

Follow-up and Audit
Reports - 1997

DO A 036553
CONFIDENTIAL

Leblanc, Gretchen

To: Wagener, Gerald
Subject: RE: Caustic/CA2 Rx Chem review
Sensitivity: Confidential

Those look quite fair to me; and we are already working on all four of the items anyway.

Thanks,

Gretchen

From: Wagener, Gerald
Sent: Monday, February 17, 1997 2:13 PM
To: Leblanc, Gretchen
Cc: Wagener, Gerald
Subject: Caustic/CA2 Rx Chem review
Sensitivity: Confidential

Gretchen,

Please review and let me know if you agree. I will wait to hear from you before I send this to Howard Wilkinson.

Thanks,
Gerald

Caustic/Chlor-Alkali 2 Consolidated Audit
Reactive Chemicals Review
Review date February 13, 1997

Review team: Mark Mitchell, Buck Bailey, John Gross, Don Jones, Joe Schell,
Gerald Wagener

During the "walk-through" inspection, a spot check of the plant's documentation of the reactive chemical hazards was done. The results were excellent--Pertinent reactive chemical hazards and lines of defense are clearly listed. Included are previous review packets with worse case scenarios, concerns/responses from previous reviews, rx chem data files, incident files, scenario training info, vital process safety requirements, Chlorine Institute NCL3 pamphlet, Rx Chem matrices, Sealants database, operating limits and consequences of deviation.

Also, random interviews of the operations personnel were done to check the deployment of reactive chemical knowledge. Five out of six employees interviewed scored 92 - 100% indicating that the plant's reactive chemical training program is excellent.

Recommendations:

1. (MUST DO) Scenario: Backflow of dry chlorine through E-201/E-202 titanium exchangers during activation of venturi scrubber (see chlorine plant incident below).
Recommendations: Determine if there are any credible backflow scenarios and, if so, consider adding a water spray on the outlet of these exchangers.

Incident No: 93-0011 **Incident Date:** 02/93

While starting a liquid chlorine pump, an operator accidentally bumped open a block valve allowing liquid chlorine into the sniff header. This over pressurized the cell header tripping a rectifier and the train. The venturi scrubbers were activated and the dry chlorine gas was pulled back through a titanium exchanger. A titanium/chlorine reaction occurred which damaged approximately 10 percent of the tubes that had to be plugged. There were no injuries but repairs were estimated at \$18,000.

2. (HIGHLY RECOMMENDED) Scenario: Sulfuric acid carry-over into the purification area.
Recommendation: Consider performing taffy pot sulfate analysis on a quarterly basis.

3. (HIGHLY RECOMMENDED) The reactivity of titanium with dry chlorine is well known and is documented in the plant's reactive chemical files. Less known are the conditions for reactivity of titanium with WET chlorine.

Recommendation: Consider adding a section to the plant's reactive chemical files that show the safe and dangerous temperatures and partial pressures of water for wet chlorine and titanium. (G. Wagener will provide this information).

= 3 complete 3/4/97 EsclerBlanc

4. (HIGHLY RECOMMENDED) When updating the IPT modules, consider adding pertinent reactive chemical hazard/worse case scenario information from the plant's reactive chemical files to the IPT companion manuals.

Leblanc, Gretchen

From: Wagener, Gerald
Sent: Monday, February 17, 1997 2:39 PM
To: Leblanc, Gretchen
Cc: Wagener, Gerald; Schell Jr, Joseph G
Subject: RE: Reactive Chemicals Documentation Upgrade

Gretchen,

I've added some comments to your write-up below.

In regards to titanium, I will send you a recent article that John Gross gave me on the safe use of titanium in chlorine. It comes from 'Modern Chlor-Alkali Technology' Vol 6. The conclusions they list are as follows:

1. Below about 13 deg C, water vapor pressure becomes too low to be safe with titanium in chlorine.
2. Water contents below 0.37 wt% are dangerous. Even under flowing conditions and with chlorine hydrate forming, ignition is still possible.
3. Up to about 70 deg C the minimum water content to prevent a fire is flowrate-dependent and to a lesser extent temperature dependent.
4. At higher temperatures (75 deg C and up) exponentially more water is needed for safe conditions.
5. The unstable transition area between safe and dangerous conditions depends on mass transfer of water to the metal surface and should be avoided

From: Leblanc, Gretchen
Sent: Monday, February 17, 1997 1:24 PM
To: Gross, John W.; Wagener, Gerald; Schell Jr, Joseph G
Cc: Leblanc, Gretchen
Subject: Reactive Chemicals Documentation Upgrade

Gerald, Joe and John,

Thanks again for participating in our review and for making several suggestions with regard to improvement of our documentation. Before I modify the documents, I want to insure that the statements are correct as there was some discussion on specific temperatures, etc., during the review. Please respond as you can with the information.

- ✓ 1. (See above note) At elevated temperatures (>150 C, 300 F), wet chlorine will react with titanium.
- ✓ 2. (See above note) At very low temperatures (<-8 C, 18 F), rapid condensation of wet chlorine will occur, resulting in the chlorine taking on the characteristics of dry chlorine.
- X 3. ~~Freon 123 can combine with chlorine to produce a flammable and reactive mixture.~~ *not so per Gerald Wagener*
- ✓ 4. Tantalum is attacked by caustic and its use should be avoided.
- ✓ 5. Chloroethene and other chlorinated organic cleaning agents should not be used in caustic service. Exothermic reactivity with caustic varies depending on the structure of the chlorinated organic. Flammable and explosive chloro and dichloroacetylenes can be formed and in some cases it is possible to form unstable and highly reactive dichlorocarbenes.

Thanks, in advance, for your response.

Gretchen LeBlanc

$$100^{\circ}\text{C} = 212^{\circ}\text{F}$$

100

$$^{\circ}\text{C} \times \frac{9}{5} + 32 = \text{F}$$