

Power Plant Increases Efficiency and Reduces Risk of Equipment Damage with Innovative Guided Wave Radar

RESULTS

- Reduced risk of equipment damage
- Improved heat rate
- Reduced risk of outages
- Decreased operations and maintenance costs

APPLICATION

Feedwater Heater Level Control

CUSTOMER

Large Power Plant in United States

CHALLENGE

The Instrumentation and Control Fleet Team at a large U.S. power plant sought to improve the efficiency of heat transfer in their feedwater heaters. Controlling the level of the condensate is critical for efficiency and reliability of the steam generation system. If the level is too high, the feedwater tubes are submerged which reduces the heat transfer efficiency. However, if levels are too low, the steam can blow through without effectively heating the tubes which also reduces heat transfer efficiency. In addition, it is essential to monitor levels to prevent water induction (water carryover into the turbine).

A recent ASME standard recommends triple redundancy for the level measurement of feedwater heaters. Previous installations at this plant achieved triple or just dual redundancy using multiple measurement technologies: DP level, displacers, and electronic magnetic level indicators. The output often varied between the different technologies due to accuracy, density variations, and installation differences. This made it challenging for the control scheme to discern which level measurement was accurate. Often maintenance groups were called out to explain the variation.

High variability in feedwater level output leads to several negative business impacts. This plant had previous history of water damage in the turbine resulting in expensive replacement costs. In addition, MW generation was reduced and more outages were experienced. Unstable level measurements prevented operation at optimal heat transfer levels. To compensate for instability in feedwater level control, levels were kept higher than desired to prevent risk of steam blow through. The feedwater tubes are therefore submerged leading to reduced heat transfer efficiency and higher operations costs. Lastly, maintenance costs are high because the instrument and control team was called out to work on equipment and explain the variation.



Feedwater heater level control is critical for heat rate efficiency and to prevent costly equipment damage.



Figure 1. Feedwater heater level achieves triple redundancy with Rosemount 5300 Guided Wave Radar

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SOLUTION

The challenges faced by the power plant were solved with the Rosemount 5301 Guided Wave Radar (GWR) combined with the Rosemount 9901 Chamber. The Instrument and Control Fleet Team installed three GWR in duplicate external mounting assemblies on each of the eleven feedwater heaters. The ordering transaction was minimized by obtaining both the GWR and chambers from a single supplier. True triple redundancy was achieved with high accuracy and consistency of the GWR measurements which are unaffected by density changes. Additionally, they utilized the SIL2 suitable transmitters to fulfill SIS requirements.

By improving the stability and accuracy of feedwater level measurements, this plant operated at feedwater heater levels that increased heat transfer efficiency and reduced risk of equipment damage. This reduced the plant heat rate and decreased the risk of unscheduled outages. The variability between the outputs decreased thereby improving the controllability of the system and reducing operations and maintenance costs.

RESOURCES

Emerson Process Management Power Industry

<http://www.emersonprocess.com/solutions/power/>

Rosemount 5300 Series Guided Wave Radar

<http://www.emersonprocess.com/rosemount/products/level/m5300b.html>

Rosemount 9901 Chamber for Process Level Instrumentation

<http://www2.emersonprocess.com/en-US/brands/rosemount/Level/Guided-Wave-Radar/9901-Chambers/Pages/index.aspx>

Technical Notes

Guidelines for Choosing and Installing Radar in Stilling Wells and Bypass Chambers

<http://www2.emersonprocess.com/siteadmincenter/PM%20Rosemount%20Documents/00840-0300-4024.pdf>

Replacing Displacers with Guided Wave Radar

<http://www2.emersonprocess.com/siteadmincenter/PM%20Rosemount%20Documents/00840-2200-4811.pdf>

Using Guided Wave Radar for Level in High Pressure Steam Applications

<http://www2.emersonprocess.com/siteadmincenter/PM%20Rosemount%20Documents/00840-0100-4530.pdf>

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