

Barking Power Lowers Steam Costs, Improves Efficiency with Wireless Acoustic Monitoring

RESULTS

- €1400/day steam loss minimized through early leak detection on high pressure superheater
- Eliminated steam loss, estimated at 4 tonnes per hour, from multiple slow leaks lasting for weeks
- Improved ability to get power to the grid more quickly, more consistently
- Improved overall plant efficiency
- Reduced unscheduled downtime through early fault detection on critical assets



APPLICATION

Wireless steam monitoring and management

CUSTOMER

Barking Power Station owned by Barking Power Limited and operated by Thames Power Services, is one of the largest independently owned generating plants in the UK. The Combined Cycle Gas Turbine (CCGT) is capable of generating 1,000 MW of electricity - about 2% of the peak electricity demand in England and Wales.

CHALLENGE

Deregulation of the power generation market in the U.K. has increased the need for power plants to reduce overall unit generating costs. Originally built for base load generation, Barking Power now competes in the peaking power market. To be competitive, they must continually strive to lower cost and increase flexibility to meet short-term contract windows.

“We are constantly looking to get the highest heat rate,” said Tony Turp, Senior Control Engineer. “We have performance models and are continually striving to improve our heat rate even one hundredth of a percent.” The problem, of course, was time and money. “Our main area of concentration is our steam lines,” Turp continued. “We need to minimize steam loss on any steam lines that go to drains, or any steam traps, anything that vents to atmosphere, start-up vents, blow-down lines... anything that will increase our effluent waste or cause us to generate more water to replenish any losses.”

To minimize losses, operators performed frequent rounds to identify leaks from vents, poorly seating pressure relief valves (PRV's) and malfunctioning steam traps during normal operations. Large, single leaks were easy to detect (most of the time) but smaller leaks could go unidentified for 2-3 weeks. Although lower volumes were lost during these episodes, multiple leaks lasting for 2-3 weeks when combined,

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Tony Turp

Senior Control Engineer

Barking Power Station, London



Acoustic technology combined with *WirelessHart* enables on-line monitoring of steam traps, vent valves and PRV's across the plant, including remote areas.

lost as much as four metric tons of steam per hour before detection through deterioration in plant performance. Ideally, Barking wanted to identify failed steam traps and leaks caused by malfunctioning valves before they impacted the plant.

A few vent valves were also known to stick during startups and shutdowns, and had to be monitored manually. Manual monitoring was not only time consuming, but also failed to indicate when or why a release occurred, increasing the chances of a safety, regulatory, or environmental incident in the case of PRV's.

SOLUTION

Sophisticated *WirelessHART*® acoustic “listening” technology combined with an integrated temperature measurement was deployed across the plant to monitor steam traps, PRV's and vent valves. This innovative combination of technologies offered a reliable and cost effective solution for identifying the problems that lead to unscheduled downtime, poor turbine efficiency and energy loss. A total of 100 Rosemount™ 708 Wireless Acoustic Transmitters were non-intrusively installed on critical vent valves, steam traps and PRV's.

Barking had previous experience with a *WirelessHART* network in the plant. Despite the vast distance covered by the network and the tough environment introduced by the power plant, the wireless network proved to be very reliable. This gave Barking confidence to use Emerson's Smart Wireless technology for this new application.

Steam Traps

The plant is split into two areas consisting of a 400MW unit with two boilers and a 600MW unit with three boilers. To cover both areas the customer installed two new wireless field networks, each with a Smart Wireless Gateway that will support up to 100 devices.

The first acoustic transmitters were targeted for problematic steam traps, where the software will “listen” to pick up a change in noise level from the expected footprint. Any deviation from normal state alarms the operators to take corrective action. This reduces the risk of significant leaks taking place during periods of production to minimize energy loss.

Within the first week of operation, the new technology identified a leak from a high-pressure superheater steam trap. The cost of that leak was estimated to be over €1400 for every 24 hours of operation, not including the loss of pressure when the operation moved to hot standby mode, lost nitrogen if the plant moved to cold standby, increased discharge waste, and increased water and chemical use.

Steam Vent Valves and Pressure Relief Valves

After deploying 35 acoustic transmitters to identify failing steam traps, Barking instantly saw the potential of these devices and installed 15 additional wireless acoustic transmitters to monitor PRV's and steam vent valves. “Steam loss isn't restricted to steam traps,” said Turp. “Vent valves can stick during start-up, or fail to seat properly. We normally have an operator viewing problematic valves during this time, but by installing wireless acoustic transmitters we can now monitor these devices from the control room, removing the need for field observations.”

Some of these valves are located 25m high on top of the boilers and are difficult to check visually by operators. Remote monitoring significantly improved operator safety and improved reporting of releases. While lack of visibility increased the chances of a safety, regulatory, or environmental incident, the Rosemount devices enable very precise reporting of a release, alerting operators within a second of when a relief valve had



Previously, steam traps were monitored by manual inspection. This was time consuming and failed to indicate when or why a release occurred.



Acoustic noise detected on the safety relief valve of an economizer alerted operators to a potential problem that risked a plant trip.

opened. The time stamped alerts can be compared against process conditions or environmental reporting to help identify the root cause of a release.

Conclusion

With three wireless networks now in place, additional devices can be added anywhere in the plant at a much lower cost than adding wired devices.

The devices have proven effective at reducing steam loss and downtime and have freed up valuable time for operators. "We no longer have to send one of our operators to watch this valve during start-up," said Turp. "It is prone to failure from debris in the seawater. The acoustic transmitter alerts operators when the vent is stuck, and only then does an operator need to go out to the device".

The devices have been installed for over a year, and have proven very robust. Recently, a leak from a vent valve bathed one of the acoustic transmitters in high temperature steam for over a day before it was discovered, with no effect to the performance of the device.

"These devices give us a better picture of what is happening," said Turp. "Someone made a comment that they are like a baby monitor; you know everything's okay until they alert you that there's a problem." He also noted that Barking can now better plan their maintenance resources to avoid losses that impact efficiency. They don't have to pay a premium to third party contractors when repairs can be planned in advance, "Overall, we have improved plant efficiency, reduced steam losses, and improved the safety and productivity of our people."

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RESOURCES

Emerson Process Management Power Generation Industry

<http://www2.emersonprocess.com/en-US/divisions/power-water/Pages/powerwater.aspx>

Emerson's Smart Wireless

<http://www2.emersonprocess.com/en-US/brands/rosemount/Wireless/Pages/index.aspx>

Rosemount 708 Wireless Acoustic Transmitter

<http://www2.emersonprocess.com/en-US/brands/rosemount/Wireless/708-Acoustic/Pages/index.aspx>

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