



# CSB Public Meeting

## DuPont La Porte Investigation Update

July 22, 2015

# Recent CSB Investigations of DuPont Incidents

- Belle
  - In 2010, a phosgene release resulted in one fatality
  - There were three release incidents in two days: methyl chloride, oleum, and phosgene
- Yerkes
  - In 2010, there was a hot work incident resulting in one fatality and one injury
- La Porte
  - In 2014, 24,000 lb highly toxic chemical release with four fatalities.
  - During investigation, there were additional smaller releases on site and at other DuPont sites.



# Recent CSB Investigations of DuPont Incidents

- Deployment decision based on seriousness of the incident as well as third fatality incident at a different DuPont facility – a first in CSB history
- CSB concerned about DuPont's process safety performance
- DuPont has had good personal safety performance
- These incidents reflect a poor process safety performance
- CSB has advocated for a separate focus on process safety since BP Texas City



# La Porte Incident

- November 15, 2014
- Four DuPont employees were killed
- 24,000 lbs of highly toxic methyl mercaptan released on and off site
- Release occurred inside an enclosed building
- All four employees were inside the building
- Two of the four fatalities occurred during rescue
- DuPont employed 300 personnel at the site



# Investigation Progress

- Investigation deployment from November 16, 2014 to June 12, 2015
- Continuous identification and communication of serious process safety issues to DuPont
- In June 2015, DuPont communicated their dismissal of some key actions needed to prevent future similar major accidents
- These serious hazards are the focus of the proposed recommendations

# Inherently Safer Design

- Following Bhopal, DuPont modified its La Porte methyl isocyanate (MIC) process using inherently safer design (ISD)
  - Open building structure
  - Equipment to direct leaks to an incinerator for destruction of highly toxic chemicals

- Minimum in-process hold-up of MIC
- Minimum process piping runs and number of flanges
- Relief devices vented to an abatement device
- Use of an open building structure with potential leak sources vented to the incinerator
- Lethal service equipment and piping design
- Multi-layers of MIC destruction to ensure no MIC releases.
- Multi-layer interlock systems for fail safe operation.

These principles were, and are, the basis for the design. The sections that follow spell-out the design basis in more detail.



# Inherently Safer Design

- DuPont did not effectively apply similar ISD to other highly toxic chemicals such as methyl mercaptan and chlorine
- The methyl mercaptan release on November 15, 2014, inside an enclosed and unventilated building, played a significant role in the deaths of four DuPont employees





# Enclosed Building Hazards

- The portion of the process where the incident took place is enclosed within a building that has no documented design function and appears to serve no essential manufacturing purpose
- Housing the process equipment inside the enclosed manufacturing building introduces highly toxic chemical exposure and asphyxiation hazards to personnel that DuPont has not effectively identified or controlled



# Enclosed Building Hazards

- The DuPont manufacturing building design introduces all of the negative design features of a containment building, but offers none of the benefits through off-site risk reduction
  - Vapors from highly toxic chemical leaks are trapped and concentrated inside the building, increasing risk to personnel
  - The manufacturing building ventilation system will discharge these highly toxic chemical leaks to the outdoor surroundings



# Building Ventilation Hazards

- The manufacturing building ventilation fans were classified as “PSM Critical” equipment by DuPont
  - meaning their failure could result in a high consequence event
- Neither fan was in operation at the time of the incident
- Preliminary calculations indicate that even with both fans operating, ventilation would likely have been insufficient to avoid a lethal atmosphere inside the manufacturing building



# Building Ventilation Hazards

- At the time of the incident, the manufacturing building ventilation fan for the portion of the unit where the methyl mercaptan was released (wet end fan) was not operating despite an “urgent” work order written nearly a month earlier on October 20, 2014
- The breakdown of the ventilation fan did not result in any additional safety precautions, such as operational or emergency response requirements, worker access restrictions to the manufacturing building, or personal protective equipment (PPE) requirements



# Building Ventilation Hazards

- The stairs that provide the primary means to access the equipment within the manufacturing building are designed for fire escape, and DuPont has not effectively evaluated entry or egress hazards in a toxic or inert gas atmosphere
  - One victim was located in the stairway
- There is no ventilation provided in the stairways and internal doors to the process; furthermore, the internal doors do not provide an effective barrier to keep hazardous gases from entering the stairway



# Gas Detectors are Ineffective

- The design of the methyl mercaptan detection system does not effectively warn workers or protect the public from highly toxic chemical exposure
- The detector alarm point is above the permissible exposure limit for workers and the response to a detector alarm (administrative control) is not sufficient to protect the public



# Response to Detectors

- During the hours prior to the November 15, 2014 incident, multiple highly toxic chemical gas detectors alarmed (sounded)
- The DuPont emergency response team (ERT) was not notified, and the area was not cleared of personnel
- Methyl mercaptan releases on November 13 and 14, 2014, were picked up by methyl mercaptan detectors, but were never reported as releases nor investigated as serious process safety incidents



# Process Hazard Analysis

- Process hazard analyses (PHAs) and relief system design scenarios do not effectively consider hazards from nonroutine operations, such as aligning the liquid methyl mercaptan piping to the vapor waste gas vent header
- Along the liquid methyl mercaptan feed line there were three locations where it was connected by valves to a waste gas vent header
- At the time of the incident one of these valves was fully open and a second valve was slightly open



# Process Hazard Analysis

- PHAs performed on the insecticide manufacturing process did not sufficiently identify and control process hazards
- Post-incident, DuPont has conducted a new baseline PHA for two of its 15 Insecticide Business Unit (IBU) PHAs
- These new post-incident PHA teams are applying a more robust methodology resulting in hundreds of new action items
- However, DuPont is not completing its other 13 PHAs prior to resuming production



# Ventilation Evaluation

- The manufacturing building air dilution ventilation system has never been evaluated by a PHA or engineering study
- DuPont had scheduled such a review for 2017





# Ventilation Evaluation

- The area of the manufacturing building where the largest methyl mercaptan release occurred during the incident has never been tested for ventilation flow rate or effective distribution of dilution air
- Prior to receiving a draft of these CSB proposed recommendations, DuPont management stated they were not going to perform an engineering study to ensure the dilution air ventilation system is effective to protect workers from highly toxic chemical exposure or asphyxiation hazards



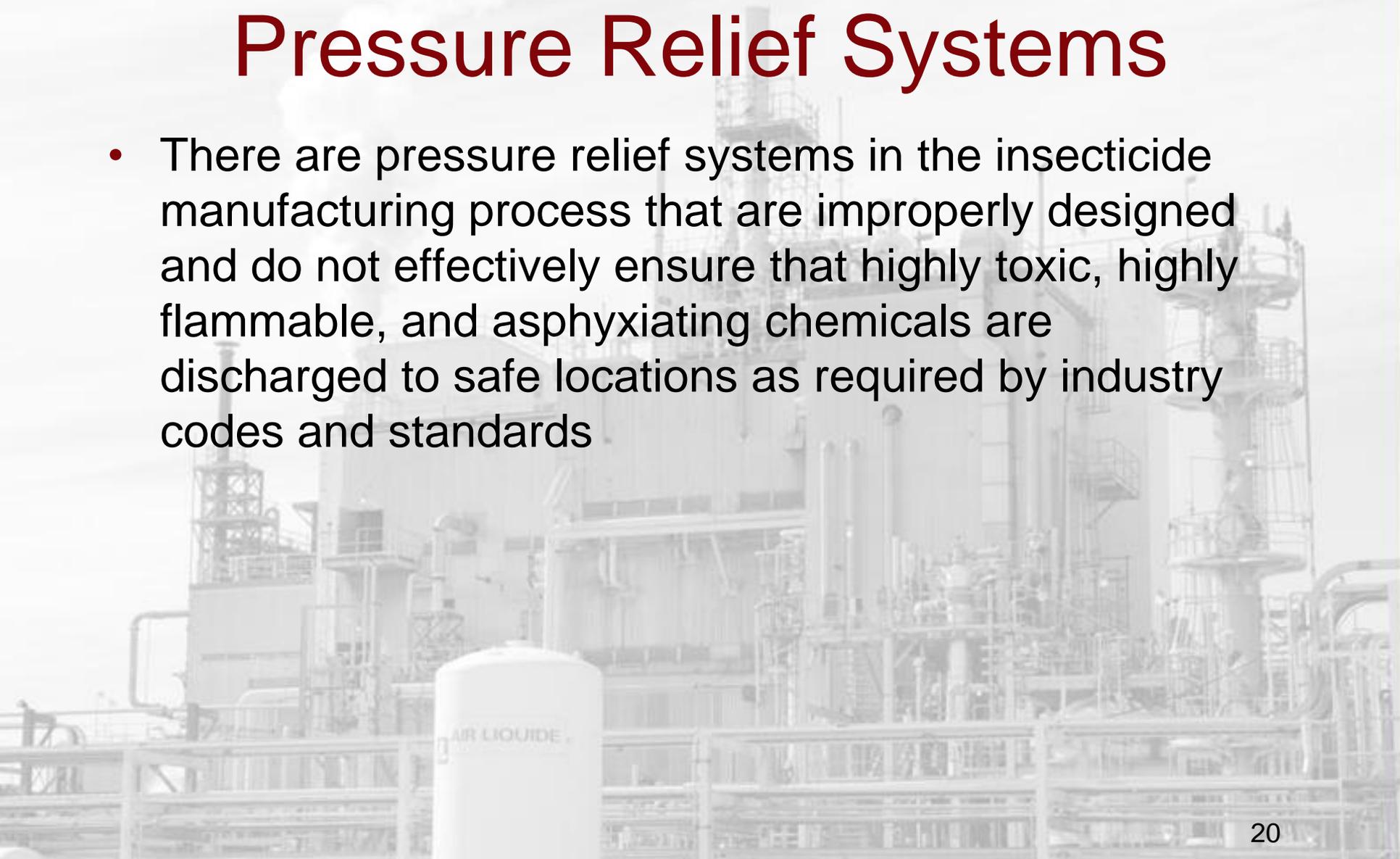
# Building Safeguards

- DuPont's process analyzer houses are infrequently entered, but they are equipped with more robust safeguards (detectors and alarms) than the normally occupied manufacturing building
- The manufacturing building has significantly larger inventories of hazardous chemicals, but has unventilated areas and is regularly occupied by workers



# Pressure Relief Systems

- There are pressure relief systems in the insecticide manufacturing process that are improperly designed and do not effectively ensure that highly toxic, highly flammable, and asphyxiating chemicals are discharged to safe locations as required by industry codes and standards.





# Proposed Recommendations for DuPont Crop Protection Unit

- **R1:** Conduct and implement a comprehensive inherently safer design review
- **R2:** Conduct a PHA and Engineering Evaluation of the building design and ventilation system
- **R3:** Perform a site-wide pressure relief study to ensure compliance with codes and standards
- **R4:** Develop an expedited schedule for robust more detailed PHAs



# Current Status

- Following receipt of a staff draft of the proposed recommendations on June 23, 2015, DuPont verbally committed to addressing the serious hazards identified in this document and to suspend the August 2015 startup
- DuPont has verbally committed to develop a formal plan to address these recommendations by the end of July 2015



# Current Status

- Formal recommendations allow the Board to effectively track and evaluate DuPont's mitigation of these serious hazards
- The status of recommendations issued by the Board is officially voted on and made publicly available on the CSB website



# Questions from the Board

