



SHOP TALK

VOLUME 12, ISSUE 2

APRIL 2010

Does Your Boiler Have Scale? Part 2

You just opened the boiler for inspection and you have scale and now the boiler inspector just recommended acid cleaning the boiler in order to keep your certificate. Now what?

This is becoming a more frequent common trend as insurance companies tend to protect their interest not to mention the potential energy losses and increased operating costs.

What is acid cleaning of boilers? Why it is carried out. The purpose of the acid cleaning is to remove impurities, scaling, possible traces of corrosion, metal oxide layers on the inner surfaces of the tubes and pressure vessel. Using acid, the inner surfaces of the pressure vessel are cleaned, which ensures high and effective heat transfer. The acid cleaning is done using acids such as HCL and or citric acid. The acid cleaning process must be done very carefully by an experienced trained professional to avoid damage of the inner surfaces by the used acids and chemicals.



Scale deposits occur when calcium, magnesium, and silica, commonly found in most water supplies, react to form a continuous layer of material on the waterside of the boiler heat exchange surfaces.

Scale creates a problem because it typically possesses a thermal conductivity, an order of magnitude less than the corresponding value for bare steel. Even thin layers of scale serve as an effective insulator and retard heat transfer. The result is overheating of

boiler tube metal, tube failures, and loss of energy efficiency.

Fuel waste due to boiler scale may result in thousands or even tens of thousands of dollars in additional operating costs annually.

The prevention of scale formation in boilers can and will produce substantial energy savings.

Monitor Flue Gas Temperature - An indirect indicator of scale or deposit formation is flue gas temperature. If the flue gas temperature rises (with boiler load and excess air held constant), the effect is possibly due to the presence of scale.

Perform Visual Inspections - Visually inspect boiler tubes when the unit is shut down for maintenance. Scale removal can be achieved by mechanical means or acid cleaning.

Suggested Actions - Any scale in a boiler is undesirable. The best way to deal with scale is not to let it form in the first place. If scale is present, consult with your local water treatment specialist and consider modifying your feed water treatment or chemical additives schedule.

How much money can Johnson Paterson save you by acid cleaning your boiler \$\$\$? Does your boiler have a scale build up? Call now to schedule an acid cleaning.

Scale Thickness (inches)	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
% Increase in Fuel Consumption	15%	19%	23%	30%	38%	43%	50%	58%	63%	70%

Making The Most of Firetube Boiler Inspections



Summer is the perfect time to inspect a boiler, sizing up its energy use, carbon footprint, and overall ability to support a process reliably and safely. Once inspected, a boiler must be restarted and tuned properly to ensure maximum performance.

This article discusses key considerations governing the annual inspection of firetube boilers ranging in size from 100 to 1,000 hp and 3,450 to 34,500 lb of steam per hour.

FIRE-SIDE

Once a boiler is opened for inspection, the first order of business is assessing the condition of the fire-side of the unit:

- Is the refractory and insulation in good condition?

If the refractory shows evidence of serious cracking (1/4 in. or more) or deterioration, which can lead to over heating and metal fatigue/failure, patch it with cement or plastic and lightly wash-coat it.

- Do the pressure-vessel and heat-transfer surfaces show signs of poor combustion (sooting) and possible metal fatigue and weldment cracking?

Sometimes, these are evidenced by rust formation, the result of water leakage when the boiler cooled (metal contraction) and was still under pressure. A hydrostatic dye test under pressure will manifest such leakage.

When soot is found on fire-side surfaces, it is time to retune the burner, making sure the fuel/air ratio properly tracks the turndown of the burner from low to high fire. Often, that is all that is required to eliminate the problem and substantially improve combustion efficiency. However, you also might want to consider installing independent motorized actuators, removing much of the linkage assembly, to prevent slippage and hysteresis.

Additionally, an oxygen-trim system may be considered to continuously compensate for variances in ambient-air temperature, barometric pressure, etc. Both of these retrofits are relatively inexpensive and can, under the right operating conditions, reduce fuel usage by 5 to 10 percent over the course of a year.

WATER SIDE

Once a boiler is drained, it is time to inspect the water side of the vessel, looking for signs of excessive scale (1/8 in. or more), corrosion, and pitting of metal. When problems related to the water side of a boiler are discovered, it is imperative that a water-treatment consultant be engaged. Failure to remedy a problem quickly can result in major repair costs and downtime or complete loss of a boiler's pressure vessel.

SAVING ENERGY

If a boiler's pressure vessel is in good shape, with only minor scaling (magnetite) and no evidence of weldment deficiencies and pitting, it likely has many years of life left in it. As such, it is an excellent candidate for upgrading, especially if its capacity meets current and anticipated process and heating needs. The upgrading of an old but serviceable boiler with the latest advances in burner and control technology may be just what the doctor ordered when it comes to saving energy and improving reliability. This might be a good time to add other fuel-saving enhancements, such as a feedwater economizer or blowdown heat-recovery system. The options are considerable, leading to thousands, if not hundreds of thousands, of dollars in fuel savings annually.

SYSTEM CUT-IN AND RECOMMISSIONING

Once a boiler has been cleaned, inspected, and closed, it should be restarted and tuned by a qualified technician, one with the experience to properly set the controls and adjust the burner to maximize fuel-to-steam efficiency.

The tuning of a burner requires a load allowing the boiler to fire throughout its operating range while the burner-management system controls the various operating and safety sequences and checks. For this to occur, the boiler needs to be reintroduced to the system in a precise manner, one ensuring safety and system integrity.

Once a boiler is safely online, the burner can be tuned for optimum operation. This requires skill and

understanding and is not for amateurs. It also requires proper tools. One such tool is the combustion analyzer, which is used to check products of combustion as a burner modulates between low and high fire. Properly adjusted burners maintain a given fuel/air ratio from low to high fire, limiting the amount of excess air and maximizing combustion efficiency. With gas, excess air normally is in the 10-to-20-percent range; with oil, it normally is in the 20-to-25-percent range. Another benefit of a well-tuned combustion is that it's cleaner burning, eliminating excessive soot formation on fire-side surfaces while keeping carbon-monoxide levels as close to zero as possible and below 50 ppm. After adjusting a burner, a technician makes sure the operating, modulating, and high-limit controls are set properly, ensuring adequate system response and continuity between boiler cycles. They also check the operating pressure and firing rate against the boiler's stack temperature. Depending on the operating pressure and firing rate, a well-tuned, efficient boiler should have a stack temperature 50 to 150°F above the saturated steam temperature. A 40°F elevation will result in a 1-percent loss in efficiency.

SUMMARY

Following the foregoing suggestions is an excellent way to get on the path of proper asset protection, utilization, and fuel conservation, conservation that puts considerable cash back into your business while playing a key role in protecting the finite resources we so often take for granted, the fuel we burn, and the air we breathe. It starts with awareness, followed by the will to make it happen.





360 Industrial Pkwy. S., Suite 7
Aurora, Ontario
L4G 3V7

Phone: 905-727-0084
Service: 905-727-0479
Toll Free: 1-800-387-9629
Fax: 905-727-2408
Email: jpi@johnsonpaterson.com
Website: www.johnsonpaterson.com

*Turning Fire into
Power
for Forty Years*

Visit our Website
www.johnsonpaterson.com



SAVINGS BEYOND A BOILER

Once a boiler has been opened, cleaned, inspected, and closed, and the burner has been tuned or retro fitted, a full audit of the steam system should be considered. A steam-system audit includes the assessment of load profiles and pressures to determine if economizers and other ancillary equipment would accelerate payback. Also, it takes into consideration piping and steam-user systems, evaluating if they can be upgraded for energy and process-improvement reasons. A full steam-system audit goes beyond a boiler, identifying ways to save up to an additional 30 percent in annual fuel costs, “cash on the floor” that can come back to a business a hundredfold year after year.

By Steve Connor—Cleaver Brooks Inc.

Proud To Be A Cleaver Brooks

I recently had an opportunity to tour the Cleaver Brooks Stratford boiler plant, which I have done many times, but it's been about 8 years since I had last been there.

Every time I go, and this time was no exception, the quality, versatility, professionalism, and cleanliness of the plant amazes me. I have had the opportunity to be in many boiler manufacturing facilities in my thirty some years in this business but none have held a candle to the Cleaver Brooks facilities. On this particular visit the plant was quite full with at least 50 different pieces of equipment making their way through the production line, which is very impressive since our competition is struggling to keep their doors open.

The most impressive piece of equipment being built while I was there was a 30,000 gallon receiver tank for a 800,000 pound per hour Deaerator which Cleaver has sold along with three industrial water tube boilers for the overseas market.

I would like to extend an open invitation to anyone who would like to tour the facility, whether you have purchased a boiler and would like to see it being manufactured, or if you are thinking of purchasing a boiler, or if you would just like to see a first class boiler plant in operation. If you're thinking of purchasing a boiler or boiler related equipment and are trying to decide between different manufacturers, I would strongly encourage you to come see the plant and then try to see the competitions facilities. I guarantee you will be blown away by the differences.

We had a Canadian Boiler Society meeting in Stratford a few years back and the meeting consisted of a plant tour. The next year we were supposed to tour one of the other manufacturers plant but once they went through the Cleaver Brooks facility they immediately recanted their invitation. Speaks volumes don't you think?

Kerry Johnson