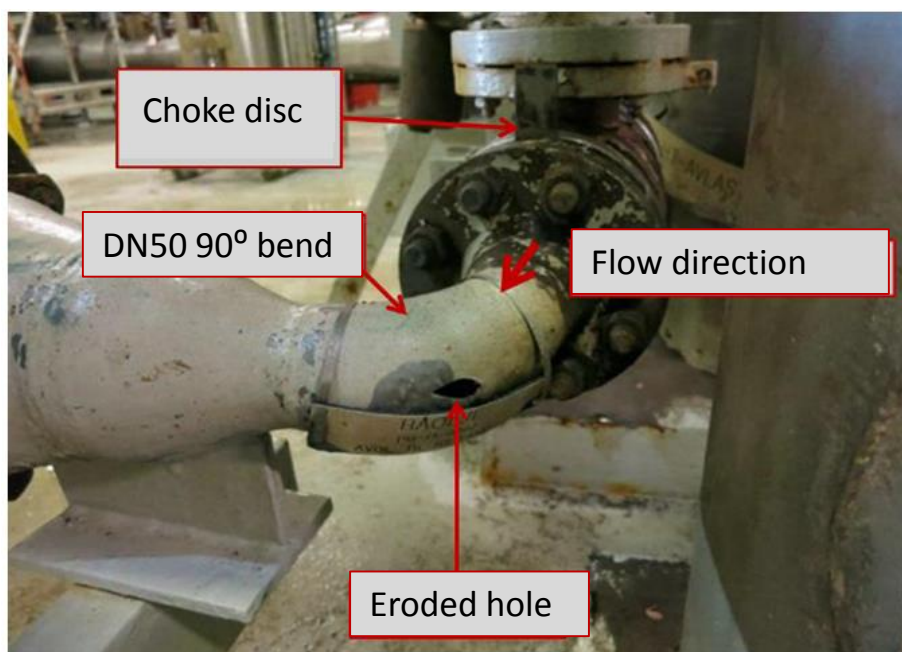


Incident description: Gas leak 2013

The platform was in normal operation when the incident occurred. A gas injection was ongoing in well A (via the blowdown system), while well B was producing to test separator. Well A and B are tandem wells, meaning that they are connected to the same valve on the test and production manifolds.

Unstable flow (slugging) from well B resulted in a shutdown of the test manifold, along with the wing and master valves for well A and B. The pressure in the test manifold, however, continued to rise. Pressure from the gas injection on the closed valves on well A resulted in a leak via the choke valve into the test manifold. A pressure relief valve opened in order to reduce the pressure. Sand lying in the pipe followed the gas flow through an orifice plate, where the flow velocity increased. A jet of sand and gas was formed eroding a hole in a 90° pipe bend installed just downstream of the orifice plate. Gas flowed out. The image below shows the pipe bend that was hit by sand from the well stream.

Initial leak rate was estimated to ca. 0,1 kg/s. About 85 kg of gas and less than 15 liters of oil was released.



Causes

Direct cause:

A jet of sand and gas eroded a hole in a 90° pipe bend during depressurisation.

Root causes:

- Shutdown of testmanifold due to slugging from well B.
- Insufficient overpressure protection of test manifold in connection with simultaneous gas injection and production (choke valve was used as single barrier between injection gas and test manifold).
- Leak through choke valve from well A.
- Inadequate risk assessment in connection with gas injection.
- Unclear / unavailable procedures and work descriptions for gas injection and operation of tandem wells and processing plant.
- Insufficient focus on updating and availability of local steering documentation.
- Deposition of sand in the inlet to the pressure relief line.
- Design of pressure relief line (blowdown system) not suitable for sand in the system.
- Insufficient requirements in steering documentation and inadequate strategy for management of sand production for the processing plant.
- Not proper design with 90° pipe bend immediately following the orifice plate

Learning points and recommendations:

- Improve design, alternatively establish inspection program, for similar design solutions with:
 - Change of direction just downstream of orifice plates.
 - Shape of parting which may give sand in security and pressure relief lines.
- Review, assess risk, update and possibly establish new work descriptions related to gas injection and operation of the processing plant.
- Finalise and document sand management strategy for the processing plant.