Minimizing corrosion risks of low load operation

Snapshot

Client
CCGT plant, UK

Challenge
Low load operation led to significant Flow Accelerated Corrosion (FAC) damage in the high pressure evaporator circuit with potential lengthy outage for replacement.

Solution
After identifying the problem, we advised changes to the cycle chemistry to reduce corrosion and we planned outage inspections with the client to assess the condition of affected components. We completed the inspections and used expertise from various teams to respond swiftly to assess pipework integrity, confirm suitable replacement piping and assess the safety of headers for continued operation.

Benefits
We supported the continued safe operation of the plant as the problem unfolded. Damaged pipework was replaced with more resistant material during a planned outage, minimizing loss of availability. Integrity assessment work to support continued operation with existing headers avoided months of lost availability.

Using our expertise in operational and maintenance optimization, we targeted our client's outage inspections to reveal a previously unseen risk area – FAC in the HP evaporator circuit. We acted swiftly and flexibly to ensure that the plant could continue to run safely and, at outages, piping could be replaced within minimum downtime.

Corrosion discovered

In line with market demands for flexible operation, our client's 1200 MW CCGT plant operates for significant periods at low load. Therefore HP piping in the heat recovery steam generator is now subject to lower temperatures in a risk range for FAC.

Significant FAC was discovered in the HP evaporator circuit, presenting challenges to replace the riser pipes as quickly as possible, ensure the safety of other parts of the circuit and protect against future corrosion.

Our response

We completed inspections to identify the extent of lost material, assessed the integrity of corroded components and agreed a replacement strategy where continued operation could not be supported. We worked with the client to redesign pipework and install replacement risers during planned outages to minimize loss of plant availability. We also supported the client in managing plant safety until the replacement works could be scheduled.

We advised replacing the carbon steel piping with more resistant P22 chromium alloy and swiftly verified materials as supplies were identified.

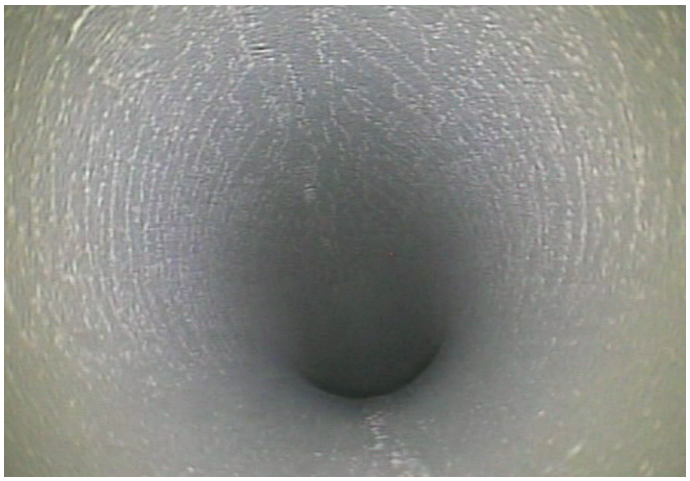
We used finite element analysis to give our client confidence in continued operation of the HP evaporator outlet headers, which had also suffered thinning.

We also advised on a change to the cycle chemistry regime. Repeat inspections showed this significantly reduced further corrosion.

Range of expertise

Our multi-disciplined team brought together a range of capabilities to give a flexible response:

- Outage optimization
- Materials science
- Non-destructive testing
- Finite element analysis
- Water chemistry expertise.



Flow Accelerated Corrosion identified in a HP riser

Optimizing outage scope

Low load operation is increasingly common as gas-fired plants are required to operate flexibly alongside intermittent generation from renewables.

With extensive experience in our own plants, we can support clients to not only take advantage of new market opportunities, but then to optimize plant operation, maintenance and outage scope. This ensures that operational changes – such as longer periods at low load – are introduced effectively with minimum impact on plant availability.

FAC is a widely recognised risk in low and intermediate pressure piping. In this case, we found corrosion in the HP evaporator circuit which could have resulted in the failure of high energy pipework and worked with the client to prevent this through a combination of chemistry changes, condition monitoring and replacement works at planned outages.

Stages of our solution

Stage 1: Cycle chemistry was revised to restrict future corrosion.

Stage 2: Outage inspections were targeted to check HP circuit condition.

Stage 3: Piping was redesigned, new materials verified, risers were replaced with minimized loss of availability.

Stage 4: The integrity of thinned headers was analyzed to support continued operation and avoid extensive replacement works.

Having identified the corrosion, we ensured our client could replace the affected pipework with material of greater corrosion-resistance in a manner that had least impact on plant availability.

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