Regenerant Gas Heater Reliability Improvement

Lead author: Ahmed Al-Baker, Operations Coordinator, QatarEnergy LNG

Co-author: Mahendra Kumar Agnihotri, Process Engineering Specialist, QatarEnergy LNG

Regenerant Gas Heater is used to heat the fuel gas (Regenerant gas) for regeneration of the molecular sieves in dehydration unit. Sweet dry mixed fuel gas is used as regenerant gas for this purpose. This regenerant gas is heated through a combination of Regenerant Gas Preheater and Regenerant Gas fired Heater to provide a temperature of 288°C at the Molecular Sieve inlet.

Assets have experienced multiple Convection and Radiation tube leaks across different periods starting from year 2015 to 2021, which led to plant trips and production losses. A multi-disciplinary analysis comprising Engineering/ Operation & Maintenance with OEM support studied the above issue and came out with the Root causes and Recommendations.

Root causes:

- Intermittent Afterburning
- Overheating due to higher flame lengths
- Poor Low NOx burner performance, low radiant section slenderness ratio, poor recirculation of flue gas, afterburning, high excess air (oxygen) content and draft.
- Internal deposits at hot spot locations
- Corrosion product originating from upstream loop.

Recommendations:

- Upgrade Tube metallurgy for Convection and Radiation section from CS to P11 material to have more resistance to flame instability issue and creep life extensions
- Burners' improvement to improve combustion and flame length, improve heat transfer, lower bridge wall and stack exit flue gas temperatures.

The study has provided significant measures now being implemented targeting progressive restoration of Regen Heater reliability and eliminate existing SHE and financial risks.
It is envisaged to improve the design deficiency of poor combustion leading to low thermal efficiency causing creep failures of radiant and convection coils.