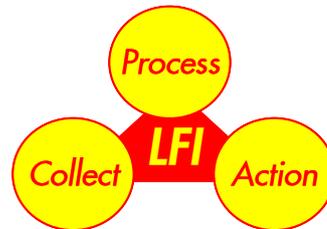


LEARNING FROM INCIDENTS

Shell Global Solutions International B.V.

SGSI GSSC, GSEI



DATE: September 2006

ALERT No. 200611 (HSE)

RAM RATING: Act.P4 – Pot.P4

Utility Hose Rupture Fatal Injury

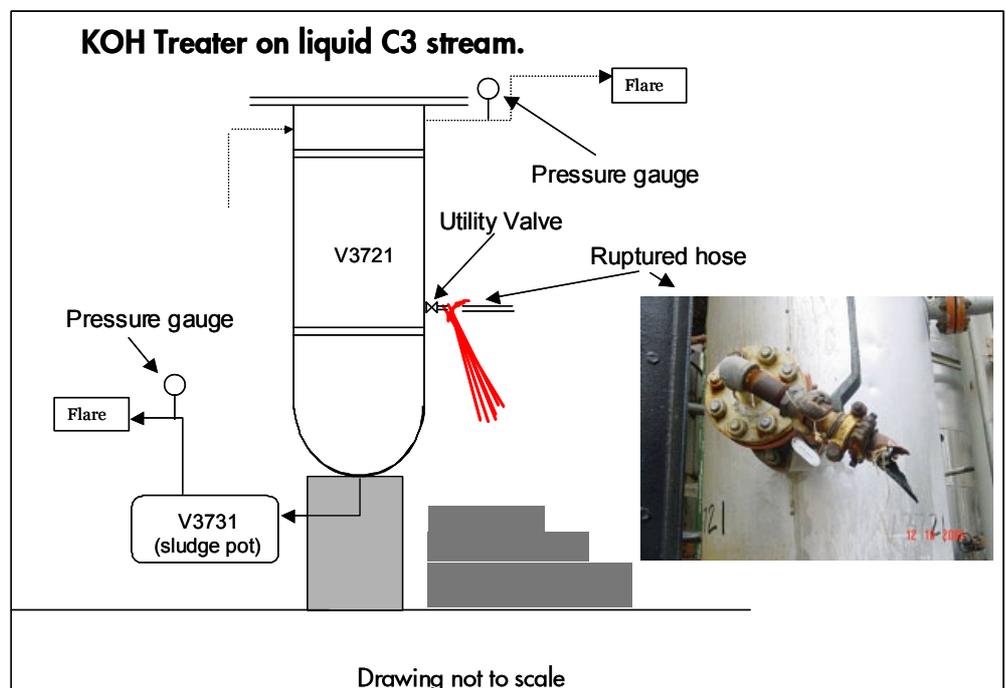
LFI Focus Area:

This Alert is potentially applicable to all Manufacturing Sites.

Summary:

In October 2005 at a Shell Operated Refinery, a process technician (operator) was attempting to purge a vessel with a Nitrogen Utility Hose. The vessel that had not been fully de-pressured was still under a pressure in the range of 15-18 bars (217-261 psig).

As a result, the utility hose ruptured causing a jet stream of chemicals containing hydrogen fluoride to spray onto the operator who was fatally injured.

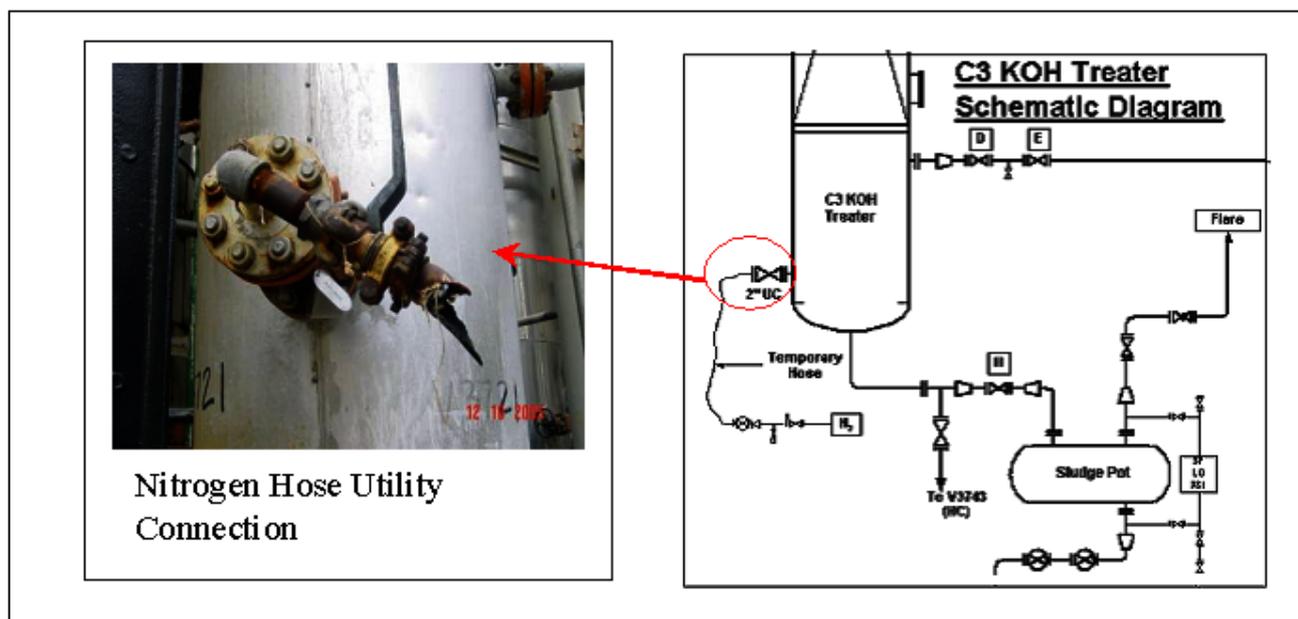


Here's what happened:

The morning shift on the day prior to the incident had started making preparations for a solid potassium hydroxide (KOH) change-out. The Utility hose for N₂ purging was connected to the N₂ supply in accordance with normal practice. However, due to the unavailability of KOH, the change out was re-scheduled to later in the week.

The day of the incident, the shift controller for the afternoon shift received information that the KOH was then available. Instructions were therefore given by the shift controller during the shift briefing at the beginning of the shift to bypass, isolate and de-pressure KOH Treater vessel and leave Nitrogen (N₂) purging of the vessel to the next shift. This was to be done in preparation for the KOH change out the next day.

The Hydrofluoric Alkylation (HFA) Unit operator began preparing the C3 KOH Treater for the KOH change-out. Based on the post-incident investigation, it appears that the operator had successfully bypassed and isolated the treater vessel and that he had started de-pressuring of the vessel via the sludge pot vessel and its 3/4 inch flare line before the incident occurred, (see diagram below).



The operator proceeded to introduce N₂ even though his instructions were only to de-pressure the vessel. However, the treater vessel was not completely de-pressured. The pressure in the vessel was in the range of 15 – 18 barg bars (217-261 psig).

As a result, the utility hose ruptured causing a jet stream of chemicals to spray onto the operator's coveralls that were exposed due to a suspected unzipped neoprene jacket (Class A PPE). For bypassing, de-pressuring and isolating the equipment, Class B PPE was specified. Further, procedures require type C PPE for breaking into the HF/KOA system.

The shift members heard a distress call over the radio (walkie talkie). The name of the caller was not identified. The panel men immediately initiated a roll call in which all shift members responded except the fatally injured operator. The automatic emergency shower alarm was detected and responding shift members found the operator standing under the emergency shower. The shift members immediately rendered first aid. The Operator was taken to the hospital where he succumbed to his injuries.

Why Did This Happen (Causes of incident):

The C3 KOH Treater Vessel was not completely de-pressured when the operator attempted to introduce N₂ into the system. The utility hose ruptured due to overpressure from backflow of product from the vessel that was at a pressure, (exceeding the hose rating 15 – 18 barg/217-261 psig). As a result, a jet stream of chemicals sprayed on the ground and onto the operator.

The Site Investigation Team concluded that the following could have potentially prevented the incident:

- Checking the pressure gauges on the treater vessels to ensure they were both fully de-pressured.

- Lining up the treater vessel relief valve bypass and fully de-pressure the vessel before introducing N₂.
- Fitting the purging hose with a non-return valve at the utility connection end per Site procedures to prevent backflow of the product.

Further, the Site Investigation Team identified that the following could have reduced the severity of the injuries:

- Wearing the specified personal protective equipment (PPE) for the task.

Key Learning's

The following observations were made regarding the incident:

- Purging hose did not have a non-return valve at the utility connection. This could have potentially prevented backflow of the product. Non-return valves on Utility connections were a requirement per Site standards but not always practiced.
- Indications are that operator wore unzipped personal protective equipment (PPE) Class A suit. For bypassing, de-pressuring and isolating the equipment Class B PPE was specified. Further, procedures require type C PPE for breaking into the HF/KOA system. Operators report the Class B and C PPE is cumbersome and uncomfortably warm. Even though PPE may sometimes be cumbersome and hot, the need to wear it needs to be emphasized and placed in administrative controls (procedures/checklists/training).

Additional information from the Alert preparation panel:

- Other Sites have reported incidents associated with connection of Utility hoses to hydrocarbon service where backup of hydrocarbon into utility hoses and services created both safety and reliability issues. Action Alert 200506 – HVU Fire from steam hose that was issued last year involved the failure of a leaking steam hose and fire after hydrocarbon backed up into it.

Recommended actions:

Conduct a risk assessment focusing on the following failure scenario:

Connecting temporary utility hoses to process equipment that could potentially be at a pressure greater than the hose rating resulting in hose failure and loss of containment.

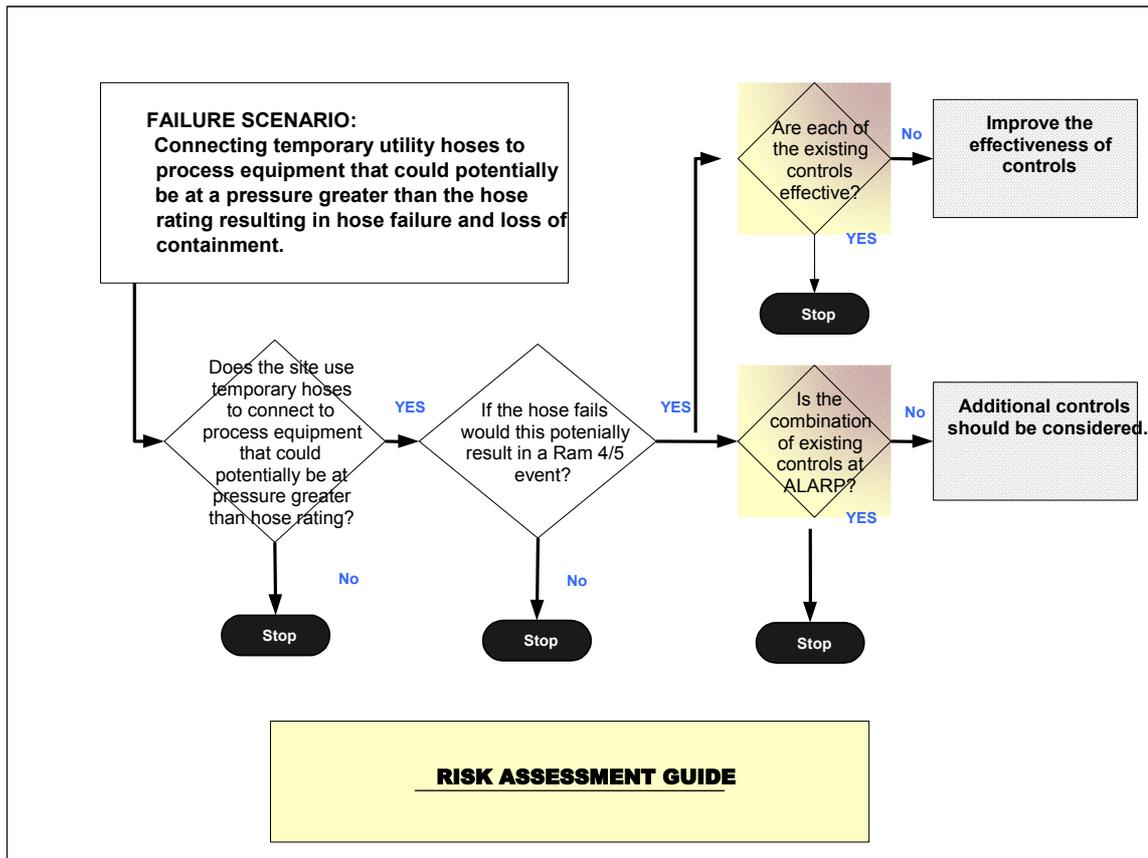
The following process steps are offered as a guide to do this risk assessment:

- Does the site use temporary hoses to connect to process equipment that could potentially be at pressure greater than hose rating?
- If the hose fails would this potentially result in a Ram 4/5 event?

For cases where both the above conditions are true, perform a risk assessment to determine the following:

- Existing controls (barriers/recovery measures) are adequate or whether additional measures should be employed to achieve ALARP.
- Each of the controls that are in place to prevent the incident is effective.

The risk assessment guide attached below is provided to help guide the risk assessment:



More Information and Data Sources:

The information and data sources listed below are provided to assist you if more information is desired or needed regarding the subject of this alert:

- SGSI Learning from Incidents Coordinator
- SGSI – GSEI
- LFI Alert 200505 – HVU Fire from steam hose

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