

# California Utility Improves Cooling Tower Efficiency and Extends Turbine Life with Emerson™ Wireless Devices

## RESULTS

- Improved throughput of cooling towers with better thermal efficiency
- Improved turbine efficiency and reduced megawatt use by monitoring filters
- 50 percent reduction in preventative maintenance on turbines with online leak detection
- \$18K saved by extending lifetime of cooling tower fan motors
- Eliminated unnecessary trips to rainwater pond with remote monitoring

## APPLICATION

Cooling tower monitoring, turbine monitoring

## CUSTOMER

A regulated public utility that provides energy service to millions of consumers throughout two counties in California

## CHALLENGE

A utility in California wanted to implement a wireless architecture throughout the combined cycle plant in order to access data that was previously unattainable through traditional wired solutions. “We needed to monitor the performance of our cooling towers,” said the Plant Engineer, “and cooling tower riser temperatures are critical to an efficiency calculation used for cooling tower performance.”

The plant also wanted better monitoring of the turbines. This included temperature monitoring to prevent overheating and air filter monitoring to reduce impact on turbine efficiency. “We wanted to monitor turbine compartment temperatures for leak detection of forced air that cools the turbine exhaust,” said the Plant Engineer. “We had switches that would close if it got hot, but we didn’t know what temperature was inside the compartment. When the switches closed we knew something was happening, but we did not have any other information.” The result was that mechanics were sent to do inspections much more frequently than necessary, since past experience had proven that leaks in this turbine exhaust cooling application were a problem and needed to be found quickly.

Air filter monitoring is also important. “Air filters on the turbines are critical to prevent particles from damaging the blades,” the Plant Engineer continued. “And when they get plugged, the efficiency of the turbines is significantly impacted.” He stated they could clean the filters with an air-purge system across the filter, but the instruments



*“Wireless provided a cost effective solution to bring new pressure, temperature, and DP readings on-line, enabling us to improve cooling tower performance and turbine efficiency.”*

*Plant Engineer  
Utility in California*



*Wireless now provides cooling tower riser temperatures which are used in the efficiency calculation to confirm the fans are running at correct speeds. This enabled the power plant to stop over-compensating, which has improved thermal efficiency.*

## INDUSTRY

provided when they bought the system didn't give good readings. The wire runs in this application were long, and a new wired solution was expensive.

In a fourth application, the plant wanted to improve safety and reduce risk of pump damage by monitoring the fire pump temperature. "If the pumps run with the valves shut, the pipes get very hot and someone can burn themselves," he said. "It also risks damage to pumps. The pumps were not left on often, but the risk was always there."

### SOLUTION

The utility purchased Emerson wireless temperature, pressure, and Differential Pressure (DP) transmitters to improve process efficiency in multiple applications within the plant.

Wireless temperature transmitters were installed to provide online turbine compartment temperatures to detect leakage of hot air, an inexpensive early detection strategy.

"Wireless temperature on the turbine compartments let us know what is happening inside the compartment," the customer stated. "We track temperature over time to help with preventative maintenance scheduling and troubleshooting (leaks). As a result we have cut our PM on the turbines in half, which has saved 15 – 20 man-hours."

Wireless pressure is also used to find leaks faster. "We are using two wireless pressure transmitters to monitor air pressure on forced draft fans for turbine cooling," he continued. "We have two fans; when one runs, the other is in standby as a backup. We want to be sure the backup fan is not allowing air to escape, as we need all the air to go to the turbines for cooling. We have a set amount of forced air available, so it is important to find the leak. If we notice a drop in pressure, we can send someone out right away to find the leak and fix it."

For air filtering monitoring, two wireless DP transmitters were installed to monitor inlet air filter efficiency on two units (two filter banks). "The wireless DP transmitters allow us to see if the filters are getting clogged with dust," he said. "We are in an area where there is construction going on, so there is a considerable amount of dust in the air. We have an air-purge system to clean out the filter when the wireless devices send an alarm."

"With better DP information across the filters, we can clean them at the proper time," the customer continued. "This significantly improves turbine efficiency and reduced megawatt usage. We saved \$15-20K for each DP transmitter compared to a wired solution because of the long distance."

For the cooling towers, the plant had no riser temperatures before wireless was installed. This measurement is now used in the efficiency calculation to confirm the fans are running at correct speeds. "With confirmation that the fans are at the right speed, we do not have to over-compensate, which gives us better thermal efficiency. As a result, we have increased the throughput of the cooling towers," the Plant Engineer said. "The information provided by the wireless measurements has enabled the plant to lower the amps that the fans are running at, lengthening their lifetimes. We will save approximately one fan motor every five years, or \$15-20K (the cost of a motor)."

Finally, a wireless temperature transmitter on the fire pumps protect against pump damage, which could cost the plant \$20K apiece. "But mostly the benefit is personnel protection," he stated. "Pipes got to 160 °F when the pumps were left running. We wanted to prevent anyone from getting burned."

In a later project, the plant added wireless to the remote rainwater pond that feeds the cooling towers. "We have a level transmitter that warns us before the pond overflows to the river," he stated, "which gives us time to go the pond and take our measurements to prove compliance." Another wireless measurement continuously monitors pH to be sure there is no issue with the water feeding the cooling towers.

The customer concluded, "One of the great benefits of Emerson wireless devices is that we can install them ourselves in a fraction of the time it takes to wire an instrument. We typically need to hire contractors, because we do not have a big staff. Being able to do it ourselves in a fraction of the time was a big savings to the company. It takes about an hour



***Wireless temperature, pressure, and DP have been employed to check for hot air leaks, forced draft fan leaks and filter plugging. Online monitoring has enabled engineers to improve turbine efficiency and reduced megawatt use as well as extend the life of turbine fans.***

to install a wireless device compared to two weeks to run wire and completely install a wired transmitter.”

### RESOURCES

#### Emerson Power Generation Industry

[Emerson.com/Industries/Power-Generation](http://Emerson.com/Industries/Power-Generation)

#### Rosemount Wireless Acoustic and Discrete Transmitters

[Emerson.com/Rosemount/Wireless-Acoustic-Discrete](http://Emerson.com/Rosemount/Wireless-Acoustic-Discrete)

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