Incident description: condensate leak 2015

The following had occurred before the incident. Production on the relevant platform was shut down because the receiving platform for export gas could not handle the output fluctuations. A probable cause was the failure of the level control valve downstream from the first-stage separator. Trends show that production ahead of the shutdown was unstable because the condensate pumps were poorly regulated. Production had been shut down a month before the incident after the level control valve downstream from the first-stage separator failed. Knocking and vibration occurred in the pipe system for one-two hours. Flaring from the second-stage separator took place during this period. The consequent noise made it difficult to locate where the knocking/slamming was coming from. Production resumed after the level control valve was repaired. On the same day, production was shut down again because of repeated failures by the level control valve downstream from the first-stage separator. A notification was established for troubleshooting the valve. Production resumed towards the test separator.

In the wake of these shutdowns, a meeting was held with the valve supplier to discuss the cause of the failure and what to do next. A Synergi case on failure of a needle valve between first- and second-stage separators was established. A notification of vibration in the valve was established. The notification for troubleshooting the valve was closed with reference to the notification for valve vibration. The Synergy case was approved with all measures closed. The level control valve was connected to the condition monitoring centre. Vibration in the piping system downstream from the first-stage separator was registered by CCTV and was experienced as noise and vibration in the living quarters. The vibration stopped and then resumed. A condensate leak occurred.

The leak point for the condensate was a crack in the two-inch pressure equalisation line on the ESD valve next to the condensate outlet downstream from the first-stage separator.

Ignition source disconnection, blowdown, ESD and deluge were initiated automatically. Personnel mustered in accordance with the alarm instructions. The emergency lasted 1.5 hours. No personal injuries were suffered.

The total quantity of hydrocarbons released from the leak site is put at about 2.8 tonnes.

The actual calculated leak rate was roughly 8kg/s.

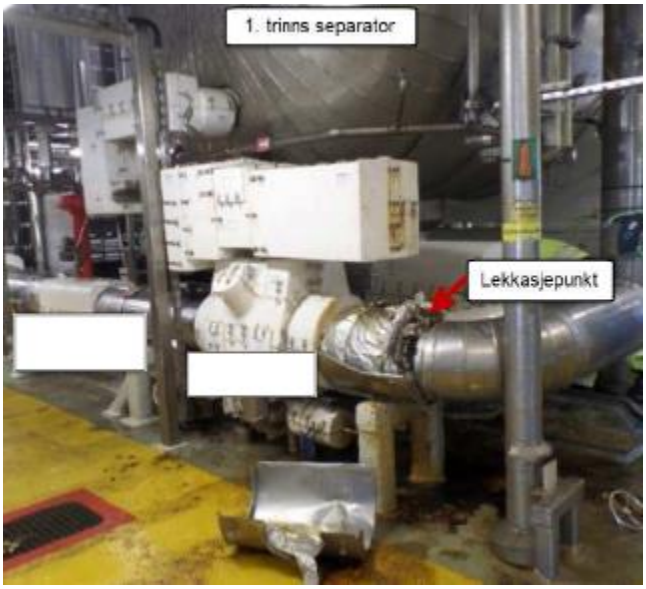

Figure: Photograph of the leak point next to the condensate outlet of the first-stage separator.

Causes

Direct cause

The condensate leak occurred because of a crack in the two-inch pressure equalisation line next to the condensate outlet downstream from the first-stage separator. Technical investigations of the material concluded that the fracture was the result of fatigue and overloading.

Underlying causes

- Repeated powerful vibration and knocking in the piping system as a result of flow-induced forces which exceeded design capacity.
- Flow conditions in the level control valve and the associated piping system have induced vibrations during normal operation of the plant. These led to the valve losing functionality on three occasions.
- Loss of control over the level control valve. It lost feedback on valve positions on two occasions, one and two months respectively before the incident. Actuator functionality was lost during the incident. Loss of control with the valve resulted in repeated powerful vibration and knocking in the piping system, which exceeded design capacity. These failure mechanisms have not been identified as a risk and are therefore not covered in governing documentation.
- Underdimensioned valve and insufficiently robust actuator for level control in the first-stage actuator.
- Lack of experience transfer related to control valves from operations to project and supplier.
- Inadequate technical expertise at the operator and the contractor on selection and dimensioning of control valves.
- Inadequate requirements concerning the fail-safe condition for level control valves when control is lost.

Lessons and recommendations

- Follow-up must be ensured for control valves in critical applications from the start-up phase.
- Good interaction between the operations organisation and experts on control valves is essential for identifying, understanding and handling risk associated with such valves in critical applications.
- Requirements should be established in governing documentation on the fail-safe condition for level control valves when control is lost.
- Identification and management of the risk for vibration in critical piping systems must be ensured in the project phase.
- Avoid running the plant with big vibrations – assess the acceptable level of vibration.