

Incident description: gas leak 2015

A valve leaked gas when it moved from open to shut position during shutdown of a reinjection compressor for planned maintenance. Its internal pressure was then 201.2 barg. The valve had only been in operation for a month. The leak was detected by line gas detectors, ESD was initiated, deluge activated and local blowdown carried out. A general alarm was activated and the emergency response organisation mustered.

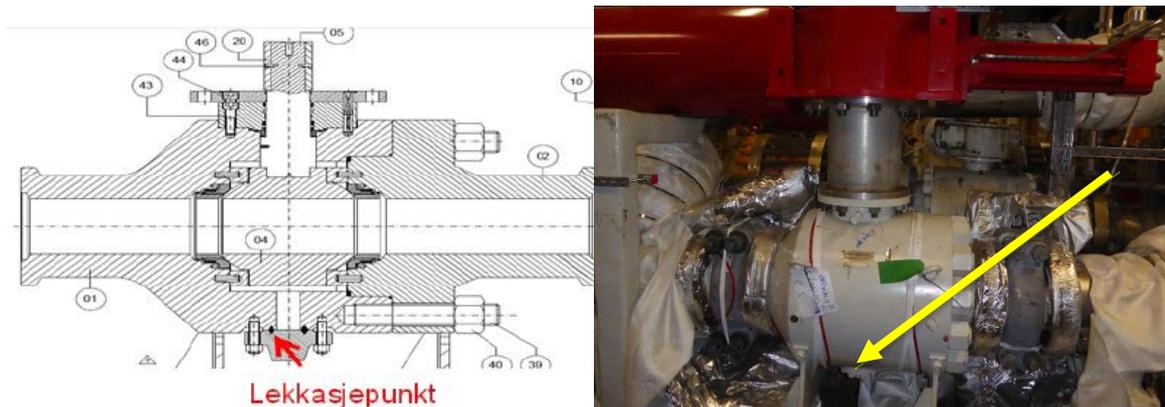


Figure 1 Leak point in the gasket on the drainage flange at the base of the valve.

The leak point was identified as the gasket on the drainage flange at the base of the valve. Marks on the gasket indicate that the flange had been tightened out of alignment and with insufficient torque.

A diffuse gas leak had been discovered and logged earlier on this valve soon after installation. The valve seat seals against the ball in the open and closed positions. Diffuse leaks are limited to internal leaks in valve seats. When the valve is opened/closed, the leak point is exposed to pressure in the pipe and the leak rate increases.

The initial leak rate was 0.21kg/s. Duration about one minute. Total quantity 3.83kg gas.

Causes

Direct cause

- The gasket on the drainage flange at the valve base failed to seal properly.

Underlying causes

- The drainage flange was disassembled and incorrectly installed (tightened out of alignment and with insufficient torque) after the factory acceptance test (FAT).
- Inadequate nitrogen-helium (N₂He) test. This failed to pick up the leak point.
- Inadequate inspection of new valve. The misaligned tightening was not identified before the system test. No final inspection was carried out at the supplier, and the mechanical completion (MC) check offshore failed to identify the misaligned flange tightening.
- Inadequate handling of diffuse gas leak. Lack of risk and impact assessment of such leaks from the valve with regard to escalation in the event of changed operating conditions.

Lessons and recommendations

- Improve requirements for the N₂He test in the work procedure.
- Consider increasing the level of detail in MC checklists to see to it that all possible leak points in new valves are checked.
- See page 19 of the best practice document¹ on main principles for testing: “Tests must be conducted in a way which avoids trapping pressure – in the housing of large valves”, and page 42 on important considerations when performing a test: “In order to test the whole valve, certain types (such as ball valves) must be placed in their intermediate position during the test”.
- When a diffuse gas leak is discovered, a risk and impact assessment should be conducted with a view to escalation in the event of changed operating conditions.
- Register quality nonconformities so that the supplier can prevent such incidents re-occurring.

¹ Norwegian Oil and Gas Association (2013). Best practice for isolation when working on hydrocarbon equipment: planning, isolation and reinstatement. Available at: <https://www.norskoljeoggass.no/Global/2013%20Dokumenter/Publikasjoner/Best%20practice%20document%20-%20english%20version.pdf>