LFI: Tube failure on an air-cooler on the Naphtha Hydrotreater Unit

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1. What happened?
2. Why did it happen?
3. What were the learnings?

What happened?

On 17th October 2019 one tube of an air cooler on the Naphtha hydrotreater was observed to be leaking hydrocarbon and recycle hydrogen. In response, the unit was taken offline and depressurized.
Fortunately a fire did not result from the leak of high pressure flammable naphtha and hydrogen.

Why did it happen?

1. Operating Naphtha Hydroteater with circulating wash water in corrosive pH range (<5.5 pH)
2. Operating Naphtha Hydrotreater with inadequate Wash water rate to the air-cooler (<3.5 m3/h)

What were the learnings?

The following corrective actions are recommended to address the identified causes:

1. Add the circulating wash water as a scheduled sample on the LIMS schedule and add specifications for pH, soluble iron and chloride.
2. If the circulating wash water pH falls below 5.5 this should prompt immediate operator action to maximise Neutracor dosing rate.
3. Investigate and correct the causes of the current low circulating wash water flow rate.
4. A more reliable online pH reading analyser is required to improve response to low pH incidents.
5. Contact the neutralising amine vendor to determine if they recommend another product for the NHT reactor effluent wash water application.
6. It is recommended to not process Yamal (or other condensates high in organic chloride and low in nitrogen) at Mossel bay GTL&R until either a replacement dosing pump is installed with capacity at least equal to the design required (3.0 litre/h vs current 2.01 litre/h), or a more concentrated Neutralising Amine than Neutracor 2902L is sourced that can provide equivalent neutralisation to 3.0 litre/h of Neutracor 2902L.

What were the learnings?

- When a new import condensate is evaluated the PetroSA laboratory is include analysis of Organic chloride content, in both the whole condensate and 70-160ºC naphtha fraction. It is also recommended to report nitrogen content in the whole condensate and 70-160ºC naphtha fraction. This is required to identify feedstocks with high corrosion risk i.e. high organic chloride and low nitrogen content.

- All Naphtha hydrotreater Air cooler bundles will be retubed progressively over the next months. Since the other bundles have been exposed to corrosive conditions similar to the bundle that leaked, it is recommended that the integrity of any bundles going back in service after the regen outage is verified. If application of a tube wall thickness assessment method (e.g. remote field eddy current / Iris / MC Bais) is not feasible, then it is recommended to pressure test (at design pressure) the existing bundles (that are going back in service) in the upcoming regen outage. This precaution is recommended to reduce the risk of further leaks in service. Further leaks in service risk fire (atmospheric release of high pressure hydrogen and naphtha) and the long production outage and start-up incidents.

Thank You…

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