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**Question 29: The relief valve on the acid storage drum on our HF Alkylation unit was designed to be rotated to relieve to the atmosphere during unit turnarounds when the unit flare system is unavailable. Is this still common practice, or have you made arrangements to provide access to another flare system during turnarounds?**

**Michael Windham** (UOP)

Some refiners do disconnect the outlet of the acid storage drum relief valve from the relief header and align it to atmosphere during turnarounds. This situation is very similar to the acid truck that delivers the fresh acid to site. As discussed in the 2009 NPRA Q&A responses for Question 1 in the Gasoline session, the situation is not a normal operating configuration and should be carefully analyzed for potential hazards at that particular location. If the acid storage drum relief valve outlet is aligned to atmosphere during a turnaround, the storage drum should be blinded to minimize the area that could possibly contain acid. The area around the acid storage drum should be clearly marked and cordoned off and no maintenance should be allowed within or above this area. Since the only relief case in this situation is a fire case, no combustibles should be allowed near the acid storage drum and no hot work should be permitted in that area. Procedures and training for the turnaround should include a notification to personnel that there is acid in the storage drum and that entry to the area is not permitted.

**Erik Myers** (Valero)

Several of our sites do swing the acid storage drum PSV to atmosphere during turnarounds. Others have alternate flares or bypass around the neutralizing system. One site has transferred their acid off site during the turnaround period. Each option should be carefully reviewed with risk analysis and safeguards implemented based on the refinery configuration and turnaround work scope. Every effort should be made to minimize the amount of hydrocarbon that is transferred to the acid storage drum during the unit de-inventory.

**Brad Palmer** (ConocoPhillips)

Refinery personnel are to determine their acceptable alternate routing of the acid storage drum PRV when the ARN and acid flare system are out-of-service, and the drum contains acid inventory. For this situation, the scenario that would cause an overpressure in the acid storage drum is an external fire, which is unlikely since the unit is shutdown. Due to specific unit layout and geography, each refinery should identify routing options and perform a site-specific safety and risk assessment considering location and quantity of hydrocarbons and HF acid in the area, location of personnel during the turnaround in relation to the storage-drum PRV discharge, location and operability of fire water

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equipment used to protect the acid storage drum, and use of a drum pressure indicator with high pressure alarm to alert an increasing drum pressure prior to possible PRV release.

The typical options for the PRV routing include atmosphere, neutralization pit and non-acid flare. Some additional considerations for these options are as follows:

- PRV discharge to the atmosphere (most commonly used throughout the industry). Consideration should be given to minimizing the potential consequence of leaking HF from a PRV not fully seated or alarming if such a leak occurs. This may be accomplished by using a PRV that has recently been leak tested or by using a rupture disk immediately upstream of the PRV. If a rupture disk is used, then pressure indication is needed between the rupture disk and the PRV to detect any possible rupture disk leak. A leak in the rupture disk will equilibrate the pressure on sides of the disk, increasing the required process pressure to burst the disk. Use of an HF detector on the discharge of the PRV should be considered to alarm a possible PRV leak.
- PRV discharge to a neutralization pit through submerged discharge line with or without a distributor. Consideration should be given to relief scenario discharge quantity; how effective a submerged discharge dissipates the vapor in the neutralization material and how to contain splashing of neutralization material during a relief case.
- PRV discharge to a non-acid flare. Consider the impact of an HF PRV release to a wet, non-acid flare. If an HF PRV is relieved to the non-acid flare, then the flare system should be inspected to evaluate its integrity from corrosion and/or fouling.

## **Kurt Detrick (UOP)**

Question 1: What do you do with your HF acid unit inventory during turnarounds?

There are actually a few different options for storing the HF (hydrofluoric) acid inventory during turnarounds, and the best choice usually depends on the specific location and situation. No matter what choice you make, it is really important to properly analyze that choice or that location for potential hazards and that the team that does that should include people from operations, engineering, maintenance, and also the safety and emergency response, so you need a full team to look at this.

These situations where the unit is not running in the usual mode deserve special attention. One option that you can use (and the most common option) is to transfer the acid to the acid storage drum and then isolate that acid storage drum from the rest of the unit. One concern with this approach is where to put (or direct) the outlet of the acid storage drum safety relief valve when the scrubber is down for maintenance. Most units will plan the turnaround work to minimize the time that the scrubber is down and then during the time that it is down, they will direct the acid storage drum safety relief valve to the atmosphere. I have also heard some people put it to the pit. No matter what you do there, it needs to be particularly scrutinized during the hazard review to make sure that it is the right thing to do for that specific situation and location.

Note that during the time that the relief valve is not going to the scrubber, the acid storage drum should

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be blinded from the rest of the unit. It should be empty of flammable materials. You should get as much isobutane out of there as you can when you shut down so that the only relief case is a fire case and the likelihood of a fire of any size is quite low.

Another concern with keeping the HF in the storage drum is accidental mechanical damage and this area should be cordoned off so that no work gets done inside or nearby the acid storage drum during the time when it is holding the acid. The other thing that you should pay special attention to is to not make any crane lifts that would involve the area over or adjacent to the acid storage drum, or close enough where it might involve some piping there if the lift winds up being dropped.

A second option that you can think about is transferring the acid to a dump drum during the turnaround. This is really similar to the acid storage drum option; just that the dump drum is oftentimes a little more remote from the unit, so it might be a good idea for some folks.

A third option is neutralizing and disposing the entire unit inventory of HF. That is kind of a tough one to do. You would have to do it very slowly and carefully. There is a lot of heat generated with this and a lot of expense and waste disposal. It is generally not an attractive option.

Another option would be to transfer the HF to trucks and transport it to another operating unit, and there is one acid supplier who will help you with that chore. They cannot store it in their trucks, but they will take it to another unit and unload it into that unit if, that is, the unit is willing to accept it.

A fifth option would be to transfer the HF to railcars and these can be used for storage. It has been done in a couple of cases. But of course, there, you need to have rail access to the unit and away from it and have a rail-accessible location where you can store it, and all of the same relief issues are present as would be if you stored it in the unit. It is just a little bit more remote from the unit.

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