Assembled Chemical Weapons Assessment Program

Safety
Neutralization/Biotreatment

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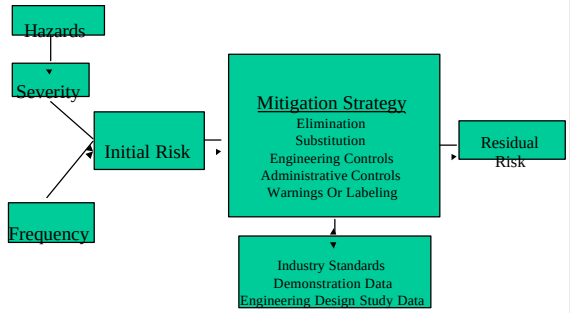
Types Of Hazards

- Inherent Hazards
  - Hazards basic to the process; the process would have to be changed to eliminate the hazard. The effects of the hazard can be mitigated, but the hazard can not be eliminated. (i.e., high temperature or pressure; corrosive chemicals).
- Manageable Hazards
  - Hazards that may be changed, eliminated or mitigated and not affect the basic parameter of the process (i.e., use of a lower concentration or type of caustic in scrubbers).
- Residual Hazards
  - Process hazards left over after mitigation or elimination efforts.

Preliminary Hazard Analysis (PHA)



Major Unit Operations

- Munition Unpack
- Agent Accessing
- Agent Treatment
- Energetic Accessing
- Energetics Treatment
- Metal Parts Treatment
- Dunnage Treatment
- Integrated Material Transport

Munition Unpack

- Major Unit Processes
  - Unload truck via forklift
  - Temporary storage in Munition Storage Building (MSB)
  - Manual unpacking & handling
- Hazards
  - Agent leaks or munitions functioning
  - Typical industrial material handling ergonomic hazards
  - Double Handling (unpacks & places in Munition Storage Building (MSB) until needed)
- Major Safety Features
  - Standard Army agent monitors & personal protective equipment
  - Facility provides vapor containment
  - Administrative control – standard operating procedures
  - Projectiles not highly sensitive to mishandling

Agent Accessing

- Major Unit Processes
  - Modified reverse assembly
    - Enhanced draining & water washout
- Hazards
  - High pressure lines
  - Machines with external mechanical moving parts
- Major Safety Features
  - Remote operation
  - Facility containment

Agent Treatment

- Major Unit Processes
  - Continuous Stirred Tank Reactor (CSTR)
    - Hydrolysis (low temperature, ambient pressure)
    - Secondary treatments
    - Immobilized Cell Bioreactor (ICB) & Catalytic Oxidizer (CATOX)
- Hazards
  - Leaks
- Major Safety Features
  - Remote operations
  - Containment at equipment level & facility level
  - Batch process
  - Hold, test, & rework/release (HT&R) capabilities
  - Slow controllable process
  - Reaction does not cascade
  - Effective secondary air effluent agent treatment (CATOX)

Energetic Accessing

- Major Unit Processes
  - Modified reverse assembly
  - Water jet burster washout machine
- Hazards
  - High pressure lines
  - Moving mechanical equipment
- Major Safety Features
  - Remote operations
  - Commercially available monitoring & control equipment
  - Facility containment (Explosive Containment Room)

Energetics Treatment

- Major Unit Processes
  - Continuous Stirred Tank Reactor (CSTR)
    - Hydrolysis (low temperature, ambient pressure)
  - Energetic Rotary Deactivator (ERD) (650°F, N_2)
  - Use of energetic hydrolysate as feed for secondary treatment (ICB)
- Hazards
  - Corrosive process chemical – NaOH
- Major Safety Features
  - Process design ensures total containment at equipment level
  - Facility design provides effective secondary containment
  - Remote operations
  - Slow controllable process that should not cascade
    - Batch process
    - Hold, test, rework, & release capabilities

Metal Parts Treatment

- Major Unit Processes
  - Rotary Metal Parts Treater (projectile bodies)
  - Batch Metal Parts Treater (all other metal parts, i.e. washed-out bursters)
- Hazards
  - Metal Parts Treater high internal temperature
    - 1000°F for 15 min
    - Steam
- Major Safety Features
  - Remote operations
  - Reaction does not cascade
  - Effective secondary treatment of air effluent (CATOX)
  - 5X Condition

Dunnage Treatment

- Major Unit Processes
  - Commercial wood shredder
  - Treatment in Continuous Steam Treater (CST)
- Hazards
  - Noise (> 140 dBA)
  - Moving mechanical parts
  - Dust generation
  - Continuous Steam Treater (CST) - High internal temperatures (1000°F for 15 min) & heat stress
- Major Safety Features
  - Remote operations
  - Proven controllable industrial process
  - Air effluent secondary treatment (CATOX) effective agent treatment

Integrated Material Transport

- Major Unit Processes
  - Pumping of hydrolysate
  - Use of conveyers
- Hazards
  - Hydrolysate leaks (almost neutral pH; agent neutralized; energetic deactivated)
  - Hot metal
- Major Safety Features
  - Remote operations or very limited attended required
  - Few potential initiations catalyses during transport
  - Standard industrial equipment
  - Effective standard industrial monitoring & control
    - Interlocking position sensors
    - Auto-stops

Conclusions

- Primary agent & energetics destruction units provide excellent containment of low temperature & ambient pressure processing parameters at the equipment level.
- Secondary air effluent treatment (CATOX) can effective destroy agent.
- The facility heating, ventilation, and air conditioning (HVAC) system & filters provide effective secondary containment.
- Batch processing mitigate or eliminate the potential for down stream exposures.
- Proven standard industrial practices & procedures are used to control hazardous process chemicals.
- Potential for an external agent release – highly improbable.