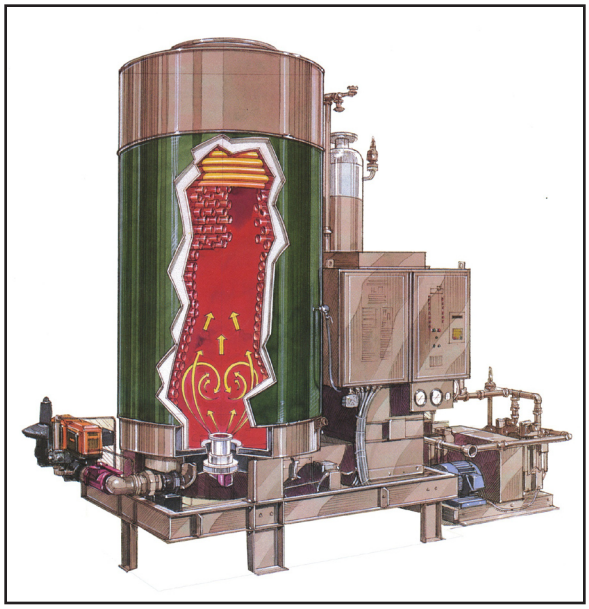
- The temperature of the condensate and make-up water – the lower the temperatures the greater the economic impact.
- The steam pressure – the higher the pressure, and thus the temperature, the greater the economic impact.
- The cost of fuel – obviously, the higher the fuel cost the greater the economic impact.
- The number of hours of operation.
- The efficiency of the boiler.

These savings can be illustrated by the following example:

Make-up water TDS Level:	300 ppm
Make-up water temperature:	60 Degrees F.
% of Make-up:	100 %
TDS level in conventional boiler:	3000 ppm
TDS level in Clayton feedwater:	6500 ppm
Average boiler load:	300 BHP
Boiler Efficiency:	80 %
Steam pressure:	125 PSIG
Hours of operation per day:	16 hours per day
Days of operation per year:	312 days per year
Cost of natural gas:	$4.00 per MMBTU

In this case, the savings in blowdown is 860 lbs. of water per hour, which equates to annual savings, based on the assumptions shown, of nearly $6,400. This could easily represent greater than 6% of the installed cost of the new equipment and, most significantly, these savings are ongoing.

As noted, savings with a Clayton Steam Generator that result from reduced blowdown can be significant. These savings are application dependent. Please contact us if you would like an estimate for your application.



Clayton INDUSTRIES

Your Single Source for Steam Technology Since 1930

World Headquarters
17477 Hurley Street
City of Industry, CA 91744
800.423.4585 tel • 626.435.0180 fax
email: sales@claytonindustries.com
www.claytonindustries.com

Europe, Africa & Middle East Headquarters
Rijksweg 30 • B-2880 Bornem, Belgium
32.3.890.5700 tel • 32.3.890.5701 fax
email: sales@clayton.be

Latin America Headquarters
Manuel L. Stampa 54 • Nueva Industrial Vallejo
Mexico D.F., 07700 Mexico
Toll Free: 01.800.888.4422 • (55)55.86.51.00 tel
(55)55.86.23.00 fax • email: claytonmexico@clayton.com.mx
www.claytonmexico.com.mx

ATLANTA • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • KANSAS CITY • NEW YORK/NEW JERSEY • SAN FRANCISCO

Clayton Deutschland GmbH
Clayton Thermal Products Ltd (UK)
Clayton Scandinavia A.S.
Clayton Nederland B.V.
Clayton de France S.A.R.L.
Clayton Sales & Service Canada

World Leaders in Precision Steam Generators, Fluid Heaters, Heat Recovery Systems and Customer Service

G-1039 9/06