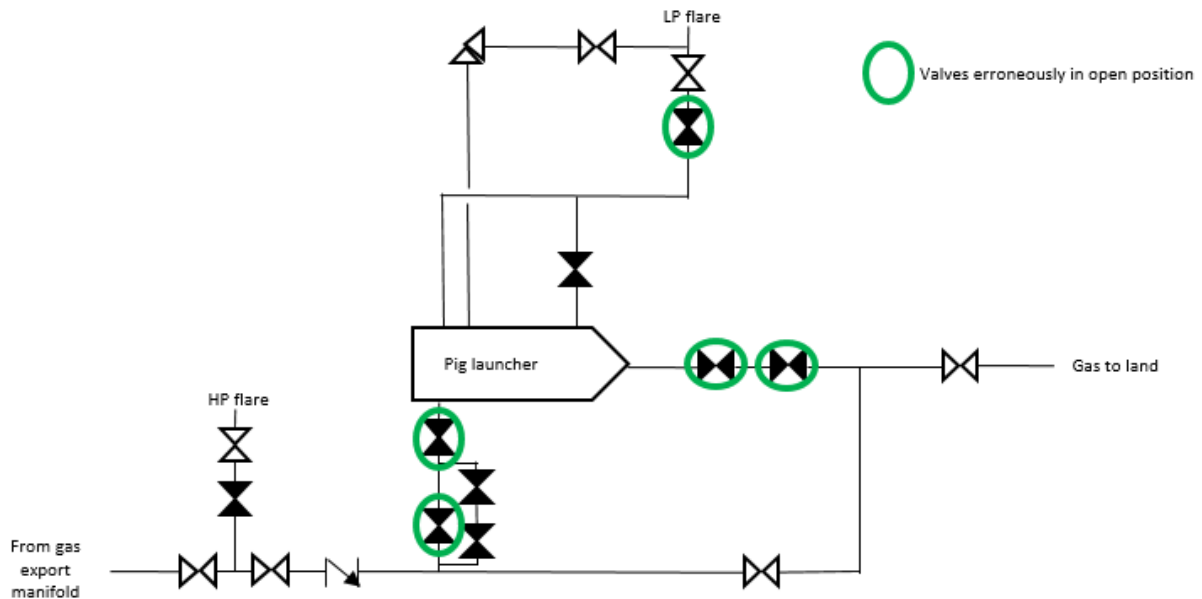


Incident description: Gas leak 2013

The gas leak occurred in a pig launcher in connection with preparation for turnaround. The preparation process also included testing of safety systems (PSD, ESD, APS and MEI¹). After the platform was depressurised a drainage of residual condensate was started. This operation is performed by using a small amount of gas to drain the condensate. The export manifold was then pressurised to 17 barg. The valves between the manifold and the pig launcher are normally in closed position, but during the pressurisation of the manifold, five of these valves were in open position (marked in green in the figure below). The reason for this was that the control logic for the valves (SAS²) was programmed to send an opening signal to the pig launcher valves when resetting after a power failure (full APS test). A simplified illustration is shown below.



Because the valves were opened, the pressure increase of the manifold led to pressurisation of the pig launcher to 17 barg. The pig launcher is designed to withstand a pressure of 142 barg. The gasket around the pig chamber door had previously been exposed to condensate and had over time been degraded. This resulted in a gas leak at ca. 0,8 kg/s of duration 1-3 minutes due to the degraded gasket. Total emissions were approximately 150 kg gas.

¹ PSD = Process shutdown, ESD = Emergency shutdown APS = Abandon platform shutdown, MEI = Manual electrical insulation

² SAS = Safety and automation system

Causes

Direct cause:

The gasket in the pig launcher door was degraded, and a leakage occurred.

Root causes:

- Condensate inside the pig launcher had over time degraded the gasket around the pig chamber door.
- Five valves were in open position. These should have been in closed position when pigging was not ongoing.
- The five valves were open because the SAS system sent an opening signal to the pig launcher valves when resetting after a power outage (full APS test).
- It was not discovered that the pig launcher valves were in open position before the pressurisation of the export manifold started.
- Drainage of residual condensate in the export manifold was performed simultaneously with the ongoing MEI-test. This resulted in a high workload with a huge amount of alarms that had to be acknowledged. In such conditions it can be challenging to keep the overview.

Learning points and recommendations

- Do not perform other activities simultaneously when testing of PSD, ESD, APS and MEI is in progress.
- Complete APS testing and reset and verify all systems before the MEI test starts.
- Review which systems fall out, with associated alarms, when testing of appropriate safety systems.
- Update checklist with ensuring that all logging systems starts normally after APS testing (to avoid loss of important data logs if systems do not start as intended after power failure).
- Establish operational routine for drainage of condensate from pig launcher between inner and outer gate valves.
- Establish operational routine for pressurising pig launchers with nitrogen (for improved detection of gate leakages, as well as preserving the gate).
- Change interval of replacement of pig chamber door gasket (from 12 to six months), alternatively switch to another type of gasket.
- Install alarm in control room for pressure increase in gates, and for position change of gate valves.