

Incident description: Gas leak 2014

Work in the process area was planned to be performed during stop in the production due to ESD/PSD¹-testing and deluge-testing . One of these jobs included removal and replacement of 8 plugs in a valve cavity on a manual ball valve on the outlet of the 1. stage separator.

A work permit (WP) level 1 was applied for, and this was approved during a meeting the day before. The job was planned to be executed after the plant was depressurised due to the ESD/PSD-testing. During the day the work was planned to be executed, the conditions changed, and it was necessary to depressurise the riser segment into the 1. stage separator. Earlier that day, the WP was activated and a paper copy was printed. In this connection, the system was verified to be depressurised by the area technician together with the mechanic that was going to execute the work.

During the depressurisation, it was informed that the job on the valve should be postponed. This message was given verbally, the paper copy of the WP was withdrawn, and the WP was deactivated in the WP system. The WP was nevertheless extended from 19:00 to 23:00 in case the conditions for executing the work were resolved. In the handover meeting with Operations at 19:00, a clear message was given that the work on the valve was not going to be executed. The WP was set to 'completed' in the WP system, to ensure that the work was not to be executed. The team that had been working during the day shift, was working on another WP in the same area as the valve. At 21:00 they were finished and saw the possibility to start a new job. A mechanic went to the CCR (central control room) to pick up the WP. He asked for 'the WP for the welded body-valve'. It was not noticed that the mechanic wanted to start the job, so it was referred to the paper copy of the WP. The mechanic brought this along, and went out to start the job. He started to work on the valve body which had now been pressurised again due to the depressurisation of the riser-segment. The area technician was called upon. When the first plug was untightened, the mechanic noticed that this valve was 'slow' and conferred his colleague if the plug could be damaged, or if the system after all could be pressurised again. The colleague replied 'maybe' without the mechanic perceiving this. The plug was 'blown out' of the valve body together with the gas that was inside the valve body. The plug weighed 1.098 kg. The plug was never found afterwards and it is presumed that it landed in the sea. The gas in the valve body contributed to the immediate gas leak, not the gas of the entire line.

At the time of blowout of the plug, the valve was in open position, see Figure 1.

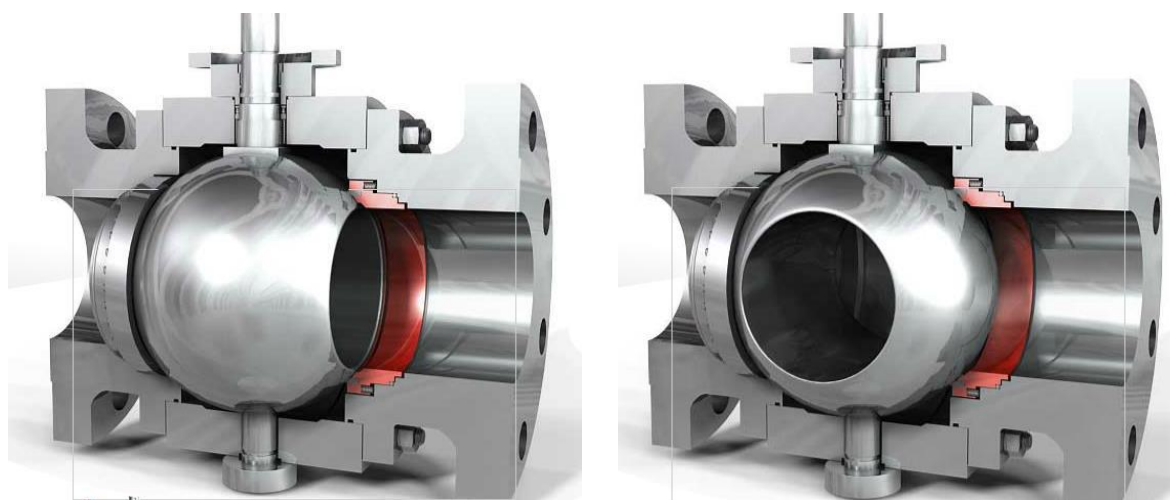


Figure 1: Ball valve in open position (left) and closed position (right)

¹ ESD = Emergency shutdown, PSD = Process shutdown.

It was attempted to close the valve manually, but this led to a brief pressure increase in the valve body since the gas volume in the valve opening was pushed into the cavity. The pressure was manually bled off via the valve body's bleed and it was possible to install a new plug.

The pressure in the line was 21 bar, and it is assumed that the pressure of the valve body was the same. The volume is uncertain. The rate is therefore calculated due to a short duration. The rate is assumed to be $< 0,1$ kg/s. The volume released is estimated to approximately 0,5 kg.

Causes

Direct cause:

- Plug was removed from pressurised valve body.

Root causes:

- The WP process was not adhered to by the work team. The WP was not active when the work started, it was set to 'completed' in the WP-system (lack of self-check and preparation for work).
- The mechanic ignored the warning signs. It was questioned whether the system was still pressurised since the plug that was untightened was 'slow'. This was not followed up (lack of risk understanding/misjudgment of danger potential).
- Area technician was not contacted during start-up of the work.
- Lack of management of change. When the system was pressurised again, potential consequences of this was not handled correctly.
- Lack of planning of work. The component/system was not adequately verified for the operation.

Learning points and recommendations:

- Review the WP-process with focus on follow-up in the field, routines when extending WP's and routines with filing of completed WP's.
- Conduct verification of work processes for work on pressurised systems, Work Permit (WP) and Safe Job Analysis (SJA)
- Review how changes are handled (management of change).
- Transfer of lessons learned for all shifts.