LFI: Flange Fire at the Distillate Hydrotreating Unit

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1. What happened?
2. Why did it happen?
3. Recommendations for improvement

What happened?

On 26th September 2020 at approximately 23:13, while commissioning the Distillate Hydrotreater Unit, there was a leak and a fire on the Reactor Charge Heater flange. A mixture of hot hydrogen and distillates escaped through a leaking flange into the atmosphere and auto-ignited.

An outside operator noticed the fire and immediately informed the Panel operator and activated the fire alarm. The furnace was tripped and the reactor circuit was depressurized according to the Emergency Response procedure. The fire was extinguished within minutes using fixed fire monitors. There were no injuries reported and no major equipment damage.

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Why did it happen?

1. **Fast heating up of the reactor inlet led to outlet flange leak.**

The high heat input into the furnace by the operator resulted in fast increase in process temperature. This resulted in inner pipe and flange expanding (thermal expansion) while the bolts remained relatively cold, putting a load on the bolts.

2. **Procedure details inadequate**

The Start-up procedure did not indicate the target inlet temperature and the required rate of increase in temperature.

3. **Corrective action needs improvement**

Further investigation is required to determine why there are frequent failures on these flanges. Corrective action needs to include:

- Improved QC documentation in line with the recently updated Assembly of Flanged Joints Procedure
- Further Engineering checks on the flange and pipe support

Recommendations for Improvement

1. **Update the procedure highlighting the required rate of change in reactor inlet temperatures.**
The Unit Process Engineer to recommend the required heat up/cool down rate to protect the flange integrity and the catalyst.
2. **Improve Critical Flange management as per Assembly of Flange Joints Procedure.**
Identify and record critical flanges on the reactor loop to allow for QC monitoring and documentation.
3**.Lower the high temperature alarm**
The current reactor inlet temperature alarm is much higher than the EOR reactor inlet temperatures.
4. **Rationalize the alarms as per Alarm Management Philosophy**
Re-rationalise the reactor section alarms considering the recent fire incident and reactor design changes. This includes reviewing the priority on rate of change alarms.

Thank You…

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