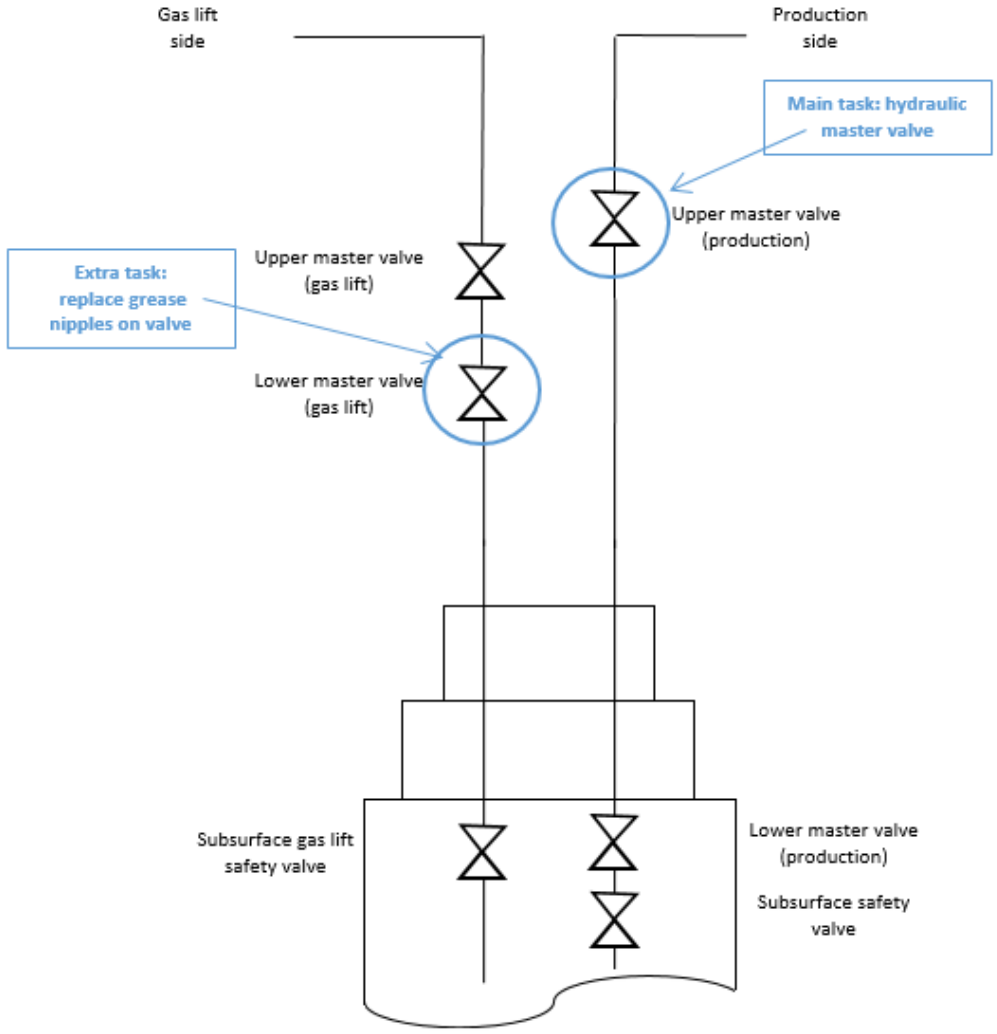
Incident description: Gas leak 2013

The gas leak occured during replacement of gate and seat of a hydraulic master valve on a double wing Christmas tree. The master valve was located on the production side of the Christmas tree. In a planning meeting four days before the leak occurred, it was informally discussed that one must remember to replace the grease nipples (located on the gas lift side of the Christmas tree), while the well was still plugged (see the figure below). Following the planning meeting an additional task was thus included in the work order for replacement of gate and seat of the master valve, «Replacement of grease nipples on valves».



Later a work permit (WP) for the main task, replacement of gate and seats of hydraulic master valve, was prepared. The additional task of the work order «replacement of grease nipples» was, however, not described in this WP.

A plug was placed in the production wing, meaning that only the production side of the Christmas tree was prepared for maintenance. The work team had been given oral information by the discipline responsible that they should also replace the grease nipples, but they started on the main task. The area manager was summoned and they went through the task of changing gate and seats on the master valve. The area responsible demonstrated that the tree was depressurised for this task, and the WP was signed. At a later point in time the WP was extended, when the mechanics realised that they wouldn't finish both the main task and the extra task of replacing the grease nipples. This extra task was not mentioned when extending the WP.

According to the executing mechanics it had been requested whether the Christmas tree was depressurised; this was confimed by the mechanical dicipline manager. This was not approved in the field with Operations after the shift change. In reality the gas lift side of the tree, where the grease nipples were located, was pressurised.

When the work team was ready to start, the team was strenghtened by a mechanic. He was told to start on the task with the grease nipples, while the other two continued the main task on seats and gate. The new mechanic was not aware that replacement of grease nipples was not described in the WP.

The mechanic started working on grease nipple on the gas lift side. This led to a gas leak at ca. 0,16 kg/s of duration 5-10 minutes, total emissions ca. 38 kg gas.

Causes

Direct cause:

A grease nipple was released on a pressurised system which hadn't been prepared for maintenance.

Root causes:

- A separate notification for replacing grease nipples was not created, which meant that this additional activity did not receive the necessary treatment in accordance with the work process.
- Requirements / guidelines were not followed:
    - Work on hydrocarbon system was executed without an adequate WP.
    - Area technician was not summoned/was not present at the breaking of hydrocarbon system.
- Assessment of well pressure conditions was undertaken only internally in the mechanical department, which did not have sufficient knowledge of the conditions on both sides of the Christmas tree.
- Mechanical should have verified against Operations that the involved equipment was depressurised. Lack of communication between Mechanical and Operations caused the extra task to go unnoticed by the area technician in the "pre-job talk".

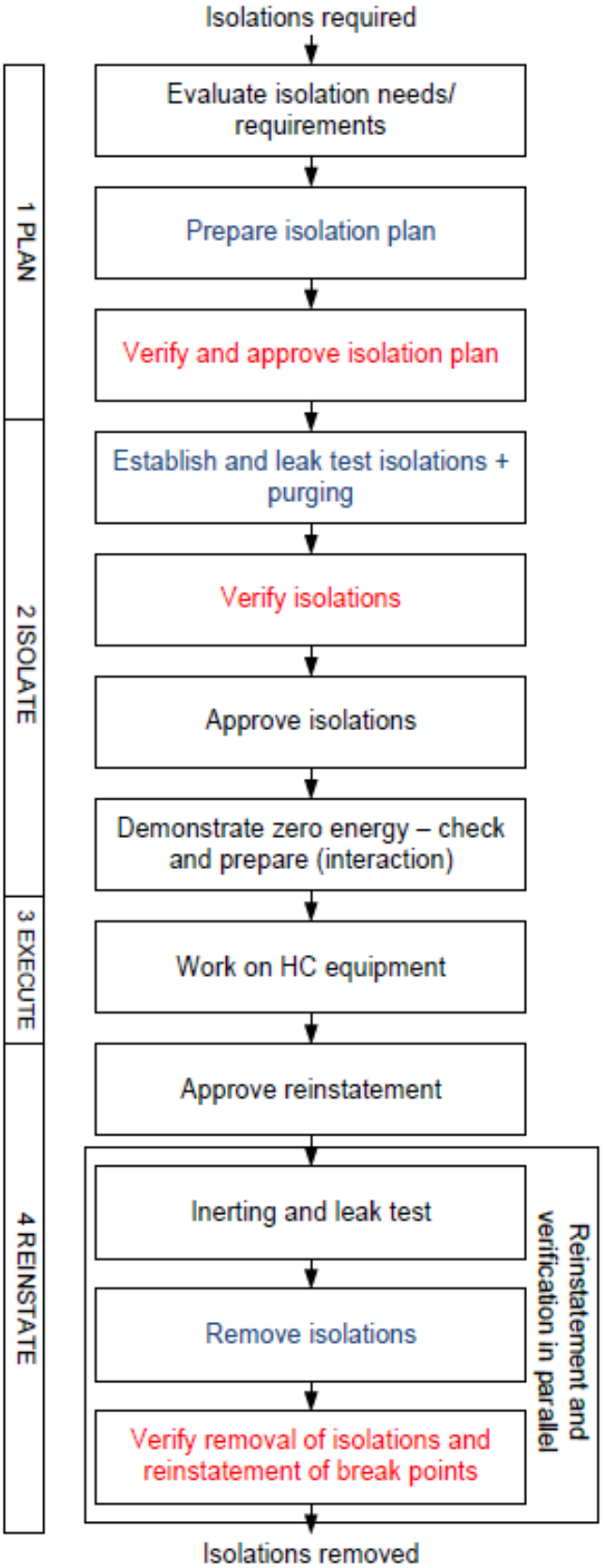
Learning points and recommendations

- Ensure that Norwegian Oil and Gas Association recommendations[1] are implemented in governing documents, along with measures to ensure that these are actually being followed.
- Train involved parties in "conversation in the field" to ensure that risk elements are included.
- Physically ensure that the system is depressurised before starting the job (as an interaction between Mechanical and Operations).
- Approve the WP at the work site, also when extending the WP.
- Ensure that new personnel joining a task are informed about orders issued in the WP, and sign for these.

[1] See the following document: "Best practice for isolation when working on hydrocarbon equipment: planning, isolation and reinstatement"

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: It was unclear whether the grease nipples was a part of the job or not

3: Isolation plan for the additional task (grease nipples on the gas lift side) was not prepared.

3: Not executed for the additional task

3: Not executed for the additional task

3: Not executed for the additional task

3: Not executed for the additional task

3: Area technician was not summoned/present before breaking

Gas leak 0,1-1 kg/s. Total 38 kg.