



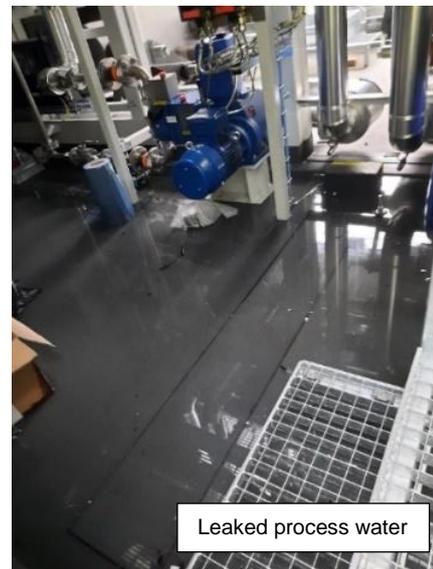
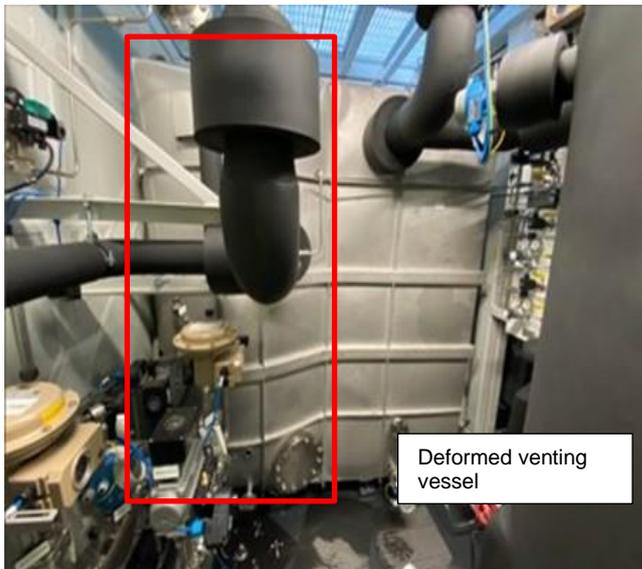
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|-------------------------|------------|--------------------------------|---|
| Number | 2024-01 | Date of Issue | 14.03.2024 |
| Date of Incident | 13.12.2023 | Incident Classification | Property Damage / HiPo Environmental Level 1 |

Summary: On 13 December 2023 at 20:47, an explosion occurred at the PtH KVA Buchs project in Buchs in the canton of Aargau, Switzerland. The explosion occurred in the electrolyser container and caused deformation of the venting vessel, container walls and damage to the equipment. At the time of the incident, the plant had been fully assembled and was being commissioned by HZI BioMethan, the supplier of the electrolyser container.

The explosion occurred when a nitrogen purge was initiated, which forced hydrogen gas with a high oxygen gas content into the hydrogen purification unit, called the RTA. The RTA contains a catalyst which burns the residual oxygen in the hydrogen mixture before it is finally stored as purified hydrogen. The explosive mixture reached the RTA, ignited there and then propagated back to the venting vessel where it exploded.

Outcome: The explosion didn't cause any injuries, only damage to property. The explosion also caused a leak of process water containing potassium hydroxide (KOH) that was contained and didn't reach the ground. In other circumstances, however, the explosion could have affected the workers in the electrolyser container, with potentially serious consequences.

Pictures:



| Root Causes d Contributory Factors | Lesson Learned |
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| <p>Root cause: The electrolyser unit had several design flaws that were not identified in the HAZOP.</p> <p>Contributory factors:</p> <ol style="list-style-type: none"> 1. Ambiguous Instructions - Incorrect calibration of the level sensors due to unclear instructions in the manufacturer's manual. 2. Procedures not used - There was no written procedure or RAMS or POWRA detailing the steps to be taken for the ongoing task at the time of the incident. 3. Procedures followed incorrectly - The final design of the plant had been developed in accordance with a HAZOP that was a 'draft' document and had not been approved or signed off. | <ul style="list-style-type: none"> • HZIB engineering business process to be aligned with the HZI AG (BP425). • Re-design the plant taking into consideration the following: <ul style="list-style-type: none"> ○ Prevention of an explosive mixture ○ Prevention of ignition source ○ Explosion proof design • All sensors and similar critical equipment (identified in the HAZOP) to be calibrated by the manufacturer or after specific training provided by the manufacturer. • Commissioning RAMS to be more detailed. • Supplier documentation (O&M task list and Operating Manual) to be received and reviewed by HZI. • Develop new process for pilot projects in PMS or include pilot projects in GP220. |



LESSON LEARNED



Every Lesson Learned is an opportunity to avoid recurrences.
What have you done to avoid a similar incident on your project?

