FIRE ON PUMP MECHANICAL SEAL

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What happened?

- A fire on a pump, deluge system to the pump was opened to cool down the pump and surrounding equipment, and the fire was extinguished. The unit was de- commissioned following the emergency shutdown procedure.
- From November 2021 to 27 April 2022 there were a total of 7 mechanical seal failures on these pumps.
- In September 2021, the column was replaced with a new column as part of Clean Fuels Project, and that pipe modifications were done on suction lines of the pumps system.
- Vibrations on the suction of the were noted visually and reported during.
- Process condition adjustments carried out which reduced vibrations, but not eliminated.

Causes

- Direct cause:

  Product leak and fire incident as a result of 033PC-102C mechanical seal leak and available heat/ ignition source.

- Human causes:
  - Information capturing in QCP documents can be generally improved.

Causes

- Root causes for the above:
  - Design Standards - Inadequate design of suction piping from day one. Checks revealed that pump suction lines did not comply with API 610 (this was a day one design deficiency).
  - However, the recent minor modification in pipe fittings changed (increased) the system's natural frequency.
  - The modified system result in the pump operation away from best efficiency zone which increased vibration of the system and nozzle load problem.
  - This condition resulted in misalignment between the pump and motor, and compromised the mechanical seal and bearing resulting in a loss of containment and fire.

Learnings

- Pump failures are not always related to the pump itself. Piping configurations connected to the pump and process conditions can also cause failures on pumping systems.

- During failure investigations all possible causes should be evaluated to determine the root cause of a failure and to take measures to prevent a re- occurrence of the failure.

- Design deficiencies are evident from day one installation of plant equipment as reflected from this RCA, and these require closer evaluation forward.

Questions