

Agrium

Kenai Nitrogen Operations

Ammonia Loading & Storage, System 24 Process Hazards Analysis Revalidation

Final Report

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SECTION 1.0 – ABOUT THIS STUDY

The Process Hazards Analysis, K24S0004, conducted over a three-month period concluding in August of 1993, was revalidated in May of 1998, and revalidated for a second time during the week of August 19-23, 2002. The original PHA, as well as both revalidations, focused on the Kenai Plant's System 24, which includes the Ammonia Storage and Loading System.

EPA RMP 40 CFR Part 68 Section 112 (7) and OSHA Rule 1910.119, "Process Safety Management of Highly Hazardous Chemicals" requires that the initial Process Hazard Analysis (PHA) for a covered process be updated and revalidated by a knowledgeable team **at least every five years**. The objective of PHA revalidation is to assure that the PHA is consistent with the current process. The PHA is revalidated by evaluating and addressing the following questions:

1. Have significant new hazards been created or introduced into the process?
2. Has the possible occurrence of a catastrophic release in the process unit become significantly more likely?
3. Have consequences of previously identified toxic or flammable material releases become more severe?
4. Have consequences that could go "off-site" been identified?
5. Have previously identified safeguards become compromised or challenged?

METHODOLOGY

Baseline PHA

The Initial Process Hazards Analysis (PHA) was conducted primarily using the "HAZOPS" (Hazard and Operability Study) technique. In a HAZOP, the team uses a creative, systematic approach to identify hazard and operability problems resulting from deviations from the design intent of the process that could lead to undesirable consequences. An experienced team leader systematically guides the team through the plant design using a fixed set of words (called "Guide words"). These guidewords are applied at specific points or "study nodes" in the plant design and are combined with specific process parameters to identify potential deviations from the plant's intended operation. For example, the guideword "No" combined with the process parameter "flow" results in the deviation "No Flow." The specific steps of the HAZOP methodology used in the baseline PHA were:

- Choose study node
- Apply a deviation (parameter + guideword)
- Brainstorm causes of the deviation
- For each cause, identify ultimate global consequences
- Identify existing safeguards
- Qualitatively assess the risk of the scenario
- If warranted, make recommendation(s) to reduce risk and/or improve the operability of the facility

This process is repeated for each deviation and node until the entire process has been analyzed.

Revalidation

There are several processes by which the initial system study may be revalidated. The PHA procedure used to revalidate System 24 Ammonia Loading & Storage was the node-by-node review of the original PHA. This methodology was organized into the following tasks, and are described below:

1. Collection of Information
2. Information Review
3. Revalidation Study Sessions (with PHA Team)

The revalidation conducted in 1998 used the Guideword/Checklist method. See File K24S04R1 for worksheets.

Collection of Information

The following information was collected prior to the Revalidation Study Sessions:

1. Baseline PHA and previous revalidation, including worksheets, Action Item list, P&ID's reviewed, and status of recommendations.
2. Documented changes to the design or operation of the process since the last revalidation (including MOC's).
3. Documented incident reports from this unit.
4. Latest revision of Piping and Instrument Diagrams (P&ID's) that describe the process.
5. Other Process Safety Information, such as PRV design basis and data and Standard Operating Conditions and Limits (SOCL's).
6. HAZOPS performed on System 24 since the 1998 Revalidation.

Information Review

The Revalidation Team Leader/PSM Assistant reviewed the collected information prior to the study dates. The purpose of the Information Review is to screen the baseline PHA and latest revalidation for content and quality, and to identify concerns and issues that need to be reviewed by the Revalidation Team during the study sessions. This resulted in the generation of an agenda, or work plan, for the sessions. The Information Review included the following tasks required to identify items for discussion with the team:

1. Review the baseline PHA and complete the Initial PHA Content Checklist, see Attachment 2, and the Baseline PHA Screening Checklist, see Attachment 3. Evaluate the baseline PHA to ensure that off-site consequences were adequately discussed and addressed.
2. Review and verify the documented status of recommendations from the baseline PHA, other revalidations, and any project PHA affecting this unit.
3. Review all incidents occurring in the system since the last revalidation, and develop a list of those pertinent to the revalidation process.
4. Develop a list of all undocumented changes that have occurred to the design or operation of the process since the last revalidation. This is done by comparing the latest P&IDs with the P&IDs reviewed during the previous revalidation, and by reviewing those changes to the design or operation of the process with the ones that have been analyzed by the MOC process. No undocumented changes were revealed during the review process.
5. Develop an agenda, or work plan for the study sessions, see Attachment 1.

Revalidation Study Sessions (with PHA Team)

The revalidation study was discussed and prepared by a multi-disciplined team knowledgeable in the process and in the PHA method used. At the beginning of the session, the Team Leader reviewed the PHA revalidation scope and purpose. The group was then lead through the revalidation procedure, which included:

1. General discussion regarding the status of open recommendations from the baseline PHA and previous revalidation, See Attachment 4;
2. Discuss and verify completion of MOC's worked since the 1998 Revalidation;
3. Discuss Previous Incidents with open recommendations, See Attachment 14;
4. Perform a node-by-node review of the original baseline PHA.

Other Issues

The Revalidation Team did not review Node 26 nor other sections entitled "Facility Siting" of the original system PHA. This node and other sections were not reviewed because an engineering contractor, EQE, completed a facility wide siting evaluation and report in 1997. For more details on that study, see PHA-K00S0056.

During this second round of system revalidations, an engineering review will be conducted of all relief valves in the systems undergoing revalidation. There are 70 relief valves (PSV's) in System 24. The set pressure and relieving capacity of these relief valves is being reviewed to ensure that the existing relief valves are properly designed for the current operating conditions. Any relief valve design deficiencies will be documented in the PSV files and engineering recommendations for correction will be issued as PHA recommendations. This engineering review is currently underway for System 24 with a target completion date of yearend 2002. Any PHA recommendations that result from this engineering review will be issued in a separate report.

Compliance with OSHA Rule 1910.119 and EPA RMP Rule

This study complies with OSHA rule 1910.119, "Process Safety Management of Highly Hazardous Chemicals" and EPA 40CFR Part 68 Section 112, "Risk Management Program."

In particular, this study complies with paragraph (e, 6) of the OSHA rule that states; "At least every five years after the completion of the initial process hazard analysis. The process hazard analysis shall be updated and revalidated by a team, meeting the requirements in paragraph (e)(4) of this section to assure that the process hazard analysis is consistent with the current process." The study also complies with Subpart D (68.67) of the RMP Rule covering the same requirements as OSHA 1910.119 and potential off-site consequences.

The study was completed within five years of the baseline PHA. A multi-disciplined team, including at least one person with knowledge and experience in the process, discussed and prepared the study in a manner to ensure that the baseline PHA is consistent with the current process.

Process Hazards Analysis Team (e, 4)

The PHA Revalidation was discussed and prepared by a team with expertise in engineering and operations, with at least one employee having specific expertise in the process being evaluated. The study team consisted of the following people:

Name and Resume Status	Title	Years of Experience	Sessions Attended
America Dukowitz	PSM Assistant/PHA Leader	5	5
Chuck Bergonzini	Safety Specialist	20	1
Darrell Ellis	A Operator, Plant 4	12	2
David Goggia	Unit Coordinator, Wharf	10	5
Gary Auldridge	A Operator, Plant 1	20	2
Larry Brackett	A Operator, Plant 4	28	3
Loran Maggi	Electrical Foreman	22	1
Michael Thompson	Mechanical Engineer	5	4
Michael Warfield	B Operator, Plant 1	8	2
Russell Peterson	Chemical Engineer	27	5
Scott Carter	Day Supervisor, Wharf	5	1
Steve Maltby	Environmental Specialist	11	1

Process Description

System 24 consists of the Ammonia Loading and Storage System.

At Kenai Nitrogen Operation, there are two units producing liquid ammonia for internal use and for external sales. The ammonia produced in these units is stored in two liquid ammonia storage tanks, F623 and F723. The liquid is received into these tanks by -28°F .

The pressure in the storage tanks is dictated by the vapor pressure of ammonia. Therefore, by controlling the temperature of the product in the tank, the pressure in the tank is also controlled. As the liquid ammonia flashes off, the vapors are collected and compressed in a ViltersTM package refrigeration system. Each system contains four compressors, two low-stage and two high-stage, which compress the vapors from nearly atmospheric pressure to approximately 190 psig. The compressed ammonia vapors are cooled, liquefied, and returned to the Ammonia Storage Tank. Either of the refrigeration systems can control pressure on either or both storage tanks.

In the event that pressure control systems do not function or cannot control pressures, an Ammonia Storage Tank Flare has been installed to combust the ammonia vapors prior to atmospheric release. Venting to the flare is a manual operation that is activated from the Plant 1 Control Room. In the event pressure excursions still persist, each tank is equipped with numerous pressure/vacuum relief devices that open to the atmosphere.

Liquid ammonia from the storage tanks is pumped either to Agrium's Urea plants or to the wharf for loading onto ships for external sales. System 24 does **not** include the pumps and equipment necessary for transferring liquid ammonia to the on-site Urea plants. Ammonia is pumped to the wharf with pumps G-632 A&B and/or G-732 A&B at a rate of approximately 500 short tons per hour. The liquid ammonia is loaded onto ships through an ammonia-loading arm that is attached to the ship's manifold.

Study P&IDs

The following Process & Instrument Diagrams (P&IDs) were studied during the PHA:

P&ID	DESCRIPTION	REVISION
R1I-1090	Plant #1, Vilters	11
R3I-3120	Plant #3/6, Ammonia Storage & Loading	20
R3I-3130	Plant #3, Wharf	11
R4I-4220	Plant #4, Vilters	7

Due to the size of the P&IDs used for this study, the actual drawings will not be included in this report. The P&IDs used during the study have been retained by Agrium Kenai Nitrogen Operations, PSM Group, and will be maintained in the PHA Revalidation P&ID file drawer.

Other Available PSI

Operating Procedures, Standard Operating Conditions and Limits (SOCLs), and Material Safety Data Sheets were available for review by the revalidation team as needed. Included in the SOCLs are the consequences of deviating from established safe operating limits. Design criteria and maintenance history for relief devices in this system were available for review as necessary.

SECTION 2.0 - RECOMMENDATIONS

No recommendations or action items were generated as a part of this study.

SECTION 3.0 – STUDY WORKSHEETS & ATTACHMENTS

The following documents were utilized throughout the PHA Revalidation Process. If you require more information, please ask for file K24S04R2.

- Attachment 1 Revalidation Agenda
- Attachment 2 Initial PHA Content Checklist
- Attachment 3 Baseline PHA Screening Checklist
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