CASE STUDY

FPI Mag® Flow Meter Solves Cooling Tower Water Problem For Covanta Energy Corp at Honolulu H-POWER Facility

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Overview

The accurate measurement of cooling tower blowdown water flowing at irregular intervals prior to reinjection into a caprock well became a stubborn problem for Covanta Energy Corp at the Honolulu H-POWER Facility on the island of Oahu, HI. The irregular flow intervals created foam and bubbles in the line, which required a next-generation flow meter solution.

Covanta, Honolulu, H-POWER Facility

Jeff Vaughan, chief engineer, said, "The FPI Mag Flow Meter from McCrometer solved our problem and performs as advertised. I watched the FPI video and showed it to the installer. There was no need to shut down the line (and the whole plant) for a ten-minute meter job."

Covanta Honolulu, known as the H-POWER facility, began operation in May 1990 and is owned by the City and County of Honolulu. H-POWER stands for Honolulu Program of Waste Energy Recovery. The facility serves the waste disposal needs of 850,000 residents and 6 million annual visitors. Up to 3,000 tons per day of municipal solid waste is processed and generates up to 90 MW of energy—meeting nearly 8 percent of Oahu's energy needs.

Problem

According to Vaughan, the accurate measurement of the cooling tower blowdown water before reinjection into the facility's caprock well is essential to remain within the 2 million gallon per day permit held by the facility. "We have to remain within our permit requirement, and our typical water flow rate is slightly less than that amount."

The accuracy of the flow meter is important because the plant operator Covanta could face substantial fines if the facility exceeds its daily water permitted use limit. In addition, the H-POWER facility is an innovative green technology Energy-from-Waste facility where every effort has been made to ensure that processes minimally impact the environment.

The "caprock" type well refers to a geologic structure in which a hard, resistant sedimentary layer of rock overlays weaker rock and traps the aquifer below it. At the H-POWER facility, a caprock well is drilled through this hard

rock layer to access the brackish, non-potable water in the underlying aquifer, which serves as the plant's water supply and reinjection point for its cooling processes.

Cooling towers are utilized in power generation plants to dissipate heat. With makeup water they convert waste heat into evaporated water in the plant atmosphere, relying on plant air circulation to perform the cooling. The waste blowdown water from the cooling tower operations at the H-POWER Plant is then transported via a 12-inch line for reinjection into the caprock well to eliminate any waste.

The H-POWER facility generates a lot of heat. It utilizes both refuse-derived fuel (RDF) and Mass Burn (MBN) technologies, allowing for comprehensive management of the island's wastes. These materials are burned to heat boilers, which produce steam for electric power generating turbines that produce renewable energy for the Hawaiian Electric Company.

The steam is condensed using water from the facility's circulating water system and is reused in the boiler system. Excess heat is rejected with the help of the facility cooling towers. The caprock wells provide brackish water that is first used for cooling tower makeup water. Other than the cooling tower blowdown water reinjection, the facility has zero liquid discharge.

Vaughan said, "We had given up on the old flow meter and were using other information to estimate the approximate flow. The strap-on ultrasonic meter that was installed in that location continuously cycled from zero to full scale and didn't match other plant measurements. We had to keep sending a guy down to reset it."

The FPI Mag flow meter installed at the caprock well

Aware of the ultrasonic flow meter problem at H-POWER, Covanta's headquarters team in Morristown, New Jersey, began looking for a new meter solution. Covanta corporate's Robert Margolis, Project Manager, and Demetri Gounaris, Corporate Engineering, contacted McCrometer to discuss the situation.

According to Margolis, "We were concerned about the accuracy issue, and we also knew there was churning in the line that was affecting flow measurement. You couldn't see the foamy bubbles because the line was underground, but we suspected the bubbles had to be part of the problem."

Solution

The applications team at McCrometer listened to the problems, including the irregular flow intervals of the cooling tower blowdown water, the foaming bubbles in the 12-inch line and the location of the meter on a curving underground line with limited access and space. To address these issues, McCrometer recommended its FPI Mag flow meter.

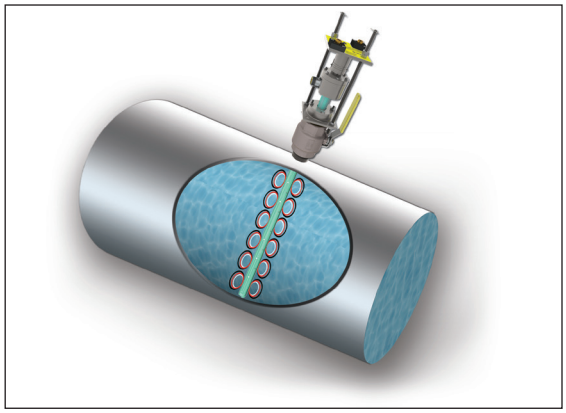
With a next-generation mag meter design unlike anything else available, McCrometer's FPI Mag meter takes accuracy and ease-of-use to a new level. The FPI Mag's precision multi-electrode flow sensing technology and efficient hot tap installation method eliminate any need for extra labor, heavy equipment, or line shut down, making the installation process easy and convenient. With no shutdown necessary on the cooling tower blowdown water discharge line to perform the installation, the company was able to avoid impacting the plant's power generating capabilities or compromising its environmental standards.

Unlike any other insertion mag meter, which only measures at a single point, the FPI Mag meter's advanced multi-electrode sensors span the pipe to compensate for the plant's challenging flow conditions with swirl and

agitation in the line. The meter's multi-electrode sensors continuously measure and report the average flow rate across the full diameter of the pipe, delivering accuracy comparable to the performance of a full-bore mag meter.

"The unique multi-electrode sensors design of the FPI Mag is what makes the difference in this application at H-POWER. For accurate measurement, most flow meter technologies require a long straight run of pipe upstream and downstream from the meter to provide a smooth flow profile without any swirl. That's not possible in many cases, which is why a meter with multi-electrode sensors spanning the pipe makes such a huge difference," said Nick Voss, FPI Mag Product Manager, at McCrometer

The FPI Mag flow meter's signal converter features an advanced filtering algorithm to support accuracy of ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) and of ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s) of reading. Built-in dual 4-20 mA outputs offer communication flexibility and additional programmable outputs serve to support the facility's distributed control system.



Multi-electrode design of the FPI Mag flow meter

Conclusions

Both the H-POWER site engineering and the Covanta corporate engineering teams are satisfied with the accuracy of McCrometer's FPI Mag flow meter. The measurement problem is solved, allowing the facility to meet its 2 million gallon per day permitted water use limit. The team at Covanta also was pleased with the installation ease and flexibility of the FPI Mag meter, which didn't require shutting down the line and potentially impacting the facility's operations.

"McCrometer is pleased to be part of this innovative green facility that is converting Energy-from-Waste with exceptional environmental sensitivity. While we have long been recognized as an instrumentation leader in the conventional energy industry, it is particularly gratifying to be associated with the new green energy industry," said McCrometer's Voss.

With the performance of the FPI Mag in this application at the H-POWER facility, Covanta is currently considering the deployment of this same meter application in other facilities. Covanta operates in over 40 state-of-the-art Energy-from-Waste facilities in the U.S.

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