CASE STUDY

Nalco Water helps Midwestern US tire plant optimize boiler operations and support production

eROI℠ by Ecolab

BACKGROUND

The boiler system in a tire plant supports several critical manufacturing processes. Steam, like any other process component, needs to be consistently supplied, and of the proper quality to make the tire manufacturing process reliable. The consequences of unreliable steam production include poor curing cycles and increased scrap rate. In some cases, this could result in tire quality liability issues. There are several process-related steam demands that can create challenges for the tire plant's utility personnel.

The primary water related stresses in boiler water systems are corrosion and scale. Any comprehensive water treatment program should help address these stesses and provide utility personnel with the best means to adjust mechanical, chemical and operational conditions as these stresses change.

A Nalco Water customer is one of the world's leading tire manufacturers. Its plant in the midwestern US, makes auto, light truck and bus tires. The plant's boiler system consists of water tube boilers, burning natural gas, operating at 250 psi, producing a total of approximately 75,000 pounds of steam per hour.

The company has a strong sustainability position, being involved in scrap tire disposal, and driving its manu-facturing plant's sustainable performance metrics such as reductions in fuel, electricity, and water consumption, as well as reductions in CO_2 and solid waste generation.

Utility personnel face several challenges – coping with increased work loads and limited resources, maintaining high boiler operational reliability, supporting production that is the source of revenue for the company, and providing a quality commodity in light of highly variable demand – steam for production processes.

Water treatment chemistry demands vary with steam demand changes – the classic means of dealing with those changes involves the following information loop:

- The boiler operator collects a sample of boiler water
- That sample is tested
- The chemical feedrate is adjusted by manually adjusting a chemical feed pump

This loop is the way boiler chemical treatment has been controlled for decades. The primary weakness of this loop is that it is, by definition, performed

ANNUAL SAVINGS

WATER

Reduced water by

3 million gallons

ENERGY

Reduced BTUs by

9.65 billion

GREENHOUSE GASES

Reduced CO_2 generation by

1,950 tons

VALUE DELIVERED

Annual savings

$75,000

NALCO Water
An Ecolab Company

after the fact – the majority of testing takes place using a boiler water sample, after the boiler feedwater is in the boiler – too late to make any adjustments based on demand changes.

The utility staff were investigating if there were any way to improve the process for controlling the boiler chemistry in the utility system. Their goals were as follows:

- Maintaining optimal steam quality
- Water / energy savings
  – Via improved blowdown control
  – Via reduced risk of scale formation
- Prevent mineral scale
- Corrosion by-product (iron oxide) scale
- Optimize chemistry control
- Streamline operator chemistry testing via automation
- Improve feedwater chemistry control regardless of steam load changes
- Extend equipment life – improved asset protection
  – Deaerator
  - Economizer

SOLUTION

The customer and Nalco Water engaged in a series of discussions, and decided to implement 3D TRASAR™ Boiler Technology.

3D TRASAR Boiler Automation uses two key innovations to provide steam utility personnel with on-line control of boiler feedw ater chemistry.

- Real-time corrosion monitoring and control using the NCSM (Nalco Water Corrosion Stress Monitoring)
- On-line adjustment of scale inhibitor feed using a fluorometrically traced scale inhibitor

Nalco Water also implemented automated blowdown control to help maximize boiler cycles and reduce water and energy consumption in the boiler room.

Nalco Water installed the 3D TRASAR equipment, and placed it in monitoring mode initially to gather baseline control data for comparison purposes. After a period of time, the system was switched into control mode.

RESULTS

There were several improvements that resulted from the implementation.

- Reduced risk of boiler water carryover and resultant steam contamination.

If boiler water conductivity is not properly controlled, boiler water can carryover into the steam, negatively affecting steam quality (Figure 1). The automated boiler blowdown system helped improve boiler conductivity control, and allowed plant personnel to optimize boiler cycles to prevent carryover incidents. This also allowed the plant to operate the boiler at higher cycles of concentration, saving 3 million gallons of water and 9.65 billion BTUs.

Estimated annual savings: $75,000.

- Improved control of feedwater corrosion and scale control chemistry

As part of the implementation process of the new chemistry control technology, baseline data was gathered. Figure 2 shows the baseline and the results of the first tuning of the instrumentation.

The Figure 3 shows the results of the final tuning of the NCSM and the internal treatment control. As one can clearly see, there is a subsantial improvement in feedwater chemistry control.

Other resultant savings and highlights

- *Reduced potential for scale formation in the boiler*

Although the energy savings related to preventing scale in boilers is primarily applicable to fire tube boilers, a 1% loss in efficiency would result in an approximate $58,000 extra fuel costs.

- *Reduced potential for tube pluggage or boiler tubing*

Plugging off a failed tube in a boiler of this size would cost approximately $6,000. The cost of retubing the entire boiler would exceed $80,000. The cost of replacing a boiler of this size and capacity would easily exceed $1 million.

- *Reduced potential of economizer failure*

The replacement value of the four economizers is an estimated $300,000. If the expected life increases from 12.5 years to 25 years, the annualized reduced depreciation (straight line) would be $12,000.

- *Optimized chemical testing labor*

Labor to operate the program was also optimized, providing a savings of $23,000, and allowing operations labor to be applied to higher value tasks.

Total savings associated with energy reduction, water savings, and optimized labor: $98,000

Total potential savings associated with risk reduction of economizer replacement, energy loss due to scale, or boiler re-tubing: $438,000.

Annual savings from extended asset life: $12,000.

CONCLUSION

The technology is being used on an ongoing basis to help the customer continue to meet its goals for energy and water savings, as well as reductions in CO_2.

The plant continues to work with Nalco Water on other continuous improve-ment opportunities, and further strengthen the boiler control platform.

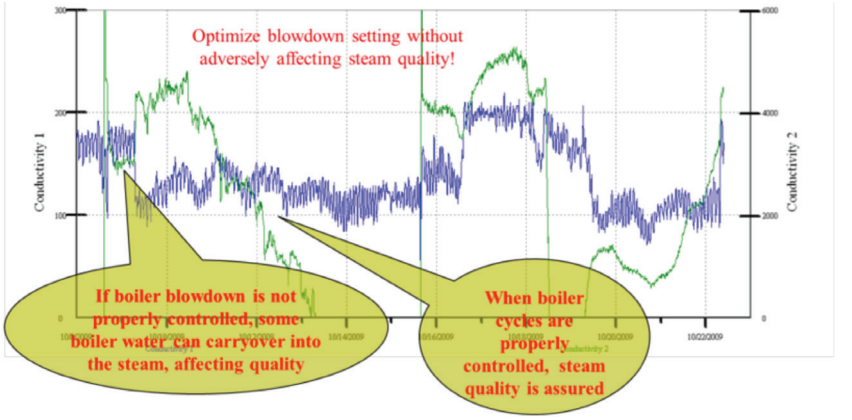

FIGURE 1: SHOWS THE IMPACT OF PROPERLY CONTROLLED CYCLES ON BOILER STREAM QUALITY.

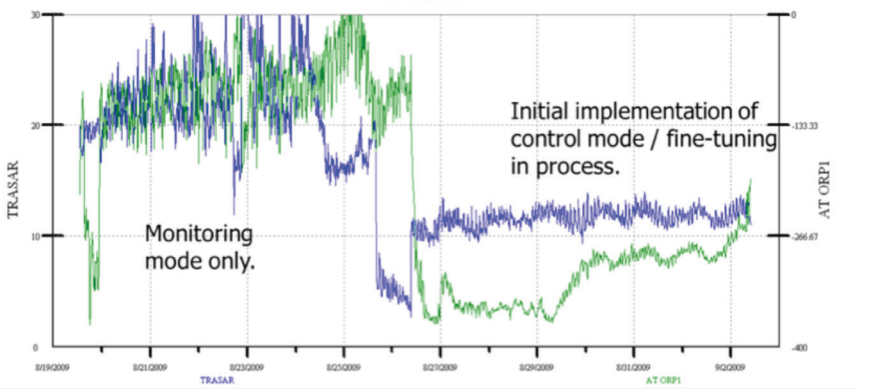

FIGURE 2: THE INITIAL TUNING OF 3D TRASAR TECHNOLOGY FOR BOILERS FOR SCALE CHEMISTRY AND FEEDWATER CORROSIVITY CONTROL.

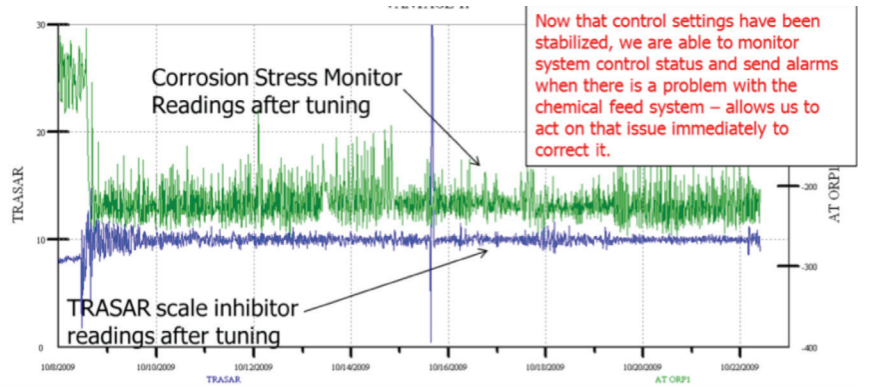

FIGURE 3: FINAL FEEDWATER CORROSIVITY AND SCALE INHIBITOR CONTROL EXAMPLES.

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