Incident description: Gas leak 2016

The leak came from a level control valve (LV) where the cage was taken out for cleaning. This valve controls the liquid out of the 1st stage suction scrubber on a high pressure compressor. The upstream process shutdown valve (XSV) was being used as a barrier against the pressure from the scrubber. However, the air supply to the actuator on the XSV was not blocked. With the air supply not being de-energized, the valve acted on signals from SAS/CCR. The XSV was programmed to open at 50% level in the scrubber, resulting in a gas/condensate/water leak from the level control valve.

According to company procedures, a single barrier was accepted as long as an operator is present throughout the job and process pressure is below 10 barg. The operating pressure in the line was 7.9 barg.

When the XSV opened, process fluids (gas, condensate and water) were released through the top of the LV. The leak was calculated to 330 kg in total with an initial leak rate of 8.7 kg/s. It lasted for 38 seconds.

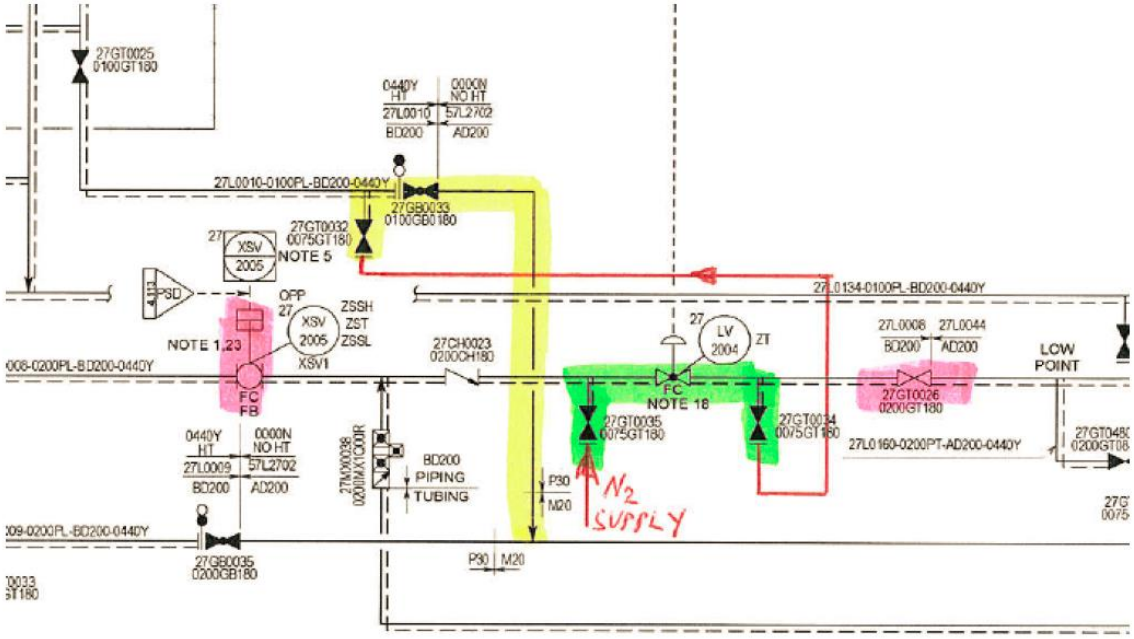


Figure 1 Reproduction of barriers and drain connection mark-up (The line from the scrubber is the one on the left hand side of the XSV).

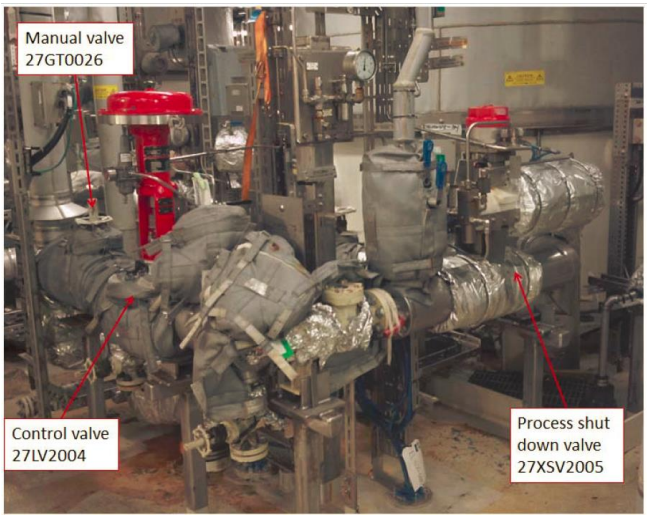


Figure 2 Layout

Causes

Direct cause

- The air supply on the actuator on the XSV was not blocked.

Root causes

- Debris in the line, resulting in the need to perform several maintenance/ cleaning jobs on the affected valve.
- Job seen as a routine job by operations; no work permit/SJA, was deemed necessary. Even though this was a routine job for the valve maintenance contractors, it was the first time the Field and CCR Operators performed this task.
- No job instructions with checklists available or used.
- V&B list was not in place. However, a marked up P&ID was used.
- Valve isolation, marking, hydraulic/pneumatic isolation/de-energizing not found/ specified in relevant procedures.
- Changes in SAS not sufficiently communicated to Offshore operations. The interface between the commissioning team and Operation has been clear.
- Independent verification of isolations before start of work not performed.
- Lack of Management commitment and follow up in previous cases where sufficient and relevant work instructions were reported missing.
- Heavy work load reported by the Offshore personnel.

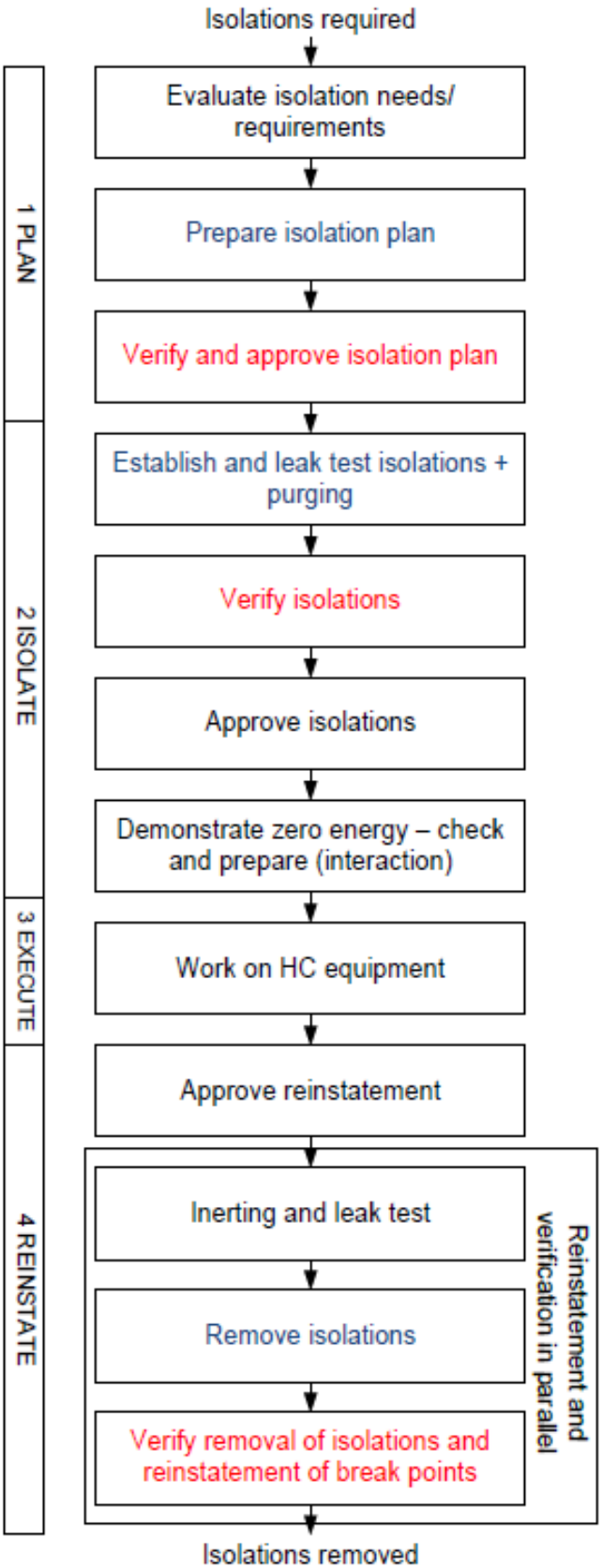
Learning points and recommendations

- It is recommended to implement work instructions for typical/routine operations on all systems.
- Revise procedure: need to specify that for valves to be isolated – the actuator supply; hydraulic, pneumatic and electric shall be isolated in order to approve the valve as a barrier.
- Make a list of typical valves how to de-energize and prevent unwanted action.
- It is recommended to do the following immediate implementation of a checklist for hazardous systems based on the figure on the next page.

Description:

Blue and red text indicate roles which are to function as independent barriers.

Status for the steps in best practice document



Description:

1 Was executed, functioning as intended

2 Was executed, but failed

3 Was not executed

– Uncertain whether executed

Status during the incident:

2: No job instructions with checklists available or used

3: V&B list was not used (only P&ID markup)

3: Not executed

2 Energy supply to actuator not blocked, uncertain whether leak test was executed, purging was carried out

3: Not executed

3: Not executed

3: Not executed

Hydrocarbon leak 8.7 kg/s, 38 seconds, 330 kg