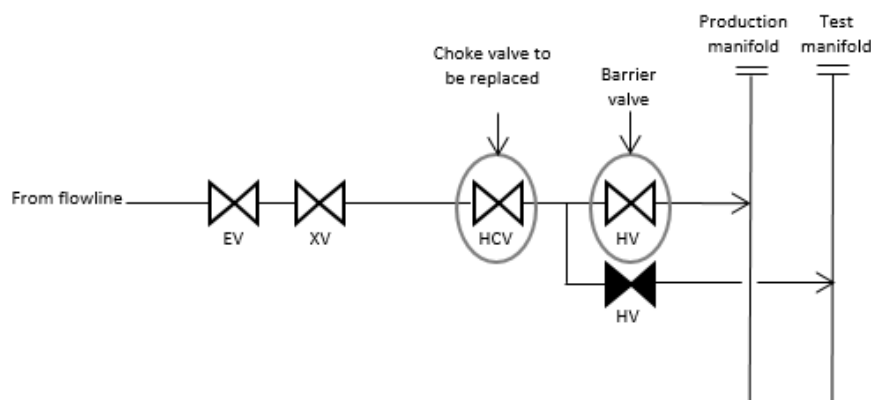


### Incident description: Gas leak 2013

The gas leak occurred in connection with startup of the production after an unintentional shutdown. A choke valve on a production pipeline was to be replaced. An isolation plan for the job was prepared. A part of the isolation plan was a double expanding gate valve<sup>1</sup>, in the following referred to as the barrier valve, located between the production pipeline and manifold. The barrier valve was closed with an electric actuator and leak tested according to requirements. It was confirmed sealed by verifying no flow from the bleed valve down to the closed drain system. The bleed valve was left in open position. The location was considered to be a safe area; the platform practice was to use the gas detection system to detect barrier failure via bleeding.



After the trapped volume upstream of the barrier valve was depressurised, gas was discovered from the open bleed valve. The barrier valve was thus tightened using the valve wheel and confirmed sealed by verifying that no more gas was flowing from the bleed valve. The bleed valve was still in open position.

While working on changing the choke valve the main power was lost, resulting in a full shutdown of the entire plant. The choke valve was replaced and the plant was then restarted. The production line with the choke valve and the barrier valve was not reset, and the bleed valve was still open. This part of the plant was not restarted. During startup of the rest of the plant, a rapid pressure buildup took place in the production manifold. This resulted in a leak in the barrier valve, and gas leaked out via the open bleed valve. The Process Operator went to the area and managed to close the bleed valve. The gas leak had a rate of 0,1-1,0 kg/s. The leak was stopped after about 4 minutes.

### Causes

#### Direct cause:

The barrier valve was not sufficiently set; full mechanical closing was not achieved.

#### Root causes:

- The closing method of the barrier valve was changed from its original design (due to earlier problems with wedging of valves after long closing).
- New method for complete expansion of valve for barrier function was not sufficiently known in the organisation or satisfactorily documented.

<sup>1</sup> The valve has two valve seats, and satisfies requirements for double barrier and bleed when working on hydrocarbon systems.

- Changes in pressure and temperature occurred compared to when the barrier was originally established and tested.
- The functionality of the barrier valve was affected by the temperature changes.
- The Norwegian Oil and Gas Association recommendations<sup>2</sup> regarding bleeding were not followed.

**Learning points and recommendations:**

- Ensure that Norwegian Oil and Gas Association recommendations<sup>2</sup> are implemented in governing documents, along with measures to ensure that these are actually being followed. This includes closed bleed with manometer or hoses in accordance with applicable guidelines.
- Follow internal requirements for bleeding (the bleed valve was left in an open position in what was considered a safe area, which was a deviation from internal requirements).
- Detail and make known the procedure for handling electric actuator controlled double expanding gate valves as barriers.
- Ensure that the procedures take thermal effects into account and how the valve must be followed up to ensure adequate barrier function.

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<sup>2</sup> See the following document: "Best practice for isolation when working on hydrocarbon equipment: planning, isolation and reinstatement"

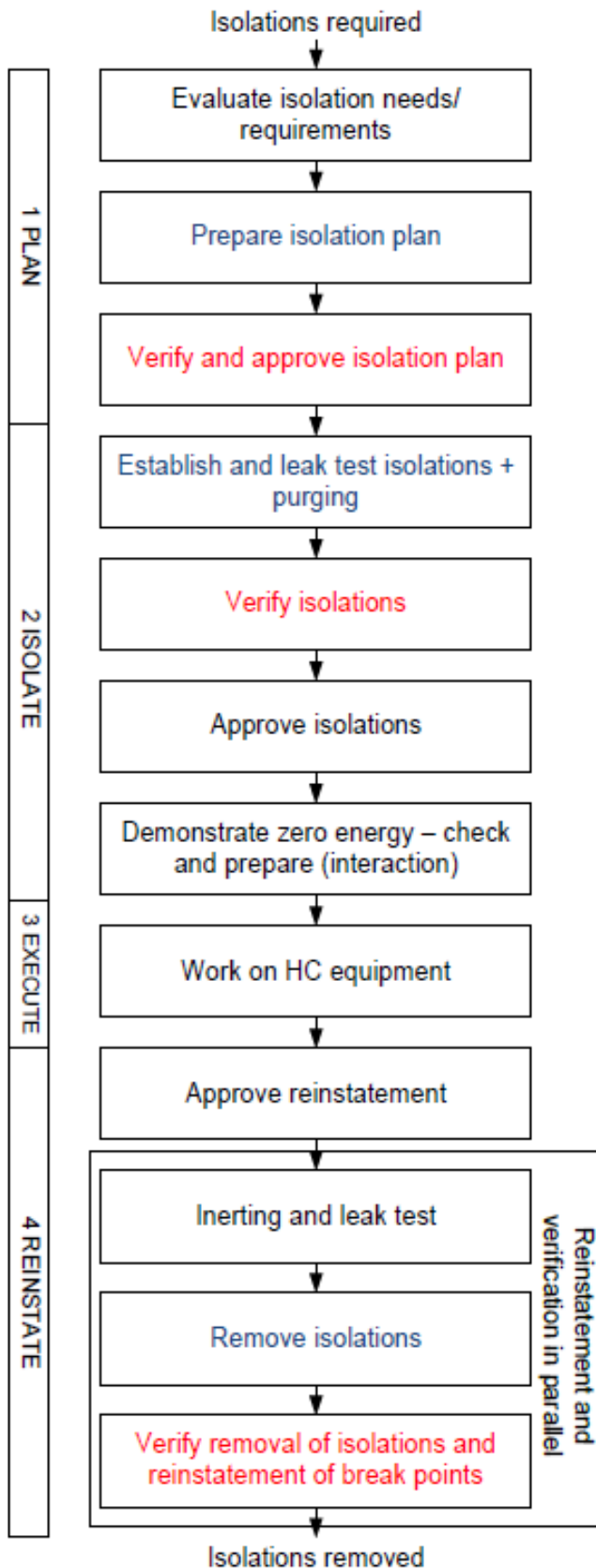
Description:

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

Description:

- 1 Was executed, functioning as intended
- 2 Was executed, but failed
- 3 Was not executed
- 4 Uncertain whether executed

**Status for steps in best practice document**



Status during the incident:

- 1 Executed
  - 1 Executed
  - 1 Executed
  - 2 Error in isolation (valve not sealed)
  - 1 Leak test executed
  - 2 Error in verification (insufficient qualification)
  - 4
  - 1 Executed
- Gas leak 0,1-1 kg/s, 4 minutes

