2018-A: Gas leak when readying safety valve

In connection with recertifying a safety valve, a segment had to be blown down to a closed drain. Governing documentation required that this should be done to the flare/venting/blowdown system. When the isolation plan was prepared and approved, however, the way blowdown and drainage should be done was not specified. During preparatory work, those involved chose an alternative method – namely overriding detectors in the area, opening a valve to the open air in order to bleed off an **assumed** small volume, reversing the spectacle blind at the closed valve and then bleeding off the pressure in the rest of the line to the closed drain.

The valve which was intended to ensure that only a small volume got bled off was a gate type with a backseat function. Such valves are designed in a way which means that an operator attempting to determine whether they are closed using normal force will receive an erroneous confirmation of this if they do not also try to **open** the valve. When closing such valves, it is considered good practice to turn the wheel a little back towards the open position to avoid the gate becoming locked at the bottom of the valve body. However, this was not done here. The valve assumed to be closed was in reality open.

After the valve to the open air had been cautiously opened, some gas escaped initially. The quantity decreased, but without stopping completely. The operator then opened the valve another few turns, estimated at 25 per cent opening. A continued escape of gas was interpreted as a minor internal leak in the valve which was assumed to be closed. However, those involved were unaware that a hydrate plug in or immediately adjacent to the valve meant that only some of the gas could pass through. While they were discussing whether the internal leak was too large for them to continue the job, a bang announced that the hydrate plug had loosened. Gas then poured from the valve.

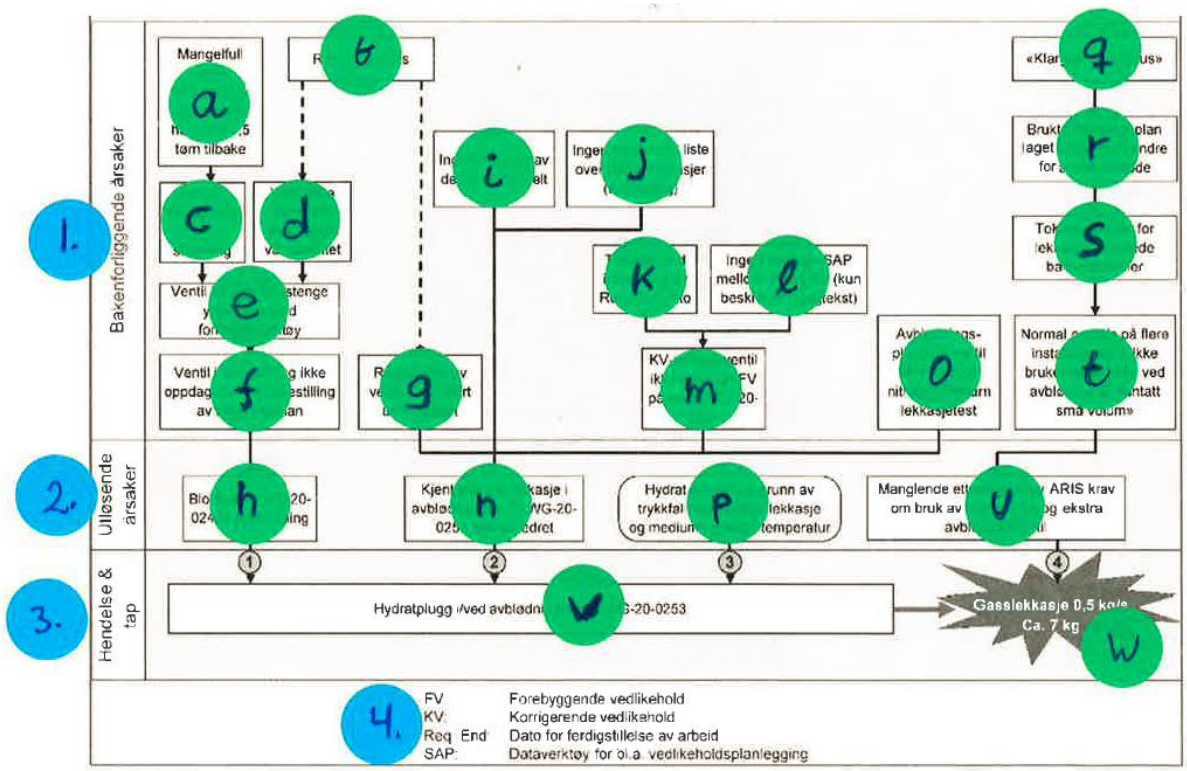
Operator 1 closed the valve while operator 2 called the control room by walkie-talkie. He explained that they had the position under control and asked for gas detectors in adjacent modules to be overridden because of the gas escape. Detectors in four modules were eventually overridden in addition to the relevant module.

Hydrate formation depends on three main factors: gas under high pressure, low gas temperature and the presence of water. All these factors were present in the relevant piping section for large parts of the year, since no heating cables were installed on the pipe.

The leak rate is calculated to have been 0.5 kilograms per second, with a total quantity leaked of about 3.6 kilograms.

Causes

The direct and indirect causes are presented in the causal chart below. The cause is not attributable to a single fault, but to a series of technical faults, decisions, design conditions, operational practice, organisational conditions and so forth, which led collectively to the incident occurring. These are numbered from 1 to 4 in the chart.



Key
1: Underlying causes. 2: Direct causes. 3: Incident and loss. 4: FV: preventive maintenance. KV: corrective maintenance. Req End: Date for completing work. SAP: Computer tool for maintenance planning, etc.

a) Inadequate understanding of opening valve fully without 1.5 turns back. b) Turnaround. c) Valve in backseat before steaming. d) Valve not closed when steam job completed. e) Valve could not be closed further with extension tool. f) Valve in open position not noticed when reinstating isolation plan. g) Valve not repaired immediately. h) Block valve WG-20-0242 in open position. i) No marking of defective valve in the field. j) No follow-up in list of known leaks (sweat log). k) Keying error when entering Req End date. l) No connection in SAP between PM and CM (only described in long text). m) No CM on valve before PM on valve PZ-20-1241. n) Known external leak in blowdown valve WG-20-0253 not repaired. o) Blowdown plug on valve not included in nitrogen/helium leak test. p) Hydrate formed because of pressure drop from external leak and medium at "correct" temperature. q) "Readying mode". r) Used isolation plan created earlier by others for different method. s) No account taken of leaks in untested barrier valves. t) Normal practice on a number of facilities is not to use a manometer for blowdown of "expected small volume". u) Non-compliance with Aris requirement to use manometer and additional blowdown valve. v) Hydrate plug in/adjacent to blowdown valve WG-20-0253. w) Gas leak 0.5 kg/s. About 7 kg.

Learning points and recommendations

- Reduce the number of unnecessary overridings and the duration of overridings.
    - Document the daily number of overridings and their duration. Reviewed in the morning meeting with the platform management.
    - Central control room must challenge area operators on whether overriding is actually needed.
- Common and harmonised mode of action when disconnecting gas detection, and in the event of possible confirmed gas leaks with automatic shutdown disconnected.
- Correct operation of valves.
    - Inform operators about the way valves with a backseat operate, and that such valves must not normally be fully open or closed. Conduct a valve course.

- Correct reinstatement of isolation plans.
    - When reinstating isolation plans, valves must be operated in both directions to confirm that they are in the correct position.
- Ensure correct choice of blowdown method.
    - Choose method in accordance with governing documentation.
    - Drop the formulation “if necessary” in describing the blowdown and drainage method.
    - Produce good work descriptions for doing the job.
- Ensure easy access to the equipment required for correct blowdown.
    - Information on where manometer and equipment for blowdown to the flare are stored. Must be in a fixed place which everyone knows about.
- Ensure access to important information about the facility.
    - System and operational documents should be updated so that restrictions in the facility are clear, and operational practice must be chosen in accordance with these restrictions.