

Avoiding Outages From Slagging

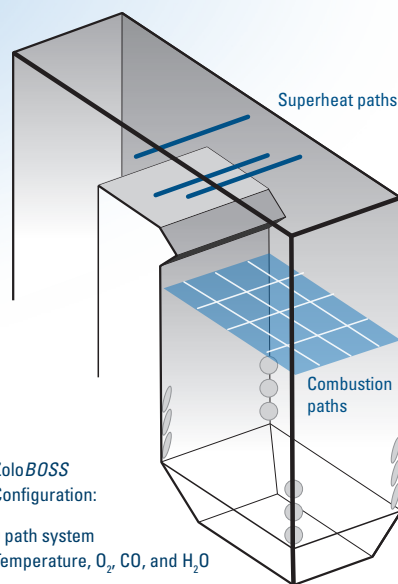
TECHNICAL NOTE

Problem

Managing slag formation in the super heat section of a boiler can be challenging without adequate furnace exit gas temperature (FEGT) information. Slag build up in this area can not only impact the heat transfer characteristics of the boiler, thereby reducing efficiency, but can often lead to a forced or unplanned outage to remove any excess slag. When the FEGT rises above the ash fusion temperature, the ash softens and sticks to the relatively cold surfaces in the boiler (e.g. the superheat pendants). Operators often rely on a single temperature sensor, visual inspections, or pressure drop information to indicate or prevent potential slag formation. However, slag formation can often be very local and go undetected. In a relatively short period it can lead to large deposits of slag, some as much several tons. When such “clinkers” break loose, they drop to the bottom of the boiler with such force that they can damage the tubes causing, in the case presented here, an unplanned two-day outage.

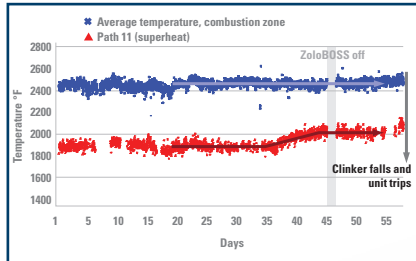
Solution

An 830 MW, T-fired unit recently installed a ZoloBOSS™ system with an 3 X 3 grid in the combustion zone just below the nose and three single paths in the super heat area. During ZoloBOSS commissioning, a large clinker formed in the super heat area, fell to the hopper and caused a two-day forced outage. Afterwards, the ZoloBOSS data was studied to understand the cause of the slag build-up. Interestingly, a review of the average FEGT as determined by the ZoloBOSS near the nose (shown in blue on the graph) did not show any insight as temperatures remained fairly constant over the period prior to slag formation. This information alone (or a single FEGT probe) would not have indicated any potential super heat fouling problem to the operators. However, when reviewing data obtained from path 11 of the ZoloBOSS system directly in front of the super heat pendants over this same period (shown in red on the graph), temperatures from this path increased from less than 1,900 °F during



ZoloBOSS
Configuration:
9 path system
Temperature, O₂, CO, and H₂O
OPC Data connection

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ZoloBOSS data during commissioning

Average temperature in the combustion zone remained constant while temperature in the super heat paths began rising over 100 °F indicating slag accumulation. A clinker built up and caused a two day forced outage costing over \$1.75 million.

the first 35 days to over 2,050 °F by day 45. This significant increase in temperature over a several week period clearly indicated a substantial accumulation of slag in this specific area as the heat transfer capabilities of the super heat perndants was compromised. Unfortunately, since the ZoloBOSS data was not yet integrated into the plant's operations, operators were not aware of this significant temperature increase and did not increase soot blowing or utilize other boiler cleaning techniques to avoid the clinker formation and subsequent two day outage.

Benefits

The ZoloBOSS system can provide valuable information in the combustion zone to both optimize combustion and monitor FEGT. However, this example illustrates the importance of having several single ZoloBOSS paths located in the convective pass to monitor temperature and constituent distribution as the flue gas goes around the bull nose. Together, the ZoloBOSS information can be used by operators or integrated into intelligent soot blowing systems to manage and monitor FEGT to reduce slag formation and ultimately increase unit availability.

In this case, the two day outage caused lost revenue of \$1.75 million assuming a cost for electricity of \$45 / MWh. At this rate, the ZoloBOSS delivers significant ROI by paying for itself in less than one day.