

RWE Generation UK's Staythorpe Power Station uses POWERFILM 10000 to reduce corrosion during cyclical operation

BACKGROUND

Around the world, many power plants are cycling more or operating under "changing mission profiles" as Mike Caravaggio and Norris Hirota of the Electric Power Research Institute (EPRI) explained in the June 2017 issue of *Power* magazine ¹.

Cyclical operation creates a perfect environment for corrosion. Many power plant operators have looked at filming corrosion inhibitors as a potential solution to the problems caused by cyclical operation.

SITUATION

Nalco Water conducted a field evaluation of such a treatment program at the RWE Generation UK's Staythorpe Power Station in Nottinghamshire, UK, a gas-fired, 1,735 MW combined cycle power plant in Nottinghamshire, UK commissioned in 2010.

PLANT DETAILS:

- Four identical, gas-fired CCGT units (288 MWe) with triple pressure HRSG (160 MWe)
- Each unit produces 73 psig LP steam [5 bars], 421 psig IP steam [29 bars] and 1987 psig HP steam [137 bars]
- All-steel construction
- No condensate polishers
- Base treatment program: 5% ammonia dosed to the feedwater, no oxygen scavenger, trisodium phosphate dosed into LP and IP drums, HP drum under AVT. The base treatment program was not modified during field evaluation of POWERFILM 10000.

RWE Staythorpe cycles daily; using a particle monitor to measure corrosion product in the LP blowdown, the impact of daily cycling was revealed

Corrosion occurs during the offline period when the unit cools and draws in oxygen. When the unit starts, corrosion products move through the system. This phenomenon repeats every day and (shown in Figure 1) and follows this pattern:

1. The unit is offline. It's cooled during the offline period and oxygen has entered the system. Corrosion occurs during this period.
2. Equipment is placed in operation in preparation for unit start-up. Corrosion product moves through the system where it is detected by the particle monitor.

¹ Mike Caravaggio and Norris Hirota, "Changing Mission Profiles," *Power Engineering*, May 2017, p. 12.

- The unit starts and corrosion product concentrations drop, both because the actual corrosion rate has dropped as the environment itself becomes less corrosive and because the corrosion product measured by the particle counter has moved to a low-flow area of the boiler system.
- The unit is online, at load, and corrosion product generation is low.

SOLUTION

Nalco Water applied POWERFILM 10000, a new filming corrosion inhibitor helped RWE Generation UK's Staythorpe Power Station address the problems caused by cyclical operation. The material was applied at 1.0 ppm, as product, by weight, to the condensate pump discharge.

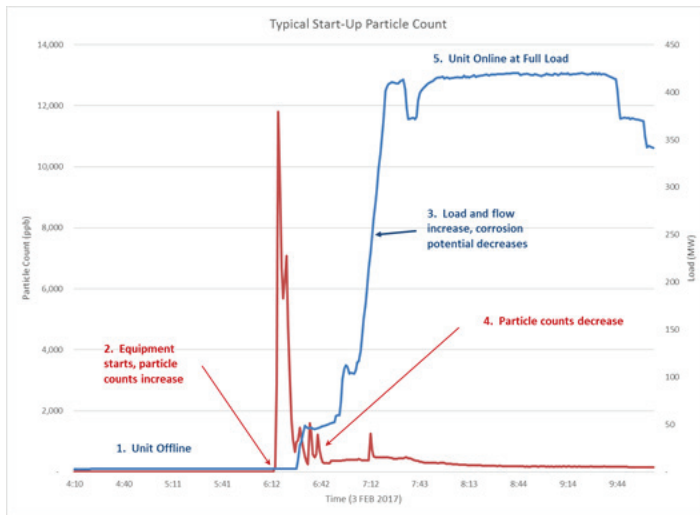


Figure 1: 3 FEB 2017 Start-Up

RESULTS

Figure 2 and Figure 3 show the impact of the filming inhibitor treatment on start-up corrosion product concentrations. These two examples were chosen because they were representative of every start-up. In these cases, corrosion product start-up concentrations were 59% lower when the system was treated with the filming inhibitor POWERFILM 10000.

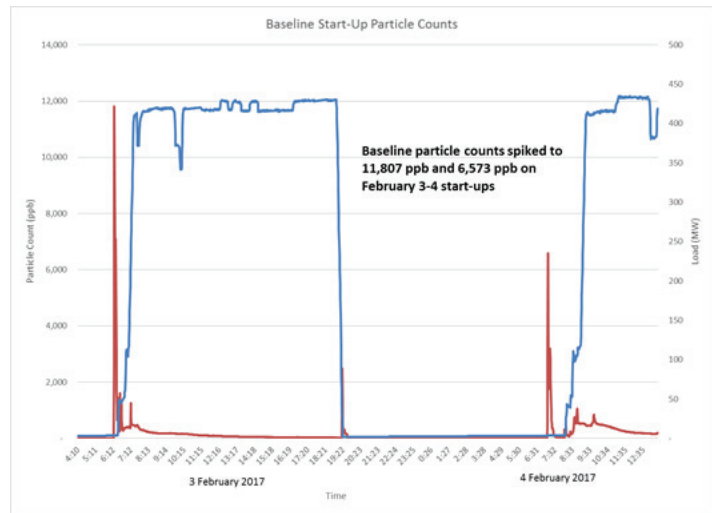


Figure 2: Baseline particle counts at start-up

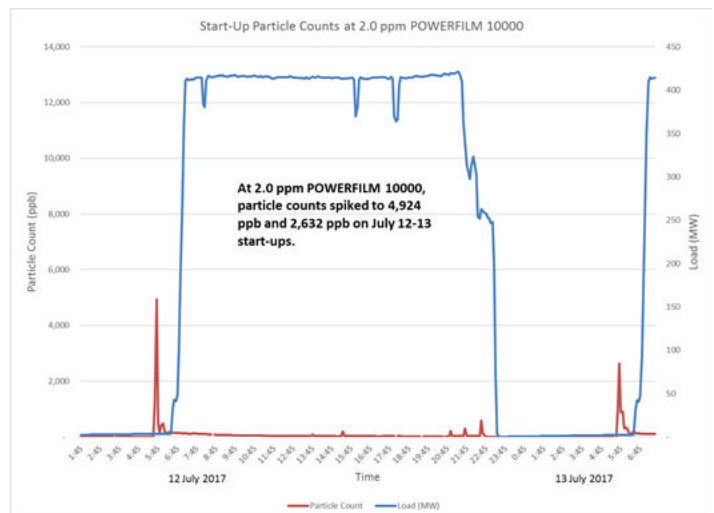


Figure 3: Start-up particle counts at 2.0 ppm POWERFILM 10000

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