Buckman

WATER TECHNOLOGIES

CASE HISTORY

Employing a video probe to measure boiler treatment efficiency in Canada

Background

This customer relied upon 4 coil–tube boilers to provide process steam to the plant, and system reliability and efficiency are critical to maintain smooth operation of the plant. Scale on the boiler tubes impaired heat exchange efficiency and drove up costs. It also meant that the system reliability dropped.

This international food processing company emphasizes sustainability; and, by having cleaner heat exchange surfaces, natural gas consumption can be reduced, lowering the carbon footprint.

As for any production plant, controlling costs is a critical activity. The change to Buckman products was driven on the basis that we would be able to lower the plant's energy costs by improving the condition of the boilers and maintain them free of scale.

Action

Coil–tube boilers, unlike water and fire tube boilers; cannot be readily inspected since the water is on the inside of a coiled tube. The tube(s) are formed into a circular body into the center of which the fuel is fired. The combination of a high heat flux and this design means that these boilers are susceptible to rapid scale formation if the treatment program is not optimized. Furthermore, due to the firing configuration, relatively small amounts of scale can result in the tubes overheating and failing. They are much less robust than a fire tube boiler; but; since the water inventory is lower than other boiler design, they can be legally operated by fewer personnel with lower qualifications. Combined with cyclic operation, these types of boilers are exposed to high stress conditions, which make program optimization very important.

The only way to effectively inspect this type of boiler (Thermogenics Thermocoil) is by using a video probe. In this case, an Olympus Iplex Advanced Video Probe was employed to conduct the inspections.

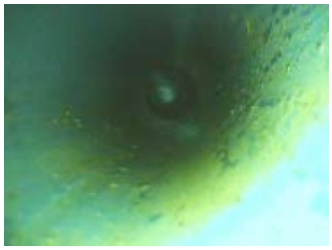
Results

Buckman became involved at the plant, then the boilers were acid cleaned and we conducted the inspections using a video probe. The client was charged for the inspection service, and they saw the value since it provided a clearer understanding of the boilers' condition.

As can be seen from the photo on the left, there was still a considerable amount of scale present. Based on an extensive sampling of the photographs from this inspection, it was clear that about 90% of the heat exchange surfaces had deposits after the first acid cleaning was completed.

Inspecting high heat flux boilers

Post-first acid cleaning – 2007



Same boiler – 2011

As a result of the video inspection, 2 of the 4 boilers had to be cleaned a second time in order to remove the majority of the deposits. However, even with the second cleaning, there was approximately 10–15% of the coil surface that still had scale, which is a testament to the amount of deposit that had accumulated with the previous program.

Combined with better pretreatment control, the plant changed to an all-polymer treatment to minimize the potential for scaling, and by 2011 the tubes were virtually completely free of deposit. In addition to the change to the program chemistry, it was also recommended that

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the plant install a condensate polisher. This was done at the end of 2010, and it has eliminated periodic hardness contamination via the condensate returns.

Benefits

This plant has a total of 4 coil-tube boilers (2 X 350 HP, 1 X 250 HP and 1 X 150 HP). Typically a minimum of two are in service at any time. Steam production averages 131.4 T/day (289,170 lb/day). Based on the amount of scale in the boilers, at the point that Buckman became involved, it was estimated that fuel savings of 10–15% would be achievable once the tubes were clean.

ROI:

After the second review period, the plant confirmed fuel savings related to boiler cleanliness of $100K/annum. The chemical cleaning costs were on the order of $25K and the condensate polisher cost was $15K, which meant that the payback was only 5 months. This saving in fuel was greater than the annual boiler water treatment spend and reflects both ROI and CI for the customer.

ROE:

The lower fuel consumption translated into a reduction in the carbon footprint of approximately 360 T/annum due to the improved heat transfer and lower natural gas usage. This would be equivalent to taking 97 Toyota Prius cars (3.7 T CO_2/annual driving cycle) or approximately 32 typical full size SUVs off of the road.

Conclusion

The use of videoscope inspection is a valuable way to demonstrate the condition of boilers and in the case of coil–tube boilers is the only way to determine their condition. When done on a regular basis, it can be used to ascertain the results of acid cleanings or ongoing improvements related to the performance of the chemical treatment program.

The energy savings at this plant exceeded the chemical costs and in effect the treatment program is now “free.”