December Public Meeting

The Meeting Will Start Shortly

U.S. Chemical Safety and Hazard Investigation Board

Nitrogen Oxides (NO_x) Releases at Austin Powder Facilities

CSB Public Business Meeting

Cruz Redman

Elle Snyder

Melinda Hartz

December 11, 2025

U.S. Chemical Safety and Hazard Investigation Board

Incident Overview – Austin Powder Red Diamond

U.S. Chemical Safety and Hazard Investigation Board

- McArthur, Ohio
- June 11, 2025
- Release of NO_x for over 3 hours
- Company-estimated release: 3,945 pounds of NO_x from emergency pressure relief valve (left) and process vent (right)
- 85% nitric acid tank overheated, creating NO_x gas
- Zaleski, Ohio evacuated and no-fly zone established
- No injuries were reported

Incident Overview – U.S Nitrogen

- Midway, Tennessee
- November 24, 2024
- Subsidiary of Austin Powder
- Two releases of NO_x: 6:47 a.m. and 8:42 a.m.
- Company-estimated release: 910 pounds of NO_x from exhaust stack
- Both were failed startup attempts in the nitric acid production unit
- No injuries were reported

Investigation into both incidents is ongoing.

Accurate Energetic Systems

Public Business Meeting

December 11, 2025

U.S. Chemical Safety and Hazard Investigation Board

Incident Overview

Credit: WTVF News 5 Nashville (www.newschannel5.com)

Summary

- On October 10, 2025, at 7:47 a.m., approximately 23,000 pounds of explosives were involved in multiple detonations and fires in Building 602 at the Accurate Energetics Systems (AES) facility in McEwen, Tennessee
- AES manufactures explosives for commercial and military use
- Building 602 housed operations where explosives were melted and poured into booster charges

Consequences

- The explosion fatally injured 16 AES employees
- 9 non-fatal injuries
- Complete destruction of Building 602

Background

U.S. Chemical Safety and Hazard Investigation Board

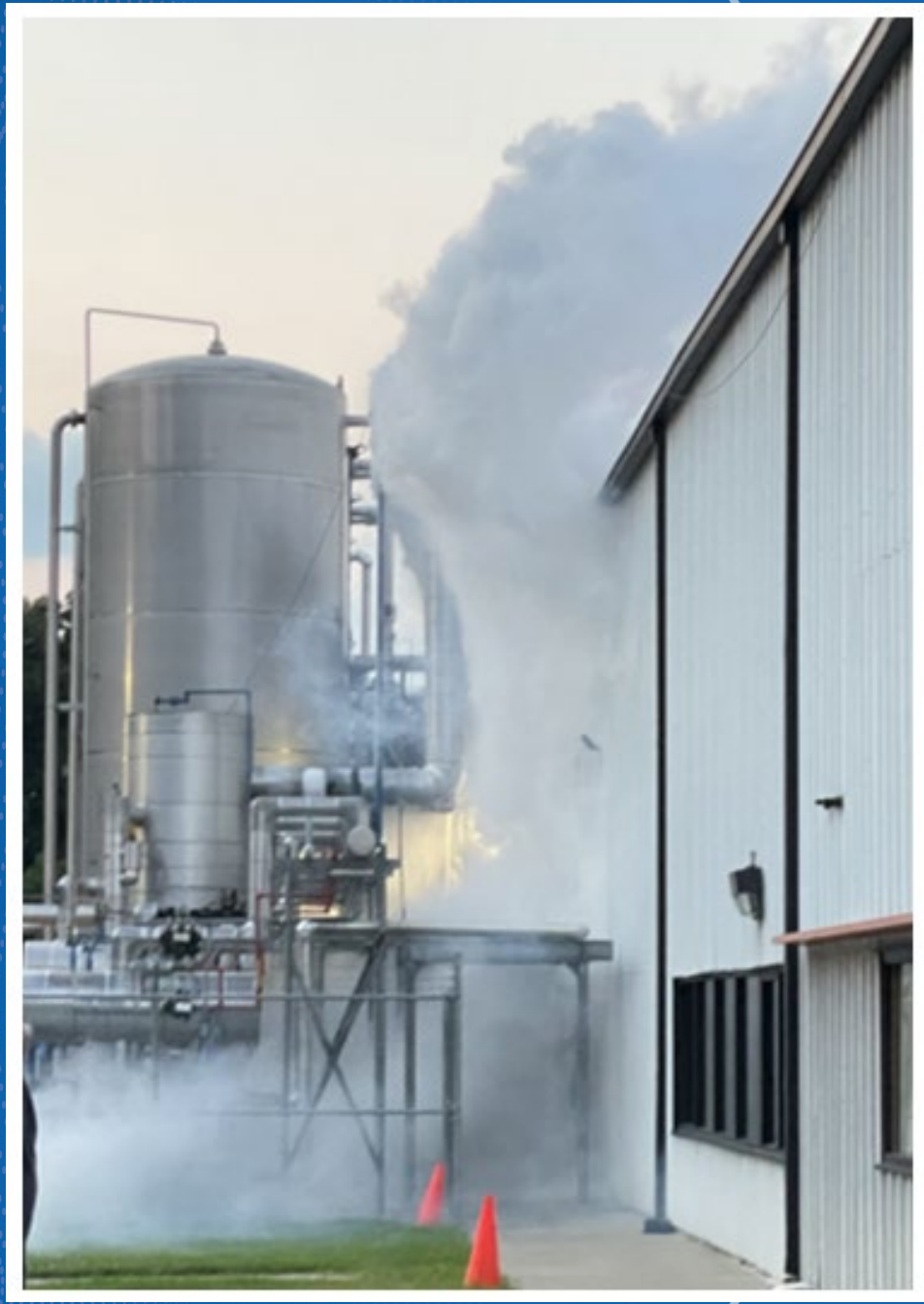
Response

- ATF and local emergency responders immediately responded to the incident. ATF took control of the site between October 10-24, 2025
- The CSB deployed 2 investigators on October 29, 2025, to interview personnel, gather evidence, and collect documentation

Ongoing Investigation

- Continued interviews with AES employees
- Additional site documentation
- Potential cause identification
- Assessment of causal factors

Credit: AES (www.aesys.biz)



Hazardous Ammonia Release at Cuisine Solutions, Inc.

CSB Public Business Meeting

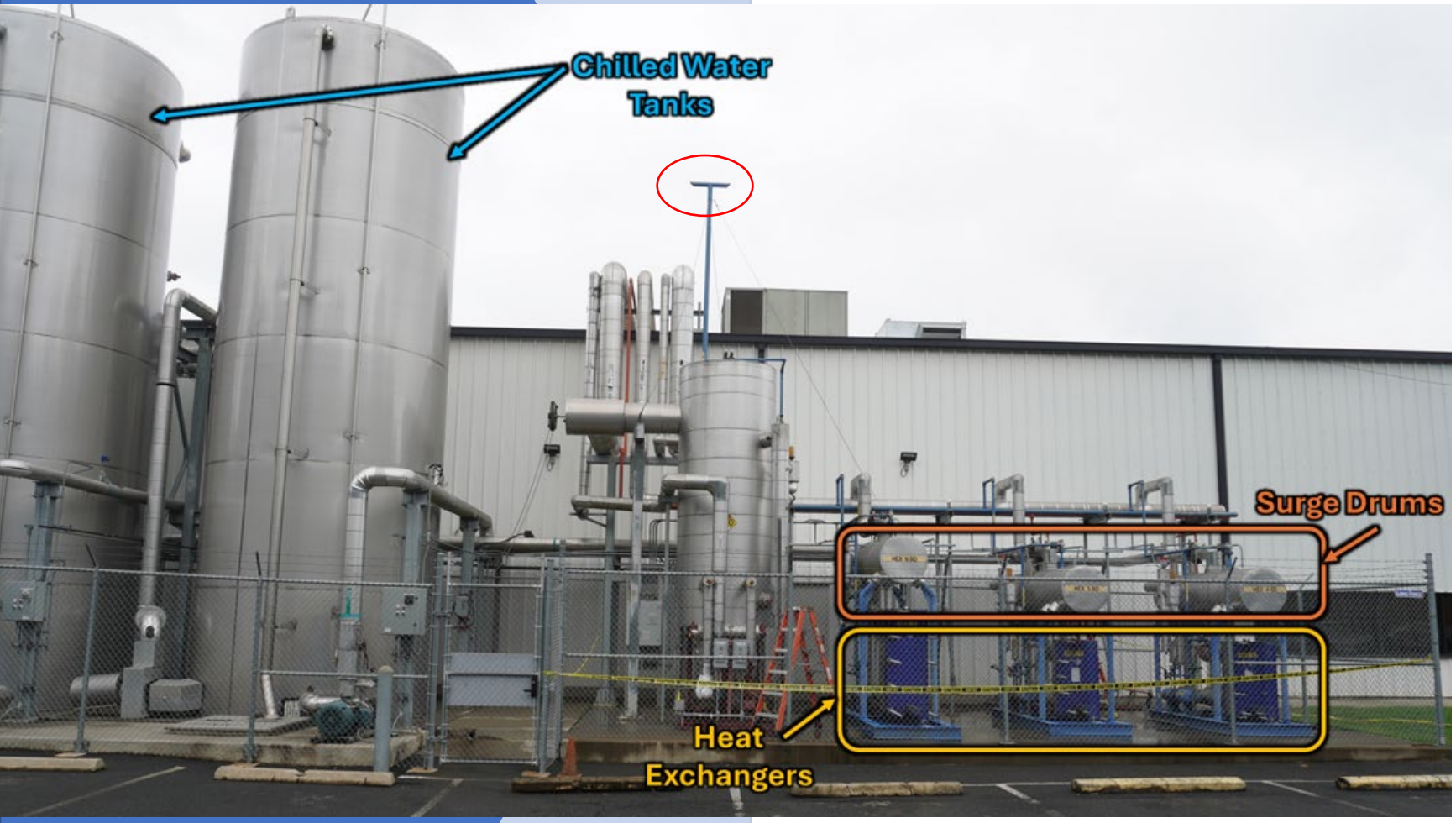
Bill Steiner
Lisaura Maldonado Pereira
Lauren Johnson
Melinda Hartz

December 11, 2025

U.S. Chemical Safety and Hazard Investigation Board

Incident Overview

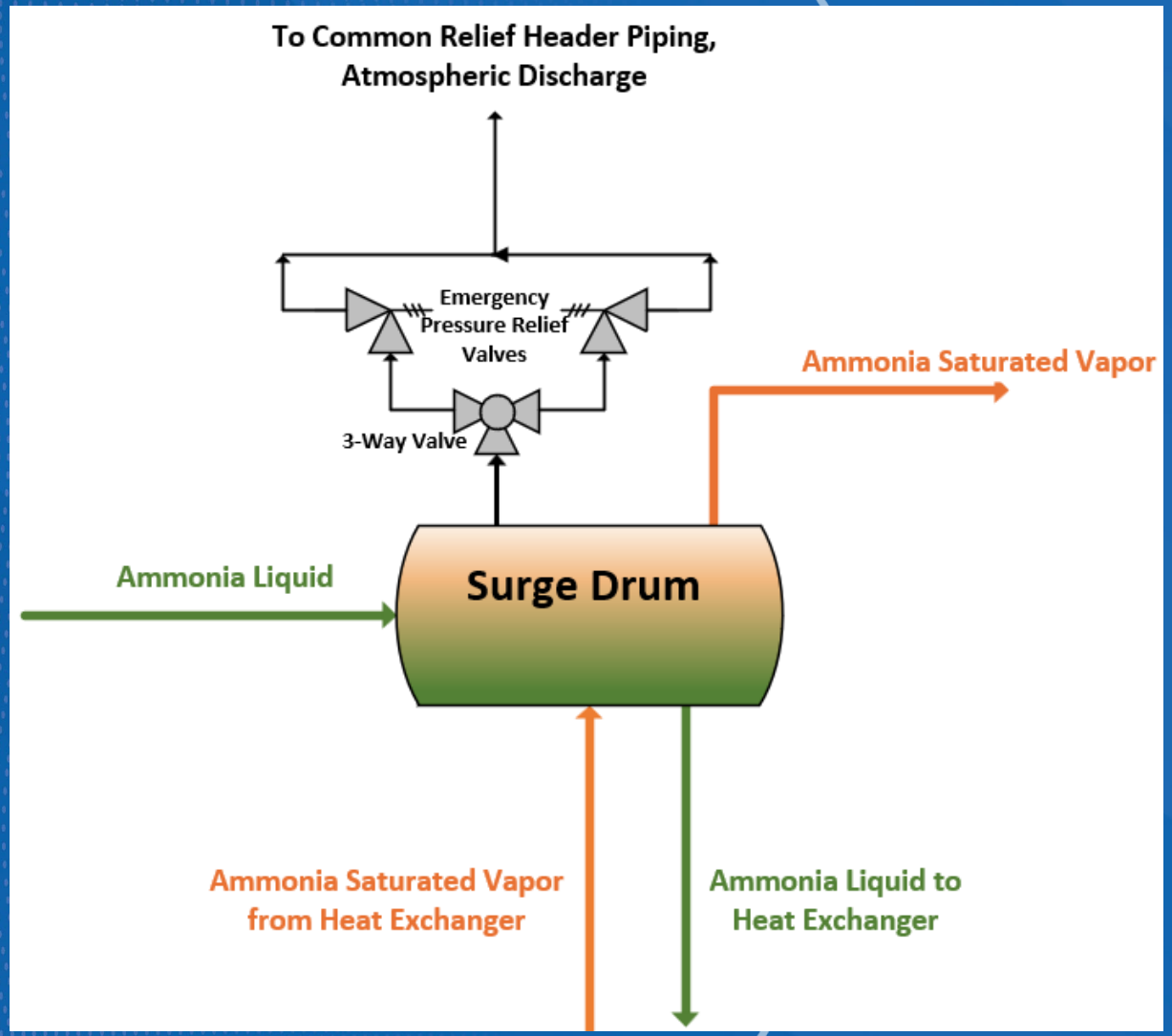
U.S. Chemical Safety and Hazard Investigation Board



- Refrigeration process upset
- Surge Drum overpressure
- Emergency pressure relief valve opened
- Ammonia reached ground level, some went over roof
- Some personnel impacted while evacuating

Safety Issues

- Two-Phase Atmospheric Relief
- Discharging to a Safe Location
- Emergency Preparedness



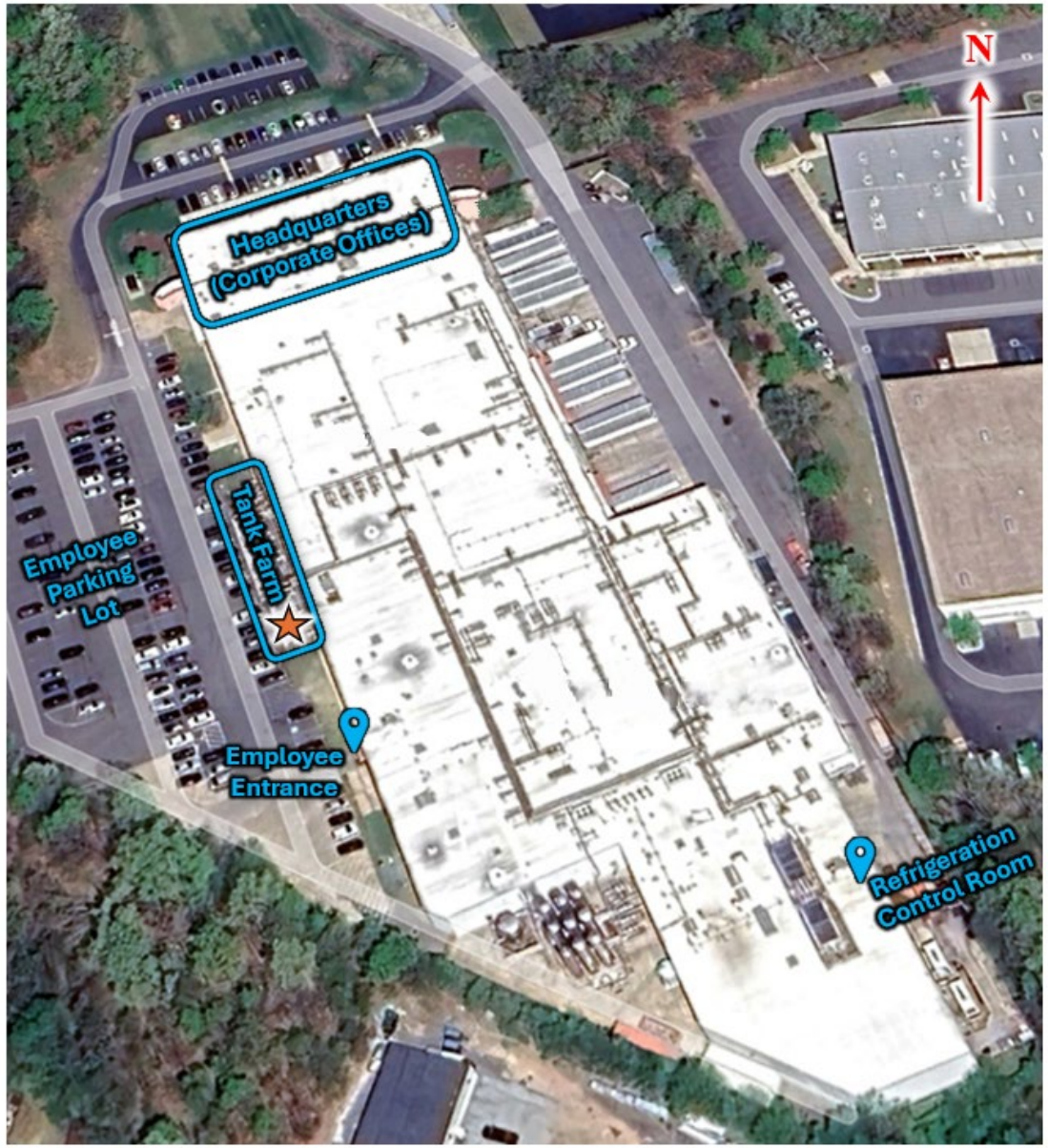
U.S. Chemical Safety and Hazard Investigation Board

Two-Phase Atmospheric Relief

- The ammonia release contained liquid aerosol, causing a slumping ammonia cloud that reached ground level. The ground-level cloud likely contained immediately dangerous to life or health (IDLH) concentrations.
- The emergency pressure relief system did not account for potential liquid overfill, liquid entrainment, or aerosol release relief scenarios.

Discharging to a Safe Location

U.S. Chemical Safety and Hazard Investigation Board



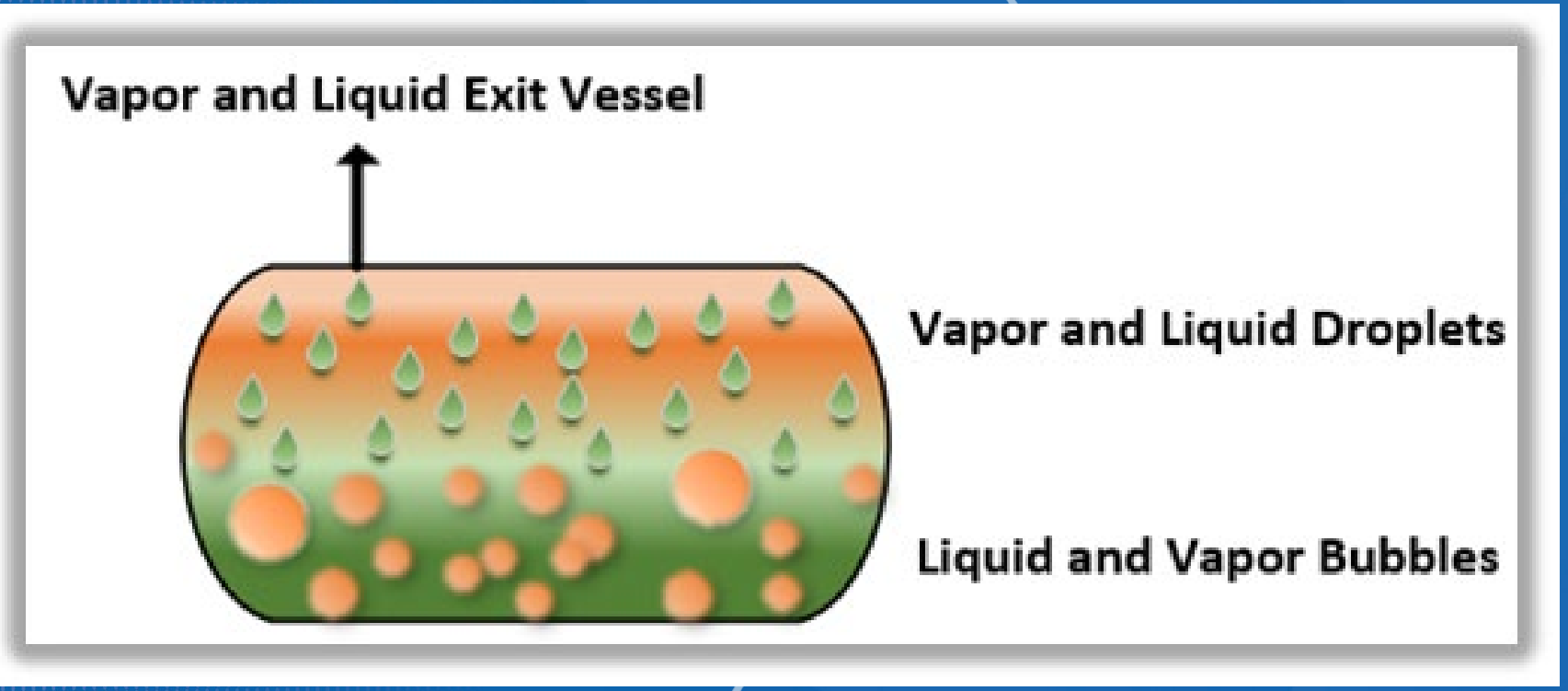
- Cuisine Solutions did not provide mitigation for liquid or two-phase ammonia relief, and did not ensure no harm to people.
- International Institute of All-Natural Refrigeration (IIAR) – Standard ANSI/IIAR 2: Standard for Design of Safe Closed-Circuit Ammonia Refrigeration Systems
- While ANSI/IIAR 2 contains several requirements for relief discharge piping to atmosphere, these requirements may not be sufficient to ensure that ammonia relief streams discharge to a safe location.

Emergency Preparedness

- Emergency Action Plan gaps:
  - Wind direction;
  - Indoor vs outdoor ammonia releases;
  - No written emergency shutdown procedures;
- Emergency preparedness gaps:
  - Ineffective planning and training on emergency shutdown;
  - Ineffective drills;
  - Ineffective communication; and
  - No evacuation alarm sounded.

Recommendations

- Cuisine Solutions, Inc.
- International Institute of All-Natural Refrigeration (IIAR)



adapted from *Industrial Refrigeration Handbook*

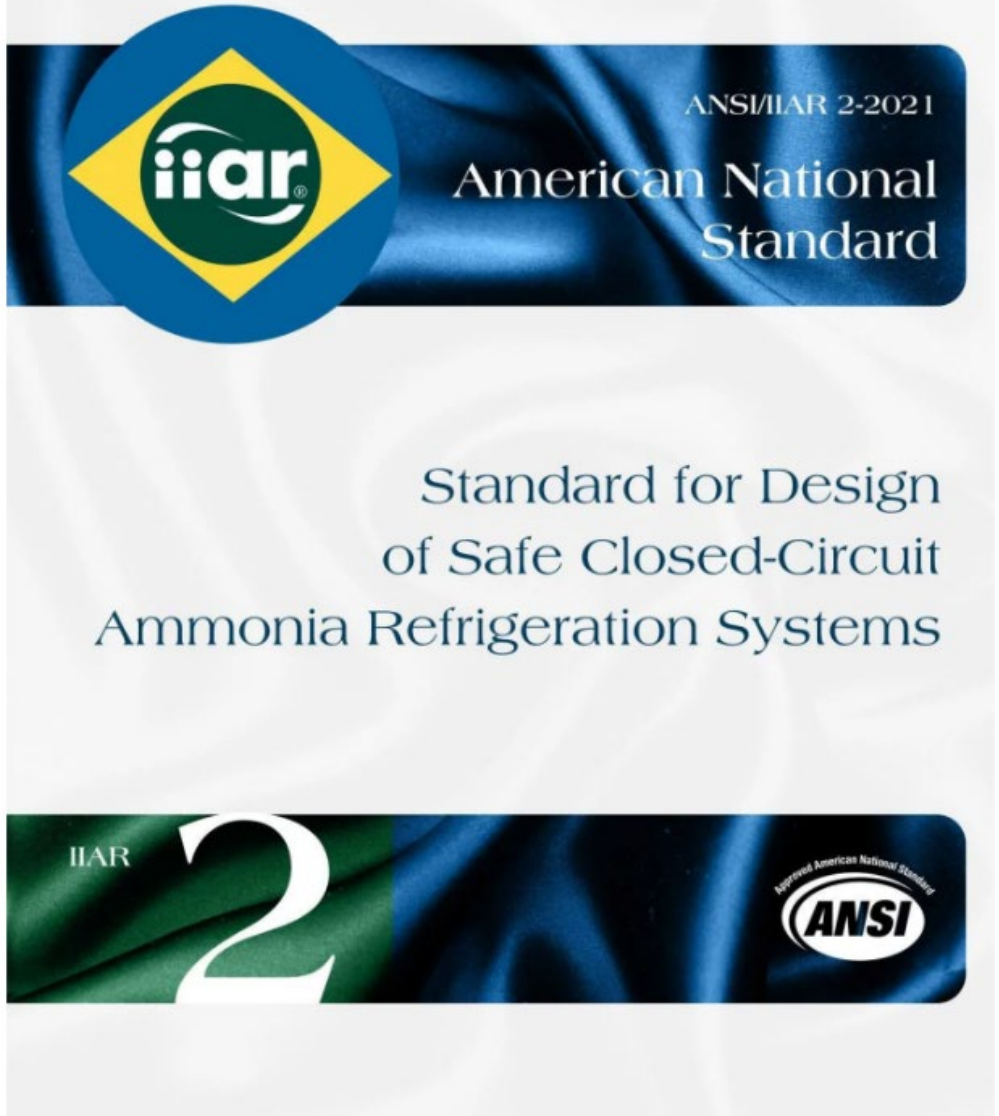
U.S. Chemical Safety and Hazard Investigation Board

Recommendations

Cuisine Solutions, Inc.

- Reduce the likelihood or mitigate the consequences of liquid or two-phase atmospheric discharges by
  - Identifying liquid or two-phase release scenarios;
  - Implementing engineering controls for high liquid level, overfill, or boiling overpressure scenarios; and
  - Third-party audit of pressure relief systems.
- Implement an electronic process data historian and management system.
- Update the site's Emergency Action Plan.
- Add an alarm or alarms specific to ammonia releases.

Recommendations



International Institute of All-Natural Refrigeration (IIAR)

Update ANSI/IIAR 2 to include:

- Guidance for preventing or mitigating liquid or two-phase atmospheric discharges from emergency pressure relief systems;
- A requirement to assess whether emergency pressure relief devices discharge to a safe location, such as with a dispersion analysis.

Fatal Combustible Wood Dust Explosion and Fire at Horizon Biofuels Facility

Investigation Update

U.S. Chemical Safety and Hazard Investigation Board

Incident Summary

U.S. Chemical Safety and Hazard Investigation Board

- July 29, 2025, approximately 11:56 a.m.
- Large explosion at the Horizon Biofuels, Inc. facility in Fremont, Nebraska
- Three people fatally injured—an operator and his two young daughters (aged 8 and 12)
- Several fires occurred and smoldering continued for more than a month
- Significant building and vehicle damage within the Horizon Biofuels property

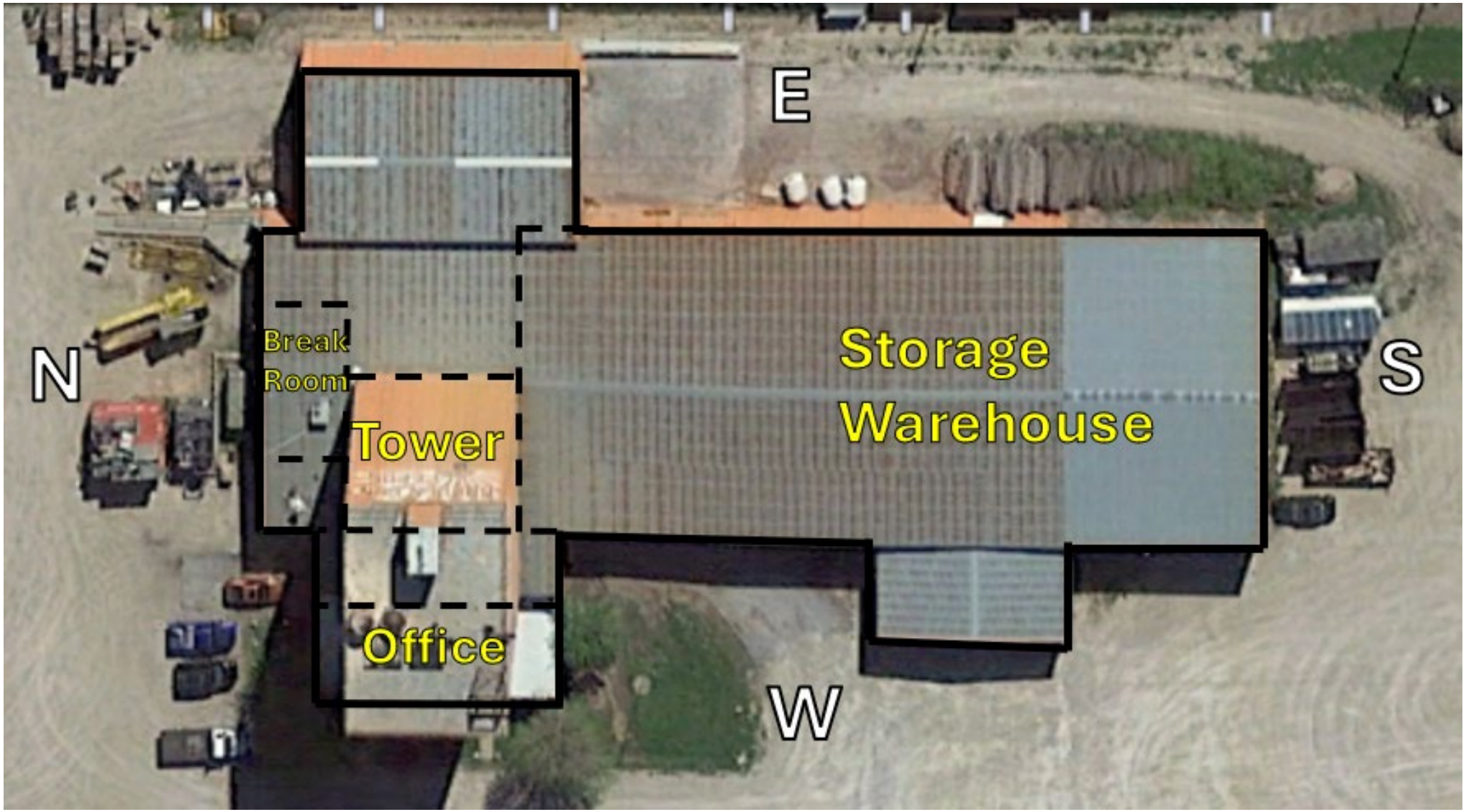
Background Information

U.S. Chemical Safety and Hazard Investigation Board

- Horizon Biofuels produced wood pellets and mulch from scrap wood since 2009
- The company had acquired and adapted a grain mill facility built in the early 1970s that had produced animal feed pellets
- Production equipment included a grinder, conveying equipment, and a pellet mill
- Enclosed dust collection system connected to process equipment helped control wood dust generated from the process
- The company employed five people
    - At the time of the incident, the day shift operator was the only employee at the facility

Incident Description

U.S. Chemical Safety and Hazard Investigation Board



Incident Description

U.S. Chemical Safety and Hazard Investigation Board

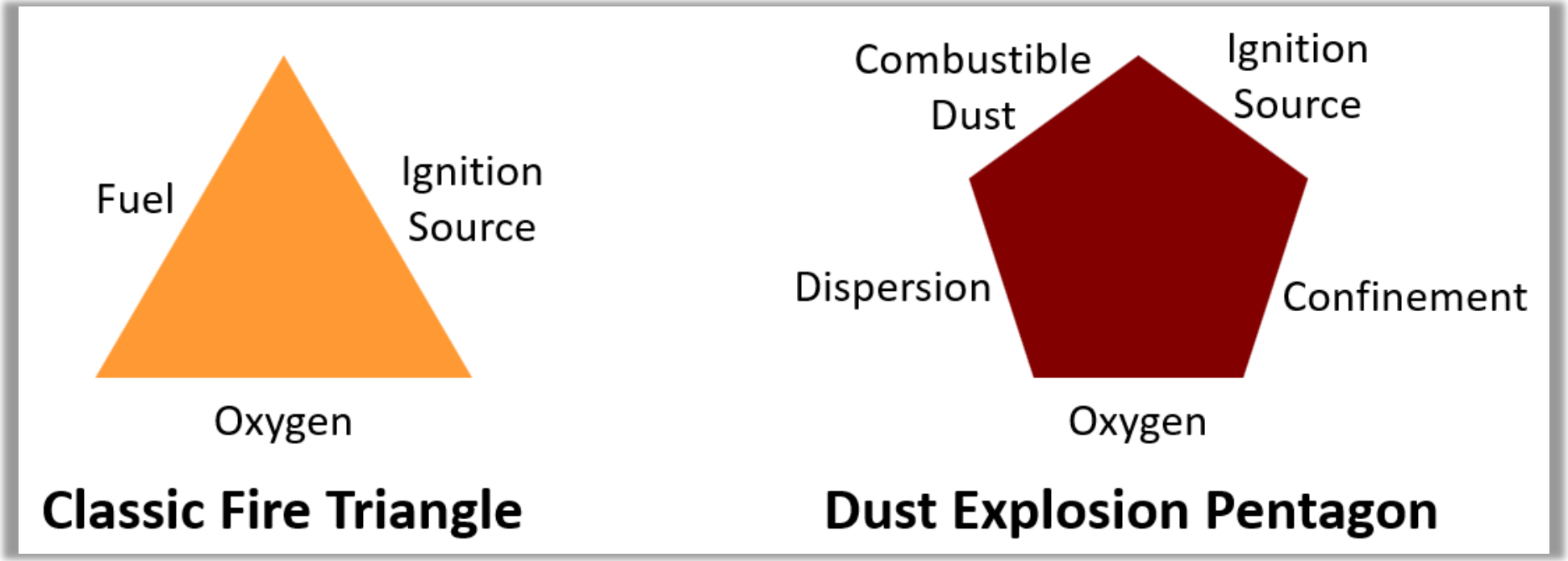
Incident Description

U.S. Chemical Safety and Hazard Investigation Board

- No operational issues reported the day and night shift before the incident
- Morning of July 29, 2025: dayshift operator brought his two daughters to work
- The two daughters waited in the break room as their father worked
- At approximately 11:56 a.m., an explosion and fire propagated through the facility
- Other fuel sources exacerbated the fire
- Emergency responders were unable to make entry due to risks of explosion, the continuing fire, and the potential for building collapse
- Responders recovered the bodies of the three fatally injured people on July 30, 2025
- Emergency responders reduced their presence on July 31, 2025

Combustible Dust Explosions

U.S. Chemical Safety and Hazard Investigation Board



- Combustible dusts can present a flash fire or explosion hazard when suspended in air over a range of concentrations. Dust generated in wood processing facilities can be combustible.
- The CSB previously investigated eight combustible dust explosion incidents.
- The CSB's Combustible Dust Hazard Study (2006) analyzed 281 combustible dust incidents.

Path Forward

U.S. Chemical Safety and Hazard Investigation Board

- The CSB is continuing to gather facts and analyze several key areas, including:
  - Cause or probable cause of the initiating dispersion of dust
  - Events and conditions at the facility prior to the incident
  - Post-incident equipment condition and failure analysis
  - Properties of combustible wood dust
  - Industry guidance for facilities that generate wood dust
  - Regulatory analysis
- The investigation is ongoing. Complete findings, analyses, and recommendations, if appropriate, will be detailed in the CSB's final investigation report.

U.S. Steel Clairton Fatal Explosion

Investigation Update

CSB Public Business Meeting

December 11, 2025

Investigator Harold “Butch” Griffin

U.S. Chemical Safety and Hazard Investigation Board

U.S. Chemical Safety and Hazard Investigation Board

U.S. Steel Clairton Fatal Explosion

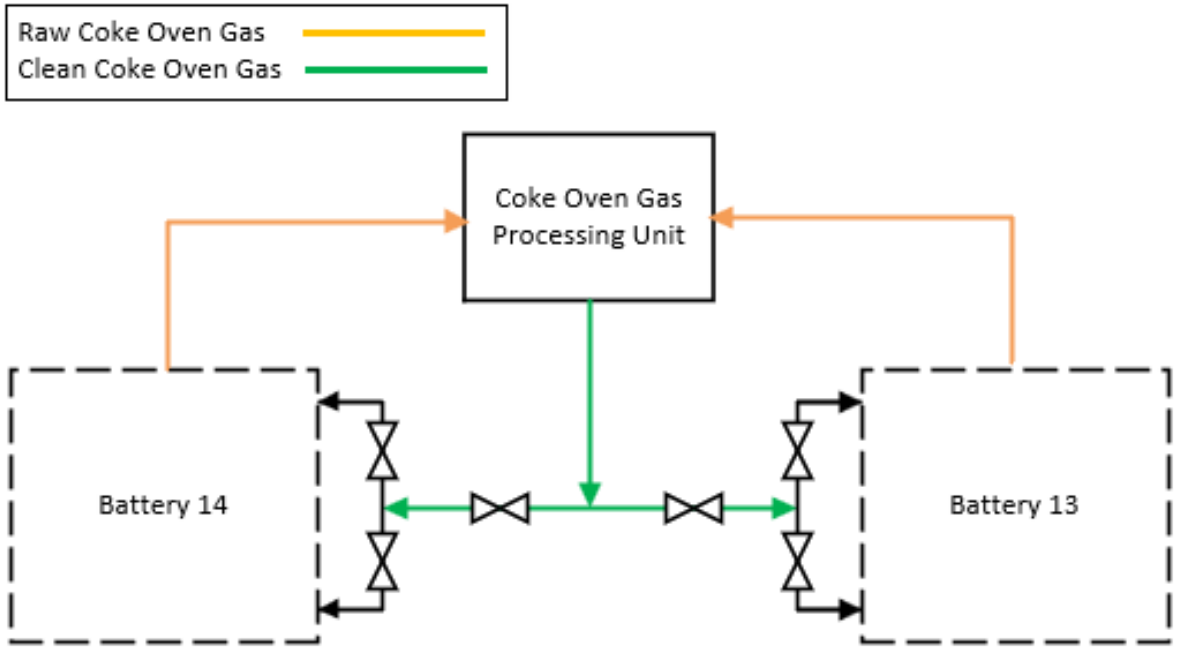
CSB Investigation Update

- Two fatalities, five serious injuries, and loss of production
- Coke battery 14 was restarted October 23, 2025

Coke Battery

U.S. Chemical Safety and Hazard Investigation Board

- Coal ⟶ Coke
- Coke battery – series of coke ovens
- Heating process removes coke oven gas
- Processed coke oven gas used to heat coke ovens
- Coke oven gas supplied to each battery through manual isolation valve.



Double Disc Gate Valve

U.S. Chemical Safety and Hazard Investigation Board

- 18-inch cast iron double disc gate valve
- Markings on the valve's body indicate that Chapman fabricated it in 1953.
- The valve was rated for 50 pounds per square inch (psig).
- The valve had two cleanout ports directed at the valve seat, one on either side of the valve body.

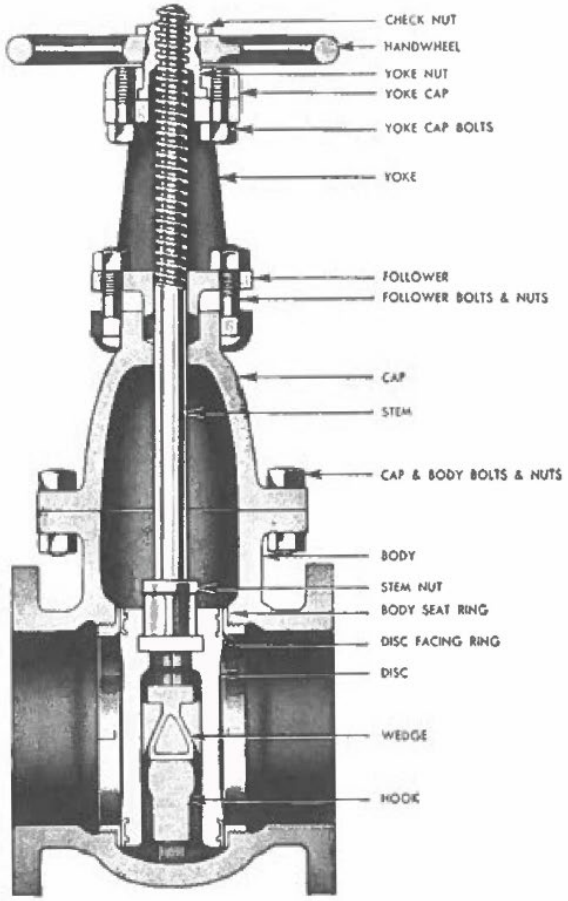
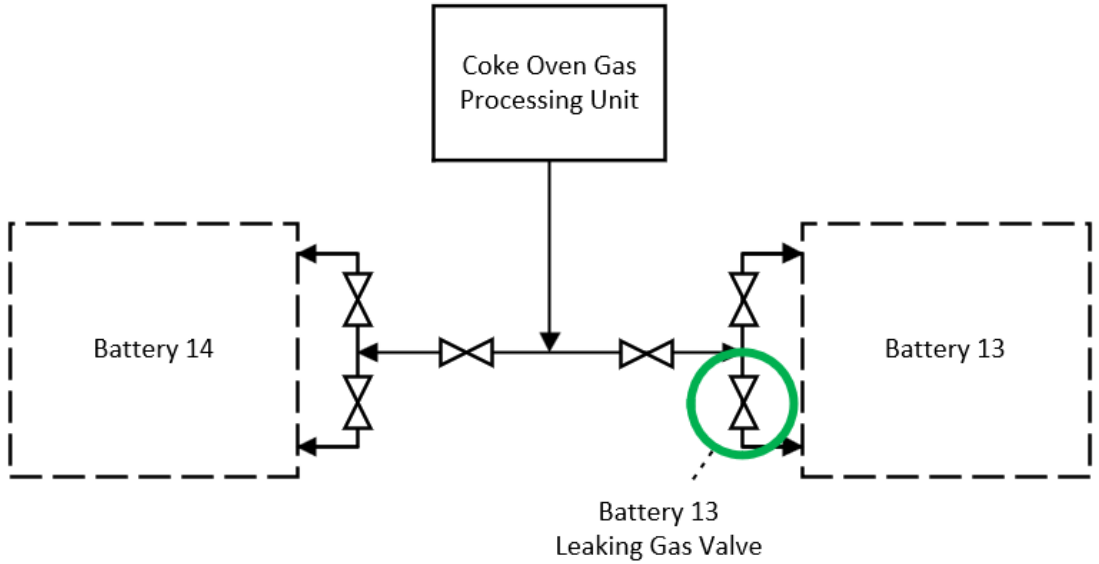


Illustration 20
Section through double disc iron body outside screw gate valve

Prior to the Incident

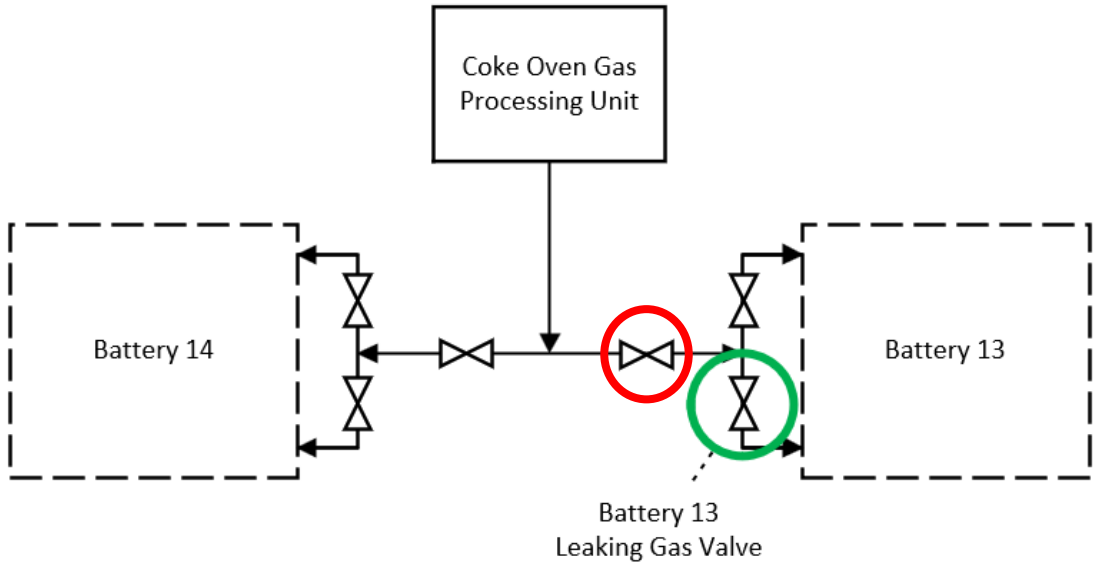
U.S. Chemical Safety and Hazard Investigation Board

- July 8, 2025 – leaking valve discovered downstream of the Battery 13 isolation valve.
- Valve cracked near flange
- Cracked valve temporarily repaired



Prior to the Incident

- Plan to isolate coke oven gas supply
- Additional valves to be replaced during isolation
- July 28, 2025 – Work scope and hazard review
- Battery 13 coke oven gas system outage planned for August 19, 2025.



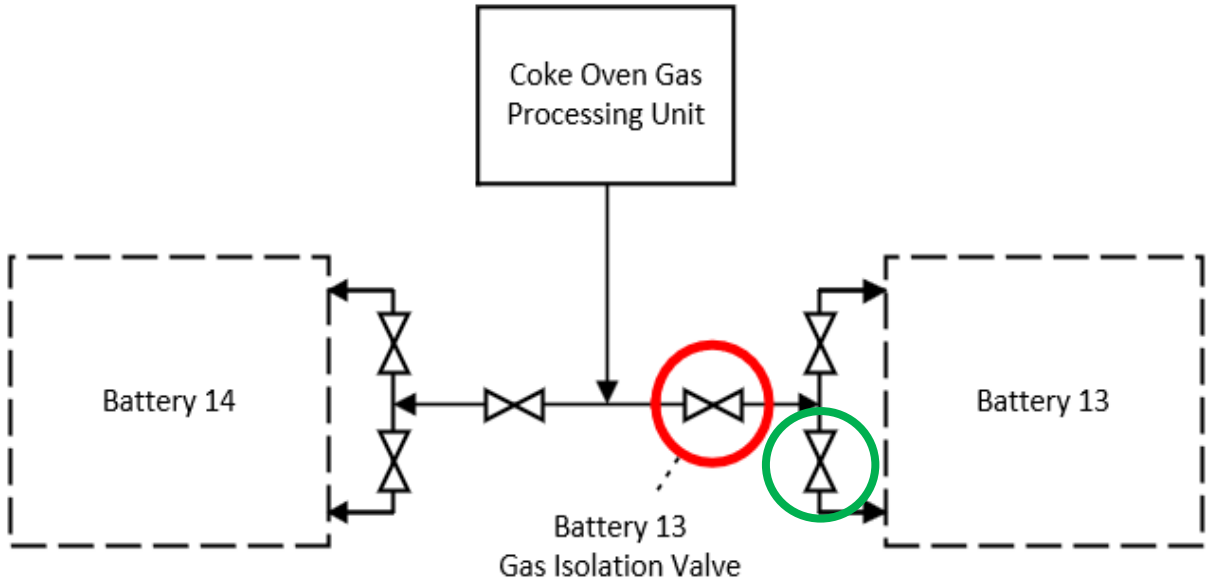
U.S. Steel Procedures

- Procedure for exercising Battery 13 gas isolation valve
- Involved closing and opening valve to ensure isolation
- Reported difficulty with fully seating a valve due to the accumulation of residue over time
- Procedure allowed for steam prior to exercising
- No mention on the use of water

Day of Incident

U.S. Chemical Safety and Hazard Investigation Board

- August 11, 2025 – decision made to exercise the Battery 13 gas isolation valve
- Contractor called to provide a pump to flush the valve seat
- At approximately 10:30 a.m., employees proceeded to the Battery 13 gas isolation valve to begin procedure
- Contract workers prepared equipment to inject water toward the valve seat through cleanout port
- Supervisor instructed contractor to begin pumping water into the valve body
- Once water introduced, workers began to close valve



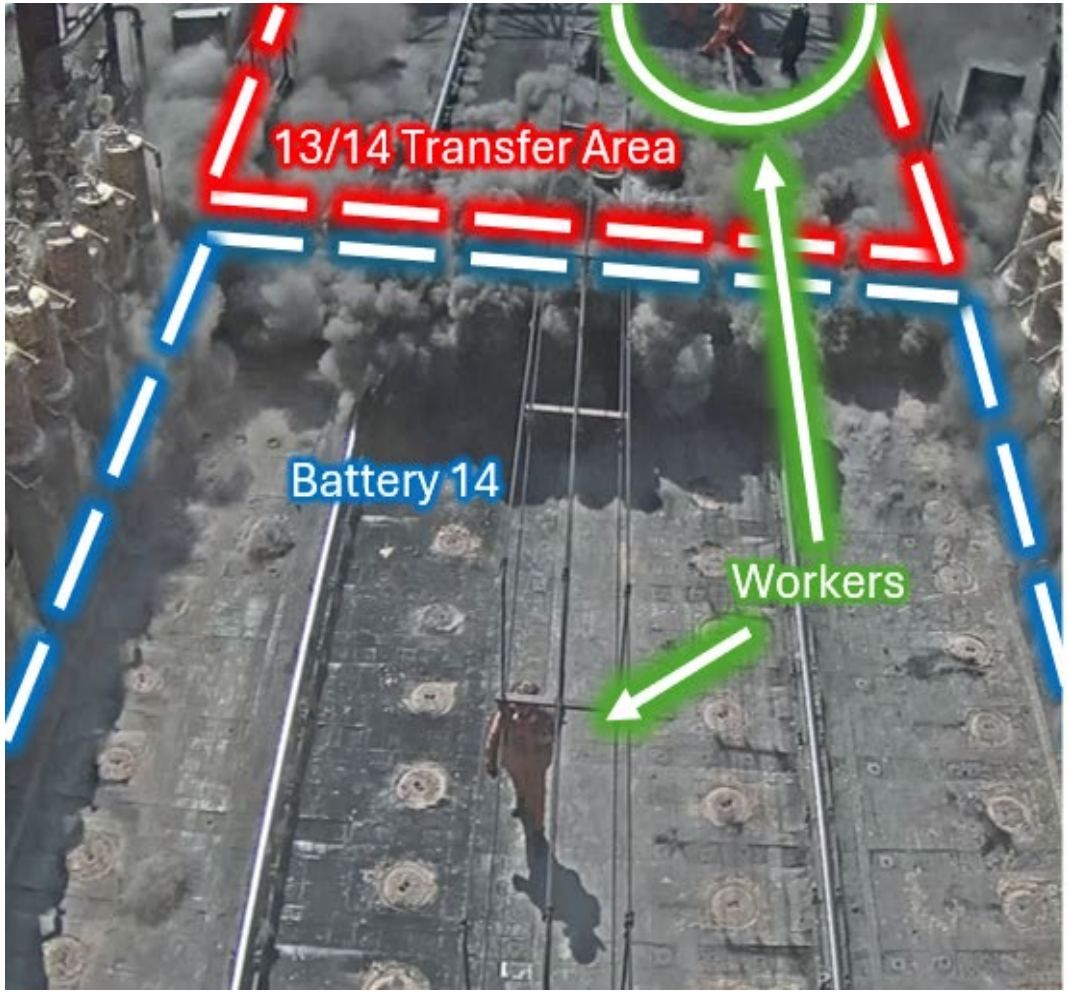
Day of Incident

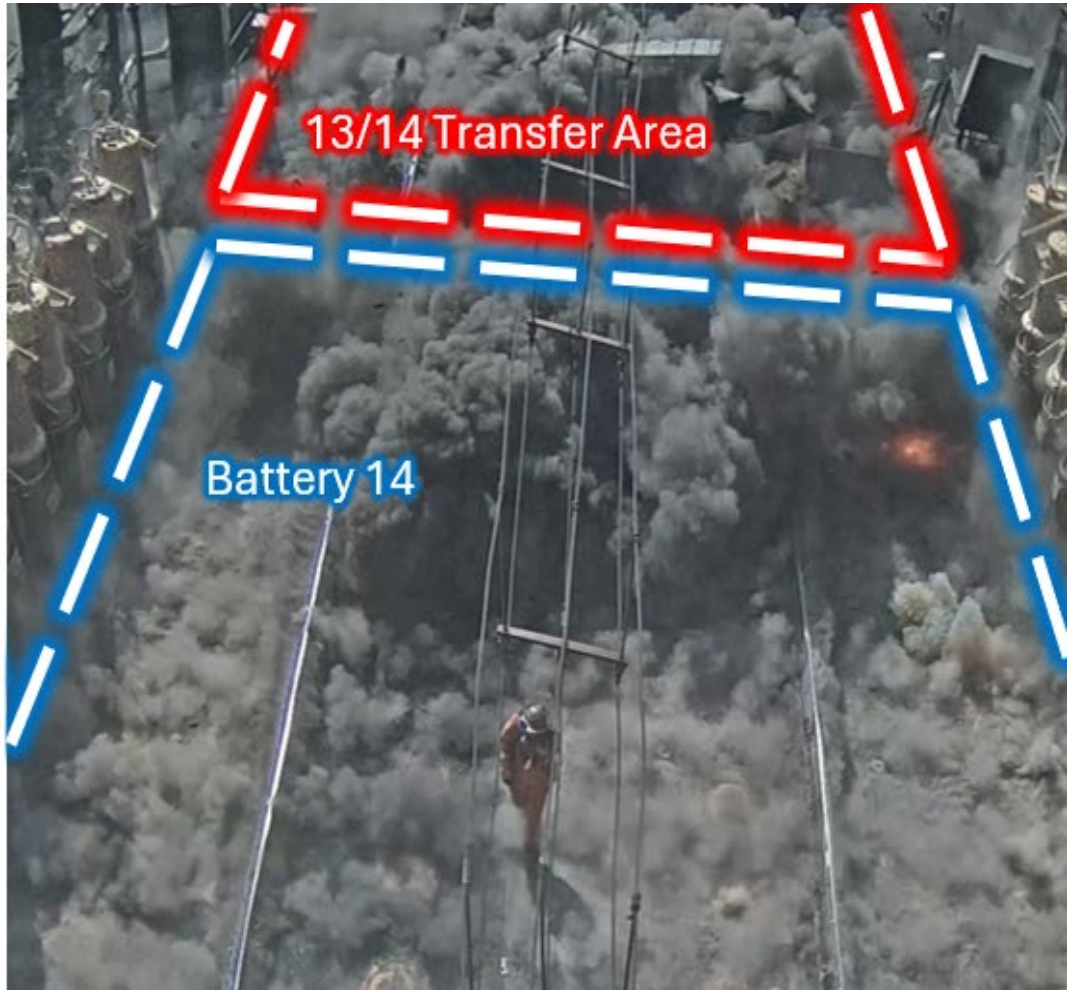
U.S. Chemical Safety and Hazard Investigation Board

- Gas monitors alarmed
- Water observed leaking from bonnet flange
- Workers heard a “pop,” one employee reported smelling gas
- Supervisor ordered evacuation of the area
- Other employees communicated evacuation of Batteries 13 and 14
- Explosion occurred at approximately 10:47 a.m., less than one minute after the workers made the radio evacuation call

Top View of 13/14 Transfer Area

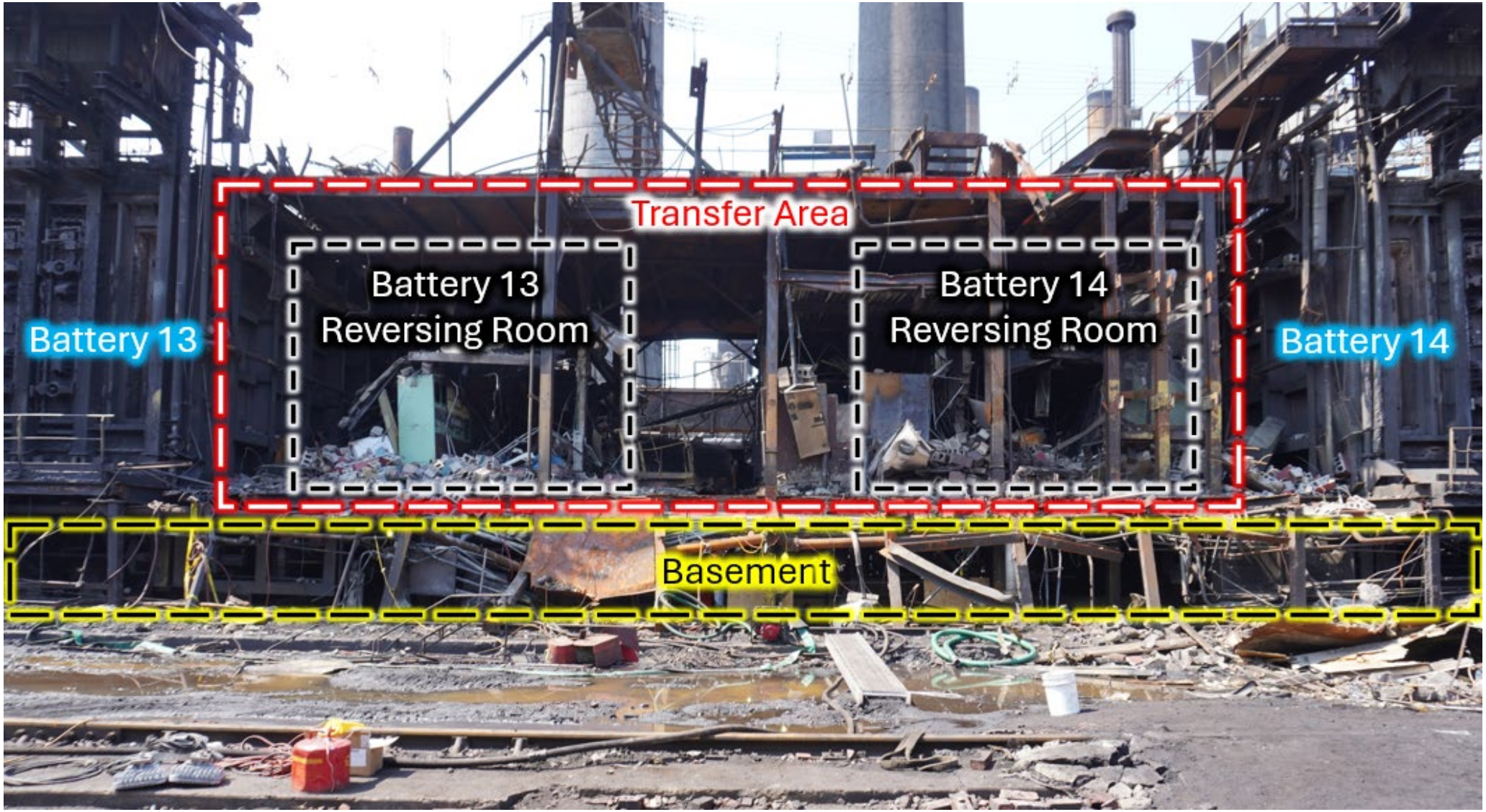
U.S. Chemical Safety and Hazard Investigation Board





Battery 13/14 Transfer Area

U.S. Chemical Safety and Hazard Investigation Board



Investigation Path Forward

U.S. Chemical Safety and Hazard Investigation Board

- Conduct computed tomography and failure analysis of one or more valves
- Use of cast iron valves in hydrogen-rich coke oven gas piping systems.
- Analyze U.S. Steel policies, procedures and practices.

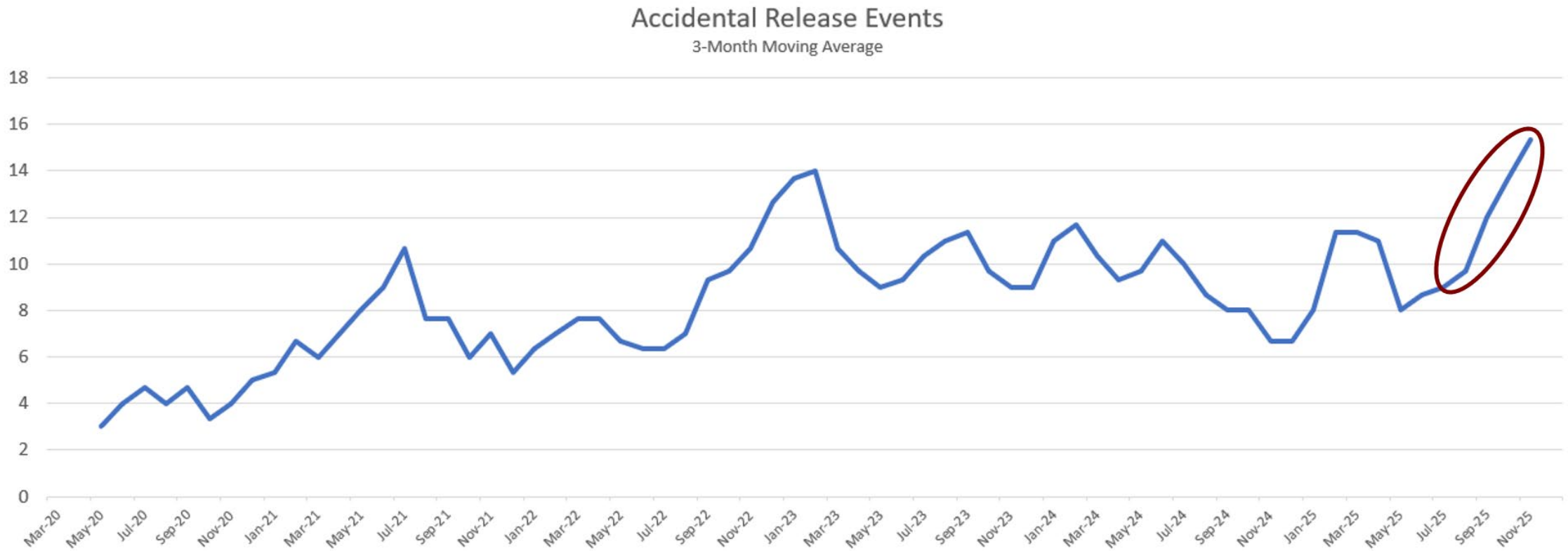
Accidental Release Team

Dan Tillema

U.S. Chemical Safety and Hazard Investigation Board

Accidental Release Reporting

- 586 reportable events (through November 2025)
- 90 with fatalities, 321 with serious injuries, and 277 with substantial property damage
- Event reporting is at an all-time high with 46 events reported from September through November



CSB Incident Reports

U.S. Chemical Safety and Hazard Investigation Board

Incident Reports – Volume Three

- 30 accidental release events in 15 states
- Two fatalities, 25 serious injuries, and $1.8 billion in property damage

Volume Three – Highlighted Events

- Two events where online leak repair efforts resulted in an accidental release
- Thin, corroded piping broke, releasing flammable material that ignited
- Combined, these two events resulted in four serious injuries and $157 million in property damage

PBF Energy
November 23, 2021 | Oregon, Ohio

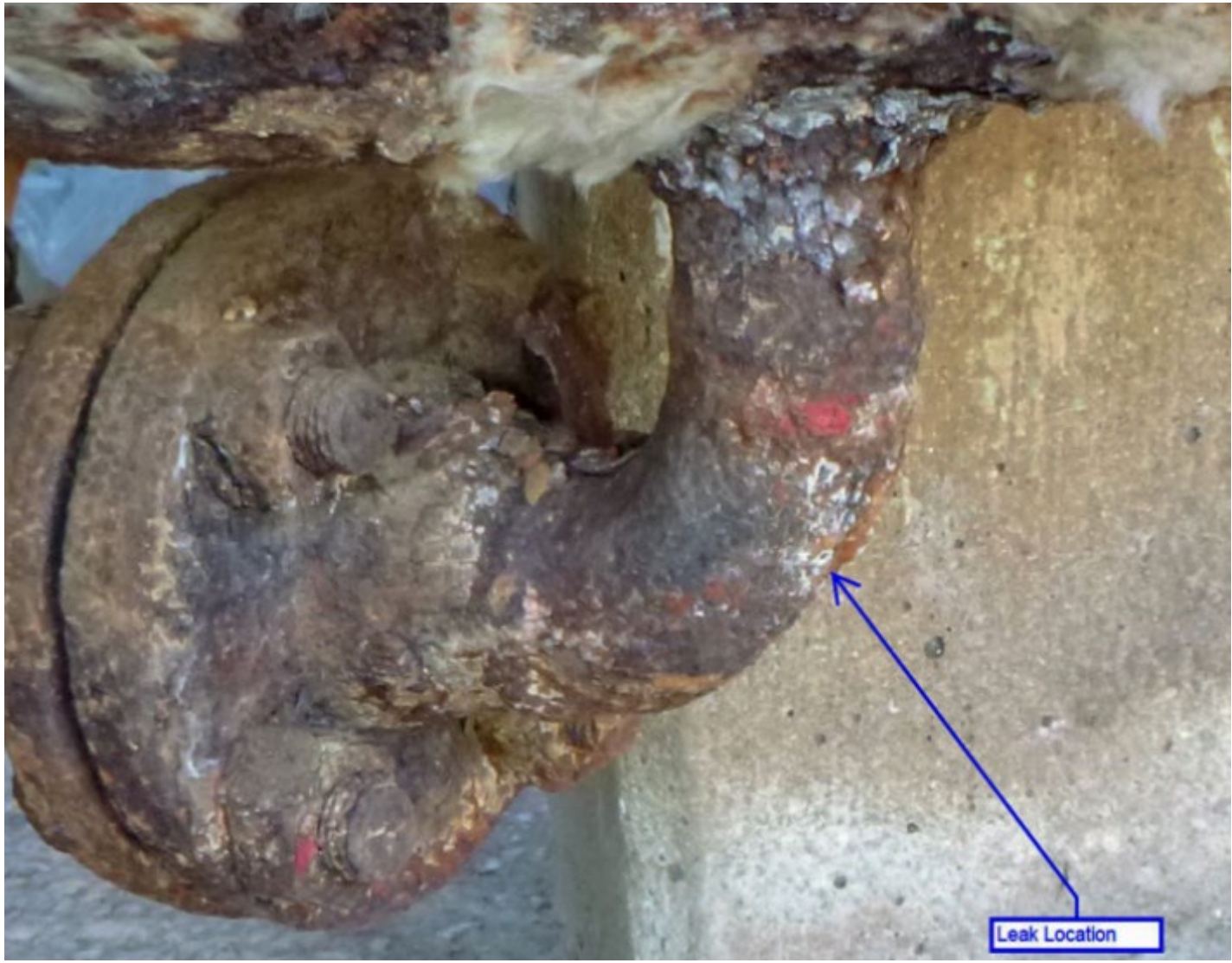
U.S. Chemical Safety and Hazard Investigation Board

Incident Summary (Volume 3 – Event #8)

- Explosion and fire with $50 million in property damage
- A 54-year-old piping segment had significantly corroded since the last inspection and was leaking
- A clamp was installed to stop the small LPG leak
- The piping segment failed (broke apart) when sealant was being added to the clamp
- LPG ignited with an explosion and fire

Probable Cause

- Corroded piping broke while sealant was being injected into the repair clamp
- External insulation and equipment washing practices likely accelerated the corrosion



ExxonMobil
December 23, 2021 | Baytown, Texas

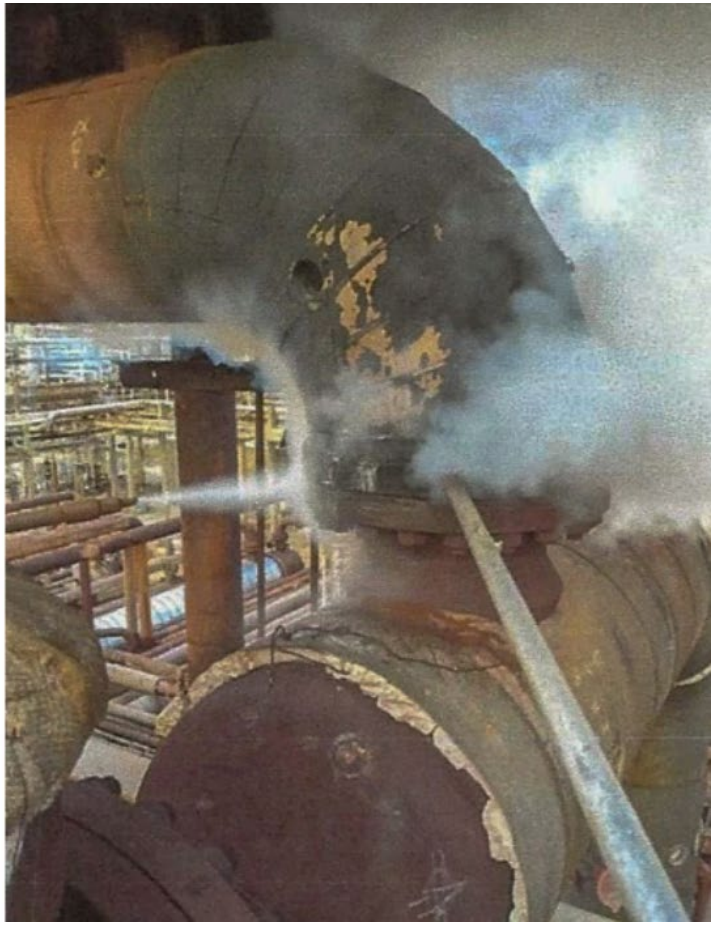
U.S. Chemical Safety and Hazard Investigation Board

Incident Summary (Volume 3 – Event #9)

- Explosion and fire with four serious injuries and $107 million in property damage
- A flange fire occurred two days before the incident, and steam lances were used to extinguish the fire
- Hot naphtha was leaking from the flange. To stop the leak, workers were installing injectable bolts as part of a wire wrap repair effort
- Hydraulic wrench applied localized force to a 59-year-old, 14-inch elbow, rupturing the elbow and adjacent piping
- The elbow was thin from sulfidation corrosion

Probable Cause

- Hydraulic wrench applied external force to a severely corroded piping elbow, initiating the rupture.
- Lack of an inspection that could have identified the thinned piping contributed to the incident



Office of Recommendations

Charles B. Barbee, Director of Recommendations

Amanda Johnson, Recommendations Specialist

Adam Henson, Recommendations Specialist

U.S. Chemical Safety and Hazard Investigation Board

Recommendations

U.S. Chemical Safety and Hazard Investigation Board

FY25 Recommendations Data/Information

- Issued Recommendations/Status Changes
- Closed Out Investigations

Advocacy for FY25

- Program Highlights
- Communications with Recommendation Recipients

Highlighted Recommendations

- Aghorn (Aghorn R7) C-AA
- NBBI (Loy-Lange R8) C-ERA

Office of Recommendations

U.S. Chemical Safety and Hazard Investigation Board

FY25 Recommendations Data/Information:

- **25** New Recommendations Issued
  - **8** – Marathon Martinez
  - **4** – Honeywell Geismar
  - **7** – TS USA
  - **6** – Cuisine Solutions

(from CSB investigation reports)

"To prevent future chemical incidents, and in the interest of driving chemical safety excellence to protect communities, workers, and the environment, the CSB makes the following safety recommendations:"

Office of Recommendations

U.S. Chemical Safety and Hazard Investigation Board

FY25 Recommendations Data/Information:

- **51** Recommendations Closed
  - **49** Acceptable
  - **1** Unacceptable
  - **1** Superseded

Office of Recommendations

U.S. Chemical Safety and Hazard Investigation Board

FY25 Recommendations Data/Information:

- **42** Recommendations Advanced (moved to a new 'Open' status)
  - **28** Acceptable
  - **14** Unacceptable (I will discuss this number later in the presentation)

FY25 Recommendations Data/Information:

- **4 Investigations with All Recommendations Closed in FY25**
  1) Caribbean Petroleum Corporation (CAPECO) Refinery Tank Explosion and Fire
     - Incident Details: October 23, 2009, while offloading the contents of the tankship, Cape Bruny, into the CAPECO tank farm, gasoline overflowed from a storage tank into a containment dike with an open drain and sprayed from the tank's roof vents, formed a large vapor cloud, and ignited.
     - Consequences: 200K gals spilled impacting soil, wetlands and navigable waterways, 17 of 48 tanks destroyed, 300 homes and businesses damaged
     - Report released on October 21, 2015, with 9 recommendations

FY25 Recommendations Data/Information:

- **4 Investigations with All Recommendations Closed in FY25**

  2) Williams Olefins Plant Explosion and Fire

  - Incident Details: June 13, 2013, a fire and explosion occurred at the Williams Olefins, Inc. (Williams), Plant in Geismar, LA, when a reboiler ruptured due to an over pressurization event while it was isolated from its pressure relief device.
  - Consequences: fatally injured two employees, 167 workers were injured (164 contractors/3 Williams employees)
  - Report released on October 19, 2016, with 5 recommendations

FY25 Recommendations Data/Information:

- **4 Investigations with All Recommendations Closed in FY25**

  3) Watson Grinding Fatal Explosion and Fire

  - Incident Details: January 24, 2020, a leak of propylene from a high velocity oxygen fuel (HVOF) thermal spray process resulted in an explosion at the Watson Grinding and Manufacturing Co. facility in Houston, Texas. The leak was caused by a disconnected hose inside a coating booth.
  - Consequences: fatally injured 2 employees and a member of the public, 2 employees injured, damaged hundreds of structures (homes and businesses), company is no longer in business
  - Report released on June 29, 2023, with 2 recommendations

FY25 Recommendations Data/Information:

- **4 Investigations with All Recommendations Closed in FY25**
  4) Evergreen Packaging Paper Mill – Fire During Hot Work
     - Incident Details: September 21, 2020, a paper mill in Canton, NC, was undergoing a planned shutdown, and associated maintenance and capital project work. In a pulp bleaching unit, two contract companies were performing simultaneous work inside connected process vessels. A fire started when an electric heat gun fell in a bucket of flammable resin.
     - Consequences: 2 fatalities
     - Report released on September 24, 2021, with 8 recommendations

Office of Recommendations

U.S. Chemical Safety and Hazard Investigation Board

FY25 Recommendations Data/Information:

- **4 Investigations with All Recommendations Closed in FY25**
  - **In summary for some perspective, 4 investigations addressing:**
    - 7 fatalities
    - 169 injured
    - Significant public impact
    - Significant property and environmental damage
  - **24 Recommendations issued; all are Closed**

Office of Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Advocacy Program Highlights:

- Magazine Articles – 1
- Press Releases – 2
- Advocacy and Outreach Events – 31
- Federal Register Public Comments – 2
- Issuance of the CSB Investigation Digest: *20th Anniversary of the 2005 Fatal BP America Refinery Explosion in Texas City, Texas*
- CSB Safety Videos - 6

Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Communication with Recommendation Recipients

- API – 7 closed, 3 advanced from various investigations
- Aghorn Operating Inc – 5 closed, 1 advanced,
- Ohio Refining Company (ORC) – 4 closed, 1 advanced
- BSEE – 4 closed
- Cenovous – 3 closed, 1 advanced
- EPA – 3 closed

Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Communication with Recommendation Recipients

- When things don't go so well…
- 14 Unacceptable:
  - 9 Didion Milling Company
  - 5 Yenkin Majestic/OPC Polymers
- Didion established communications…since then all 9 were acceptably advanced – 4 of those have been acceptably closed

FY25 Recommendations Data/Information:

- **42** Recommendations Advanced (moved to a new 'Open' status)
  - **28** Acceptable
  - **14** Unacceptable (discuss this number later)

SUCCESS STORY so far…

Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Communication with Recommendation Recipients

- When things don't go so well…
- Yenkin Majestic/OPC Polymers - 1 fatality, 8 employees injured to include 3rd degree burns, fractured limbs, and a leg amputation

5 recs all currently Open – Unacceptable

Unacceptable statuses are like

Sand in the Gears of achieving Chemical Safety Excellence

We strongly encourage you to engage & communicate with us!!!

Highlighted Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Aghorn Operating Inc. Waterflood Station Hydrogen Sulfide Release

- Oct 26, 2019
- Aghorn employee responded to a pump oil level alarm at a waterflood station in Odessa, TX
- The pump was not isolated, kicked on, and released water containing H2S fatally injuring the employee
- The spoused investigated, also fatally injured

CSB Recommendation R7 to Aghorn Operating Inc. (Aghorn):

Develop and implement a site-specific security program to prevent unknown and unplanned entrance of those not employed by Aghorn, starting with access gates that lock upon entering and departing the facility.

Highlighted Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Aghorn Operating Inc. Waterflood Station Hydrogen Sulfide Release

Aghorn Implementation of R7:

- Aghorn developed a site security program to prevent the unplanned entrance of waterflood stations by non-employees.
- Aghorn installed fences with locking access gates around its waterflood stations.

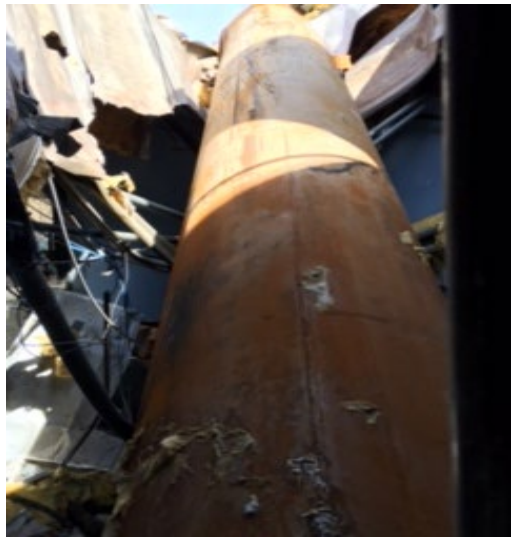
Closed – Acceptable Action

Aghorn worked very diligently this year and acceptably closed their five open recs, closing out all the Aghorn Recommendations

Highlighted Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Loy Lange Box Company Pressure Vessel Explosion



- April 3, 2017
- The bottom head of a pressure vessel (PV) catastrophically failed due to corrosion and an inadequate repair. The PV launched, crashing through the roof of a near by business.
- 3 members of the public were fatally injured

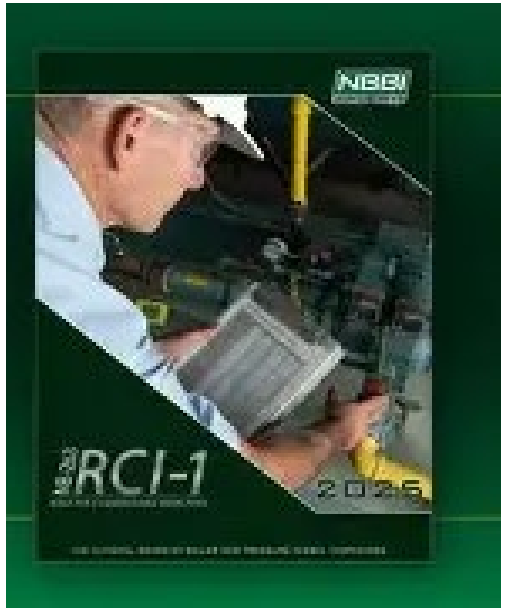
CSB Recommendation R8 to National Board of Boiler and Pressure Vessel Inspectors (NBBI):

Update NB-263 Rules for Commissioned Inspectors to include prescriptive elements in the boiler and PV repair and alteration inspection and acceptance process that would prevent the acceptance of a non-conforming repair.

Highlighted Recommendations

U.S. Chemical Safety and Hazard Investigation Board

Loy Lange Box Company Pressure Vessel Explosion



NBBI Implementation of R8:

- Published 2025 Edition of NB-263, RCI-1, Rules for Commission Inspectors (NB-263) with an effective date of January 1, 2025
- Issued the 2025 Edition of the National Board Inspection Code (NBIC). Part 32 contains new requirements for evaluating flush patches/adjacent material
- Broadly publicized the events of the Loy Lange Box Company Pressure Vessel Explosion and other incidents

Closed – Exceeds Recommended Action

Q&A

Steve Hamrick & Hillary Cohen
Moderating

U.S. Chemical Safety and Hazard Investigation Board

Thank you for attending

CSB.gov

U.S. Chemical Safety and Hazard Investigation Board