



1 b - Evaluation of Risks Related to the Transport of Anhydrous Ammonia and Their Mitigation by Localized Small Scale Production

Dennis G. Lippmann – *Uhde Corporation of America*

Q: Dorothy J. Shaffer, Baker Risk

The paper references a report that identifies a very large footprint for a danger zone related to an ammonia railcar rupture. However, the referenced report appears to apply to the worst case for a TIH such as chlorine or ammonia. Were you able to verify the footprint reference applies to NH₃ and not the much more toxic chlorine?

A: Dennis Lippmann

The referenced report estimated the following danger zones for a sudden release from a 90 ton railcar based on dispersion models:

	ERPG-2 level	Urban accident site	Rural accident site
Chlorine	3 ppm	14 miles	>25 miles
Ammonia	150 ppm	4.9 miles	7.8 miles

1 c - Multi-Layered Secondary Urea Reactor Failure

Marc Gilbertson – *CVR Energy*

Daniel J. Benac, P.E. – *BakerRisk*

Q: Ken Lamb, Linde Engineering

The lack of “buttering” was a root cause. Was this a failure of engineering (i.e. weld procedures without buttering were approved) or manufacturing (i.e. weld procedures not followed)?

A: Marc Gilbertson

Initially we thought that the buttering procedure had not been followed by the manufacturer because of the

In saying that we gave a close-out presentation before changes were made so the operators would not see the new set-points and bridge them out or defeat alarms, because the set-point was different for no reason.

Q: John Mason, Agrium

The remaining creep life was determined through modeling. Was any validation of the model results done through destructive or non-destructive testing?

A: Luke Bateman and James Widrig

Yes. Creep life was determined by a combination of factors including past destructive tests of tubes, continual diameter measurements by both the Laser Optic Tube Inspection System, LOTIS[®] and direct diameter tape measurements, plus material data and tests supplied by the vendor. When we call for creep rupture testing in our new reformer tube spec we ask for longer test times (e.g. 200+ hrs per heat #) at lower temperatures and lower induced stresses, because the usual short-term stress rupture tests are done at abnormally high temperatures and stresses to artificially produce a failure in a shorter time frame. This, therefore, may introduce a different failure mode to the long term low stress creep failures we are trying to emulate for more accurate creep life data. Hence our vendor curves for min mean and max creep data are more valid, and this has been confirmed by destructive testing old tubes.

Q: Ken Lamb, Linde Engineering

Is the use of the IOW approach considered supplemental to Risk-Based Inspection (RBI) or as a replacement for/alternative to RBI?

A: Luke Bateman and James Widrig

IOW supplements RBI. No changes are generally made to our RBI based on IOW results, but the plant's RBI is a good starting point for an IOW study. Remember that IOW assesses the most likely mode of failure for a given item of equipment, then assigns limits based on desired lifespan, to the process variable that drives the failure mode. Therefore, RBI is a good starting point for IOW because the failure modes have already been risk assessed.

2 d - Steam Reformer Pigtail Failures

Charles Ormsbee – *Agrium Inc.*

Q: Kang Xu, Praxair

Did you notice a change in pressure drop when the outlet pigtail changed from sch. 160 to sch. 80?

A: Charles Ormsbee

The line size changed from 1" to 1 ¼" as well the schedule change. There is no record of us measuring the pressure drop in this portion of the inlet piping. A reasonable conclusion is the pressure drop did decrease since the cross section area of the inlet pigtail did increase.

Q: John Turon, Orica

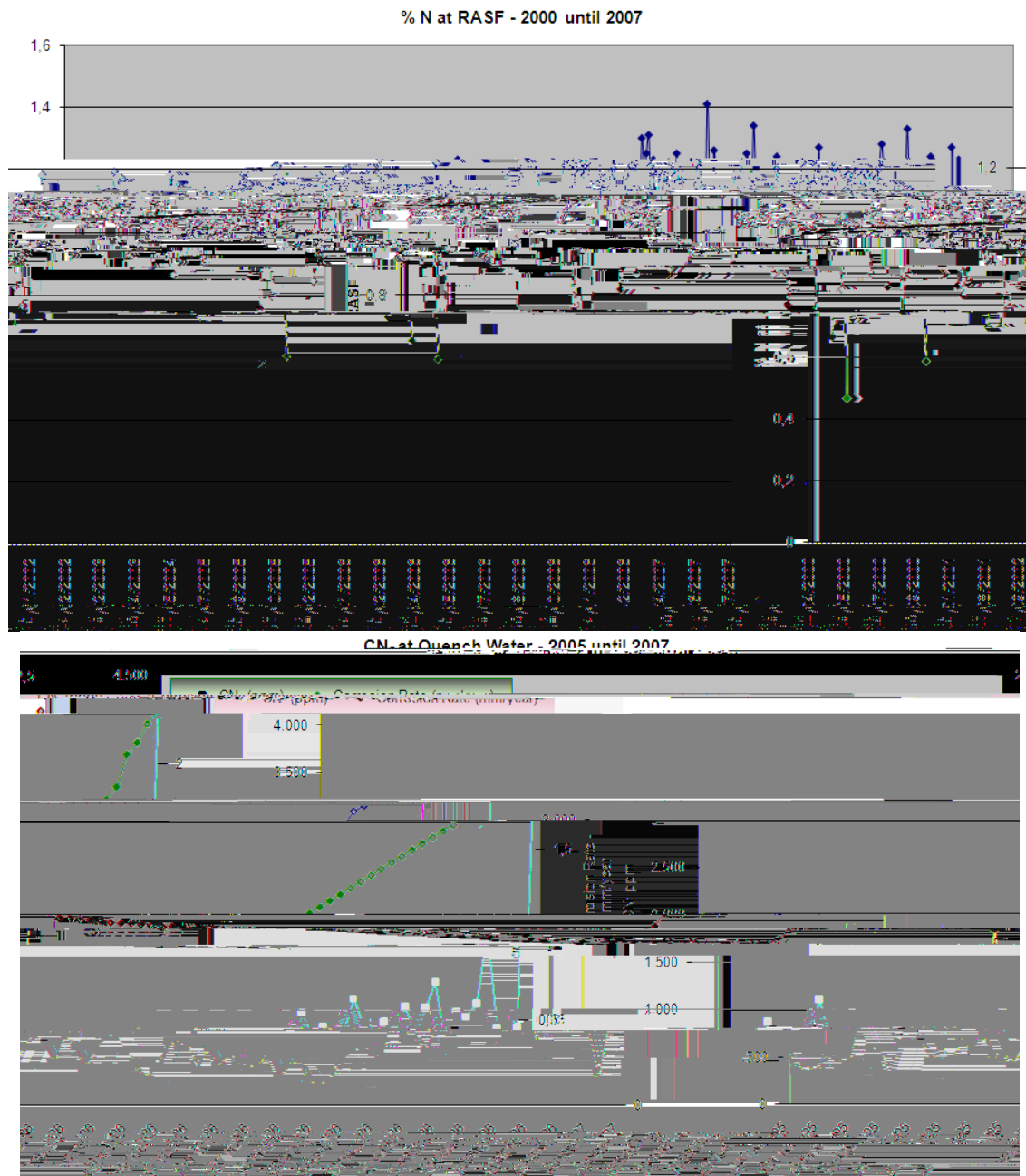
Did the management of change process apply to the new design?

A: Charles Ormsbee

MOC process did apply to this project but the review process did not apply to the new design.

A: Nestor Reis Neto

The feedstock used in Vale Fertilizantes Araucária depends strongly on the petroleum processed by the refinery. As we can see in picture above, when the levels of N at RASF and CN at quench water increased, the corrosion rate increases too.



Q: VK Arora, PE

Did you review the options to remove HCN?

A: Nestor Reis Neto

Unfortunately, the feedstock composition can't be changed because it depends on the petroleum used at the refinery to produce the RASF, and we didn't find an attractive option to remove the HCN produced during the process.

Q: Ken Lamb, Linde Engineering

The paper noted erosion and corrosion at the inlet to the POx Reactor WHB. What counter measures were taken for corrosion? What about erosion?

A: Nestor Reis Neto

Q:

A: John Li

The metallurgical evaluation was not able to determine the point of origin for the fracture. Half of the core sample was kept by the owner. We believe that the point of origin was in that sample.

Q: Kang Xu

What was the hardness measurement on the sample?

A: John Li

A maximum hardness of 38 HRC was measured in the weld metal adjacent to the fracture.

Q: Kang Xu

Comment: This material requires production hardness test.

A: John Li

Correct. For this kind of closing seam, KBR now recommends the hardness measurement should be taken every 3 linear feet of the welding length, at the location on the weld, the HAZ, and the base metal.

Q: D.H. Timbres, D. & E. Consulting Inc.

Was joint locally post weld heat treated (PWHT) initially?

A: John Li

The failure occurred in a closure weld which was locally PWHTed.

Q: D.H. Timbres

What is the cracking mechanism?

A: John Li

The brittle fracture was caused by high stresses in a low toughness material.

Q: D.H. Timbres

Was any hardness taken initially at OD & ID?

A: John Li

Hardness testing was required by the vessel mechanical specification. Only one hardness testing was done in the failure area.

Q: Mukul Srivastava – IFFCO Phulpur, India

What were the indications available in control room to confirm this leak? Or was it based on the operator feedback about leakage as it may have been leaking for quite some time?

A: John Li

There was no indication in the control room that there was a leak. The leak was detected by the smell of ammonia as well and whistling sound at the vessel site.

Q: Mukul Srivastava

Was any pressure test carried out after the repairs to confirm the integrity of the repair?

A: John Li

No pressure test was performed after the repair.

Q: Mukul Srivastava

What are the short term and long term plans to make it a reliable equipment?

A: John Li

The short term plan was to make the repair and perform NDE to verify the quality of the repair. The long term reliability will be verified by performing inspections of the repair area during all future outages.

Q: Gustavo Matute, Pequiven

When you repair the ammonia converter nozzle, do you change the ammonia catalyst or repair the nozzle with catalyst installed?

A: John Li

The repair was made without removing the catalyst and the basket from the leaking converter. The catalyst basket was protected by N2 purging during the repairing period.

carbon steel is exposed, the hardware must be replaced to prevent rot on the wooden members. Stainless steel hardware will not require such a continuous upkeep.

Q: VK Arora, PE, Kinetics Process Improvements

What is the process performance of cooling tower in terms of approach temperature and range?

A: Travis Kunnemann

The new tower was designed for a 13 degree F approach to wet bulb temperature.

Q: VK Arora, PE

Assume fills are splash pipes (of PVC); how are they supported?

A: Travis Kunnemann

The fill is supported at the bottom of each cell by a number of support columns that are anchored to the basin floor.

Q: Ahmed Attyub, Fauji Fertilizer, Bin Qasim (Ltd)

Was equal size risers installed at the outlet of cooling water return line?

A: Travis Kunnemann

Yes, however butterfly valves are used to control the proper distribution of flow to each cell.

Q: Ahmed Attyub

What measures are taken to avoid failures?

A: Travis Kunnemann

Several areas of failure were engineered out of the new tower by design as referenced in the paper. The structure of the tower is inspected routinely like other concrete support structures throughout the plant.

4 a - To Minimize Risks of Catastrophic Failure in Urea Plant Process Lines Requires RBI Methodologies

Alex Scheerder – *Stamicarbon BV*

Q: Stuart Ford, Methanex

What are the effects of applying steam tracing directly onto process pipework? You mentioned this affects the corrosion rate? Steam tracing is usually located directly on pipework?

A: Alex Scheerder

Tracing should be installed onto spacers to avoid direct contact with the pipeline. This will reduce the risk for contact corrosion at the outside. In the described case history, the issue was that the tracing most probably did not heat the pipe uniformly, but only at one side. This resulted in the corrosion presented.

Q: Reinaldo Caldera V, Petroquímica de Venezuela

Regarding the specific failure shown in Case 3 “Failure weld-o-le

A: Alex Scheerder

Several sources can be present in the industrial area of the urea plant. But also presence of urea in the atmosphere can cause nitrate SCC under insulation.

Q: Sabry El-Sanadedy, EBIC

What was the root cause of gas line failure?

A: Alex Scheerder

The root cause is not clear yet. However the failure started at the process side and did not start from the outside (CUI). We feel that the damage is related to up-set conditions which happened in this particular case.

Q: Ruben Wageck - Vale Fertilizantes

What do you know about authorities requiring periodic inspections of piping in other parts of the world? In Brazil, the government asks only to inspect equipment items.

A: Alex Scheerder

We know that in European countries for instance, authorities also include piping in inspection programs.

4 b - Reliable Des

4 e -

potentially stressing the LTS pellets with vaporized water, the recovery of the LTS allows performance to be regained as presented in the case study.

Q:

Q: David L. Steed, GrowHow UK Limited

A: Nikhil Das

We've not pursued that option but it would have prevented in the incident in question.

Q: Venkat Pattabathula, Incitec Pivot

Did you have a high level trip system on process condensate stripper?

A: Nikhil Das

No, we did not. However, since this incident we've made a combination of high level PLUS cool temperature at the mixed feed coil to initiate a stop of stripping steam but have not yet required this trip to come into play.

5 d - Ammonia Plant Capacity Increase by Autothermal Reforming and Dual Pressure Synthesis

A: Ron de Rijk

Yes, plugs can be removed without damage to the tube by means of a Removal Tool,