Burning Explosives

Chuck Rives

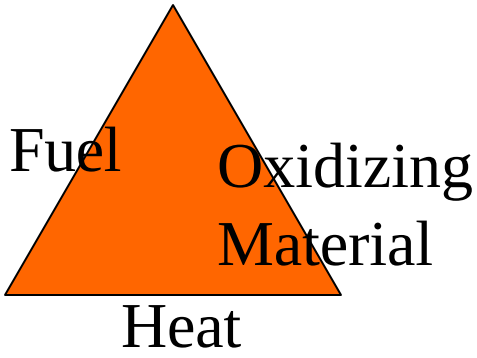
Emergency Planner & Analyst

Pantex Plant Emergency Management

Pantex

Explosives

- Heat, Fuel and Oxidizing Material are the basic “fire triangle”
- Explosives are materials that bring the fuel and oxidizing material together (sometimes separate but in the same molecule) and only require a little heat or energy to initiate the burning process



Speed of Combustion is the key

- A detonation is a very fast burning process
- Speed of the chemical reaction passing through the material exceeds the speed of sound through the same material
- Generation of heat and a resulting shock wave create the effects that we think of as an explosion
- Still, it’s just stuff that’s burning

Classes of Explosives and Burning Characteristics

- Class 1.1 Explosive
  - WILL explode
  - Sensitive Explosive
- Class 1.3 Explosive
  - Generally, not a detonation hazard
  - May burn passively (but often very quickly and very hot)
  - Soldiers sometimes cook meals over small quantities of burning class 1.3 explosive
  - May still explode in large fire events (Texas City)

Long History of Explosives

- 1942 – Pantex Ordnance Plant Constructed.
- Produced 250 and 500 Pound Bombs during WWII.

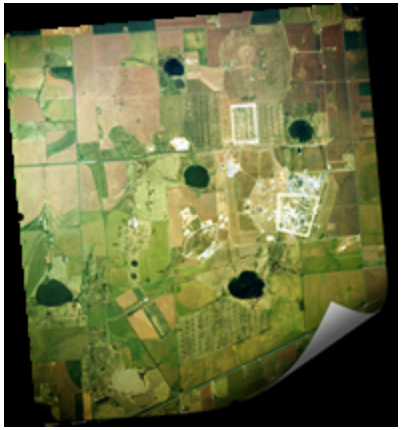
Pantex Explosives

- Many phases of explosive li
  - Formulation
  - Component manufacturing
  - Nuclear weapon assembly and disassembly
  - Storage and staging (up to 200,000 lb in a single magazine)
  - Disposal by dissolution, and . . . BURNING

Burning Grounds and Firing Sites

- Tests for things like:
  - Aging effects
  - Batch quality assurance
  - Safety
- Safe Disposal
- Require environmental permits for air emissions

The Pantex Explosives Inventory



- Mostly Class 1.3 (insensitive) Explosives.
- Still, sizeable quantities of Class 1.1(sensitive) explosives
- Up to 200,000 lb of 1.3 or 80,000 lb of class 1.1 explosive in a single facility
- Almost always co-located with some other hazardous material

Historic Treatment in Hazards Assessment at Pantex

- First assessed in the early 1990's
- Treated the explosives themselves as dispersed material
- Assumed some other mechanism of dispersal
  - Fork lift fire
  - Malevolent act involving a 30-lb satchel charge
- Ignored the reactive nature of the material

Historic Treatment in Hazards Assessment at Pantex Continued

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Current Treatment of Explosives

- Modeled after Pantex Plant Explosives Safety Program
- Uses Blast Overpressure for measurable criteria
  - Easy to calculate Pressure vs Distance based on Explosive Weight
  - Use Department of Defense Explosive Safety Board tool BECV4 to calculate overpressure distances

Current Treatment of Explosives

Continued

- Assume that fires involving explosives will become detonations
- Screen at same level that Plant Explosive Safety Program does
- Categorize and Classify using consequence thresholds . . . just like for dispersed material.

Explosive Consequence Thresholds

- EPA Risk Management Plan Consequence Assessment Manual 1-PSI overpressure as Protective Action Criteria
- People start to get minor injuries at 1-PSI distance
- 15-PSI as TEL distance (from AICHE textbook Understanding Explosions)
- “Whole body translation”

Limited Impact of Analysis Methodology

- Almost every explosives facility also contains other Hazardous Materials
- The explosives are less often the cause of the event classification than an agent of dispersal for other materials
- Because of the size and scale of the quantities of the other materials, the hazards of the explosives are often subsumed

Questions?