OSART Good Practices
CHEMISTRY
Control of plant configuration

Almaraz 2, Spain

Mission Date; 5-22 Feb., 2018

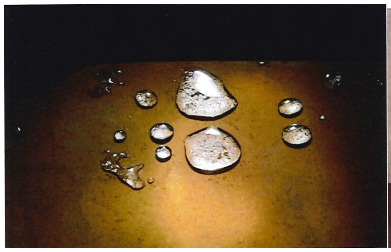
Film forming amine (FFA)

The minimization of corrosion product ingress into the steam generators becomes an important goal for ALMARAZ to improve the operation conditions and ensure the life time availability of the major components in the secondary circuit of both units as well as the integrity of the steam generators. In spite of applying high pH All Volatile Treatment (AVT), recent investigations and the results of associated outage works have shown that the iron concentration and transport of corrosion products was higher than expected. With respect to impurity ingress into the steam generators, which cannot be absolutely excluded, this phenomenon increases the risk of corrosion within the steam generators.

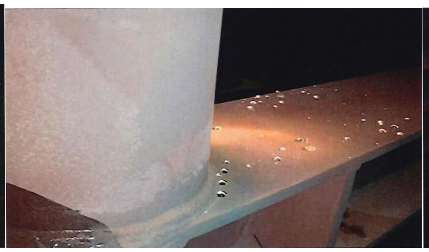
For reducing corrosion products transport for Steam Generators (SGs), the Plant has started as initial strategies:
- Reducing the impurity ingress to SGs, using High pH strategy;
- Decreasing the intake of erosion-corrosion products into SGs by means of AREVA´s FFA Injection technology before shutdown, and Ethanolamine (ETA) injection during normal operation;
- Removing the accumulated sludge during outages.

With regarding to FFA injection, the following results were observed:
- Reduction of standstill corrosion during outage periods;
- Minimization of erosion, flow accelerated corrosion (FAC) and general corrosion during operation
- Reduction of the corrosion product transport to the Steam Generators by formation of special conditioned protection layers on the inner surface of the secondary cycle
- Desorption of ionic impurities like chloride from surface deposits (additional cleaning effect for the inner surfaces)
- The adherent and non-wettable film on the metal or oxide surface acts as a shield that limits the access of water and hydrated species to the surface. This barrier lowers the corrosion rate by inhibiting the mass transfer to and from the surface.

Some pictures of the film layer formed after the amine injection:



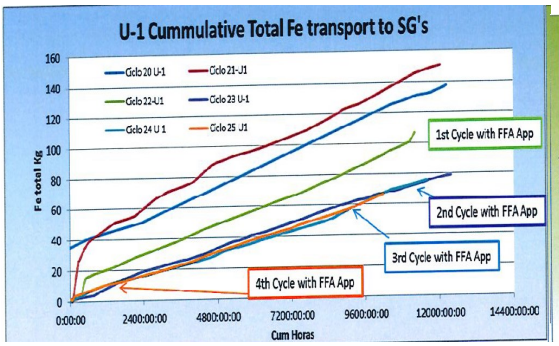
Condenser Hotwell

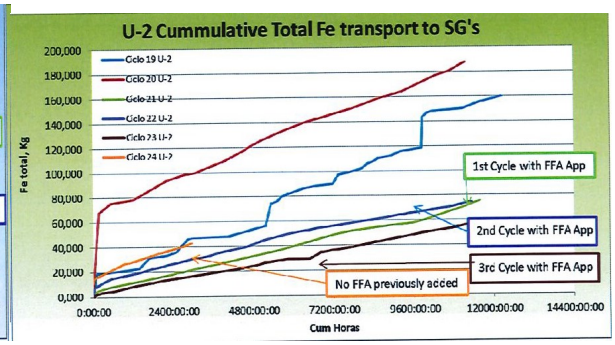


Condenser Hotwell Inspection

Non-wetted surfaced on condenser tubes

For both units, after the beginning of injection of FFA injection before outages, the cumulative total Iron transported to SGs has decreased. For Unit#2, in the last outage, there was no injection, and the results show that the iron transport was increased, if compared to last three previous outages.





As a result of reducing corrosion transport to SGs, the amount of sludge removed from SGs on outages, was decreased by 70%.