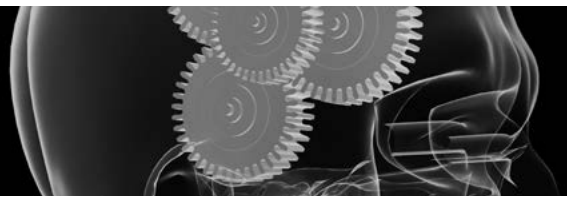


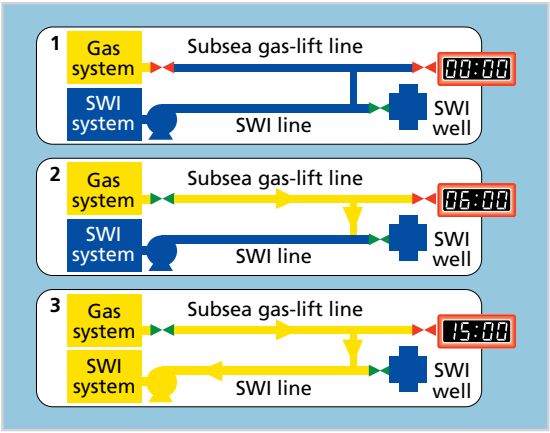
CASE STUDY 9 - Time to stop…

What happened?

An offshore installation suffered a gas release after gas from a Third Party subsea system was accidentally allowed into the Platform Seawater Injection system (SWI). The SWI pumps high pressure seawater into the reservoir and is not designed for hydrocarbon gas.

Engineers planned to empty a subsea gas-lift flowline that had been filled with water for maintenance (Figure 1). The plan was to push water out of the line and down a seawater injection well using production gas. It was calculated that 6 hours of gas-flow would be required to push the water into the SWI well at a well-head pressure of 35 barg (Figure 2).

A procedure was written by the Third Party, and provided shortly before the job was due to start. There was no time made available to review the procedure and it was considered "routine" as a similar type of operation had been done, previously. Buried in the middle of the procedure was a warning that the gas-flow should not exceed 6 hours.



Operators started the gas flow, but then it took 9 hours to get the 35 barg well-head pressure. Operators then continued flushing for a further 6 hours. Consequently, gas flowed for 15 hours rather than the 6 hours intended (Figure 3). After the water was flushed out a volume of gas flowed back into the seawater system and remained undetected for several weeks whilst the system was offline for maintenance.

On the day of the incident an operator opened a drain valve whilst restarting the SWI. Gas blew out of the drain, setting off gas alarms in the vicinity. The operator immediately shut the valve and the module was made safe.

What human factors were involved?

What did people do intentionally?

The procedure was not reviewed
The procedure was supplied at the last moment, and had not been reviewed by a competent person, even though this was an unusual operation. It hadn't been written with those doing the job, and no review or HAZOP (Hazard and Operability Study) was carried out.

The operators didn't stop the job and take time to get the procedure reviewed
They had not been involved in writing the procedure, and had no assurance that the procedure was correct. However the job had been planned for some time and they were reluctant to delay it.

What did people do without meaning to?

The operators did not detect the warning
Although the operators did use the procedure, their actions didn't reflect the engineers intention to only flow gas for 6 hours. The crucial information was buried in the text of the procedure.

Barriers

- Human Factors in Design
- Procedures
- Safety Critical Communications
- Contractor Interface
- Managing Human Failures

What can we learn from this incident?

- There have been several very serious incidents involving gas being accidentally routed into plant not designed to cope with it.
- Procedures need to be prepared in advance and reviewed by a competent person(s).
- Describe possible "abnormal situations" in procedures and clearly state what actions should be taken if they occur.
- Conventional hazard assessment techniques like HAZOP can detect errors made by designers and predict errors by operators. Specific HAZOP checklists may ask what would happen if a step is omitted or done out-of-order, or too late.
- Interfaces (communication and procedures), between Third Parties and the Operator, can be a weakness, recognise this and manage the associated risk.