Are Chemical Releases Putting Naz T-Goo on You?

Insights into Prevention

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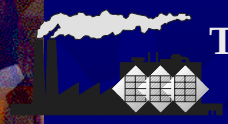


Hazardous Substances Emergency Events Surveillance (HSEES)

Why does HSEES want to talk with you?

To keep you out of the Naz T-Goo !

We will cover:

- Who and what is HSEES?
- What do we investigate?
- Where and when do these events occur?
- Who gets injured?
- Why are people getting injured?
- What can be done about it?

HSEES is designed specifically to capture the public health impact of releases like decontamination, evacuation, injury or death

HSEES Objectives

- Describe the distribution and characteristics of emergency events
- Describe the injuries and fatalities resulting from the events
- Identify the risk factors associated with the injuries and fatalities
- Identify strategies aimed at reducing future injuries and fatalities

HSEES Data Collection Form

- Type of Event
- Chemical(s)
  - Name
  - Type of Release (spill, air, etc)
  - Quantity

HSEES Data Collection Form (continued)

- Consequences
  - Victim Population Group(s)
  - Type of Injury
  - Medical Treatment
  - Demographics
  - Employee and Responder PPE
  - Distance From Event

HSEES Data Collection Form (continued)

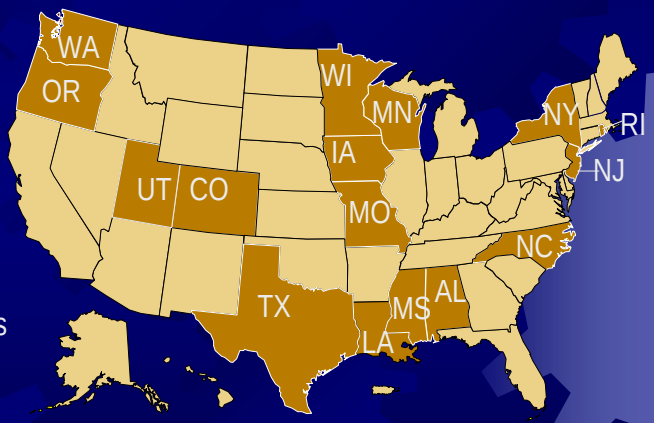
- Other Information
  - Area
  - Response Plan
  - Time
  - Environmental Sampling
  - Evacuations
  - Causal Factors
  - Affected Population

States Participating in HSEES

Sixteen states

Wide geographic distribution

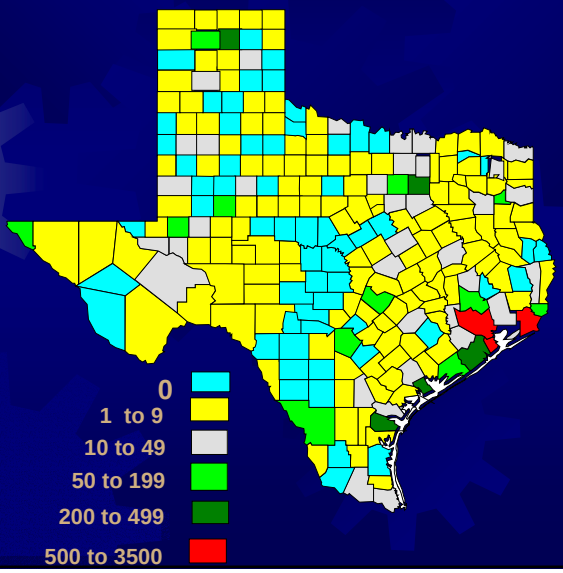
Array of industries



Texas HSEES Case Definition

- Sudden uncontrolled or illegal releases or threatened releases of at least one hazardous substance.
- The released material must be greater than 1 gallon or 10 pounds or exceed the CERCLA reportable quantity (RQ).
- *Events involving only petroleum are excluded.*

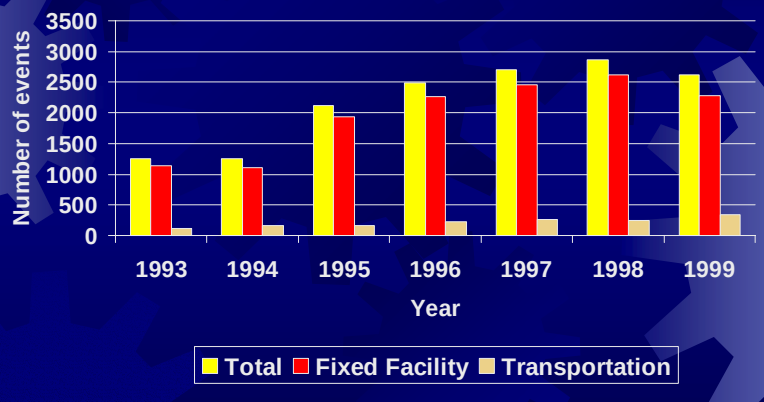
Events by county, Texas HSEES 1993 - 1997



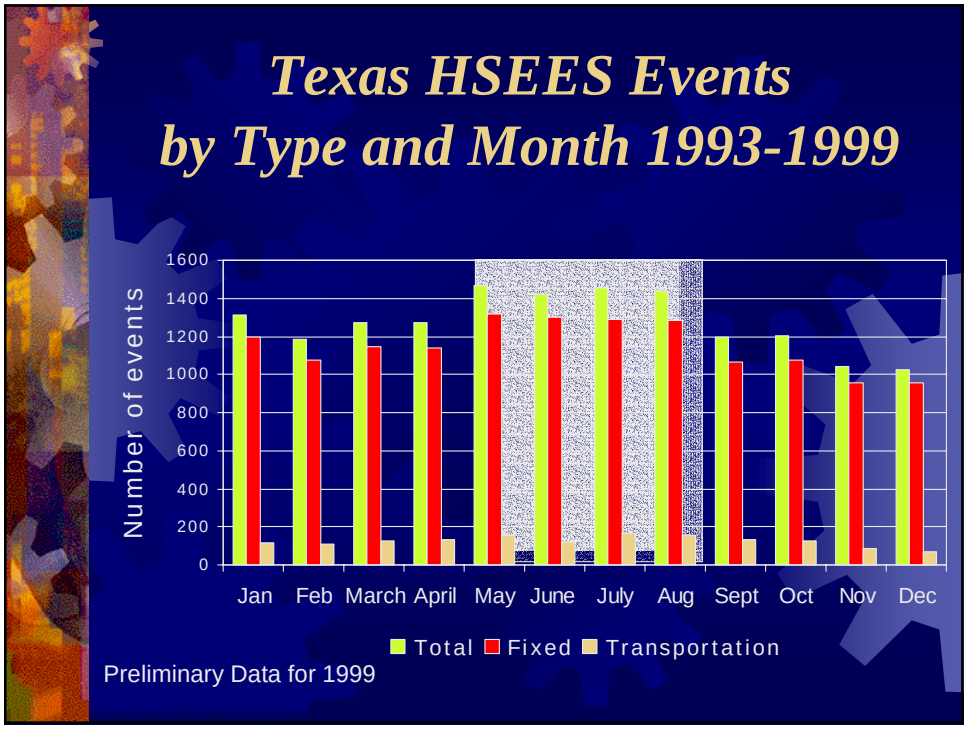
Texas HSEES, Events by County

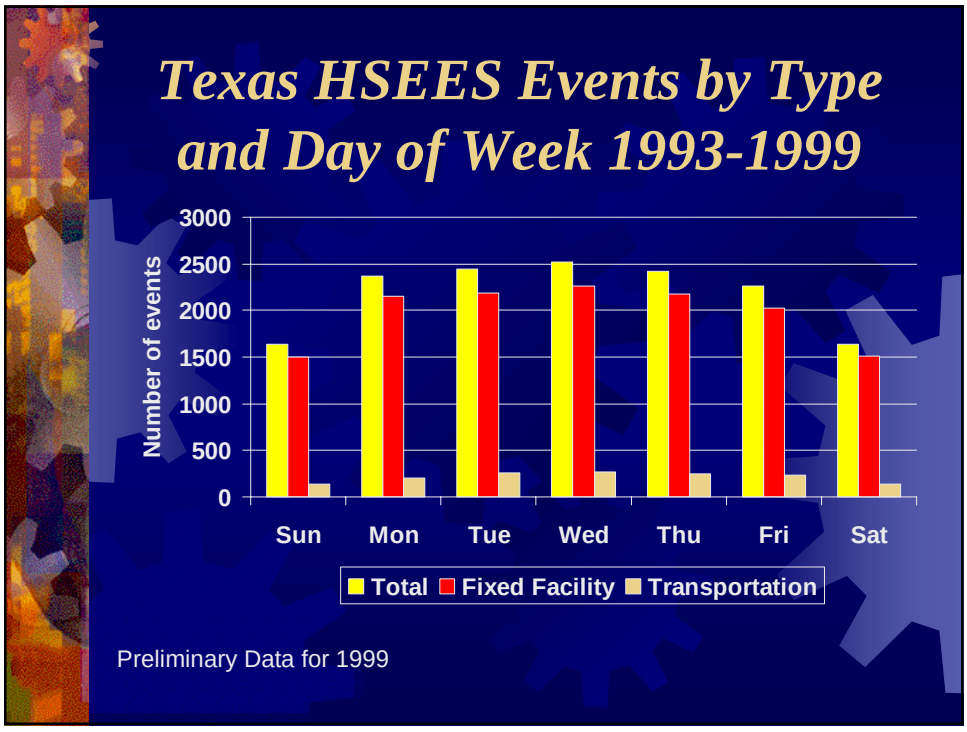
- The counties along the Gulf coast are highly industrialized and account for the largest number of events.
- Harris and surrounding counties accounted for over 60% of the events from 1993 through 1997.

Texas HSEES Events by Year 1993-1999

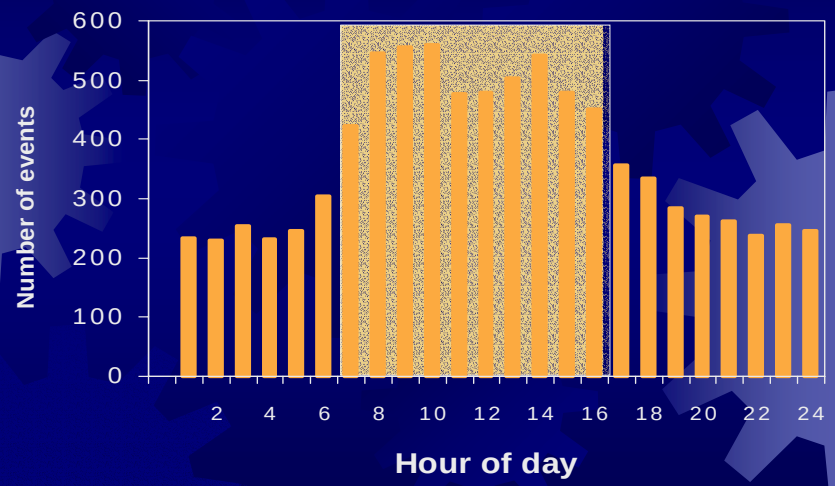


Preliminary Data for 1999

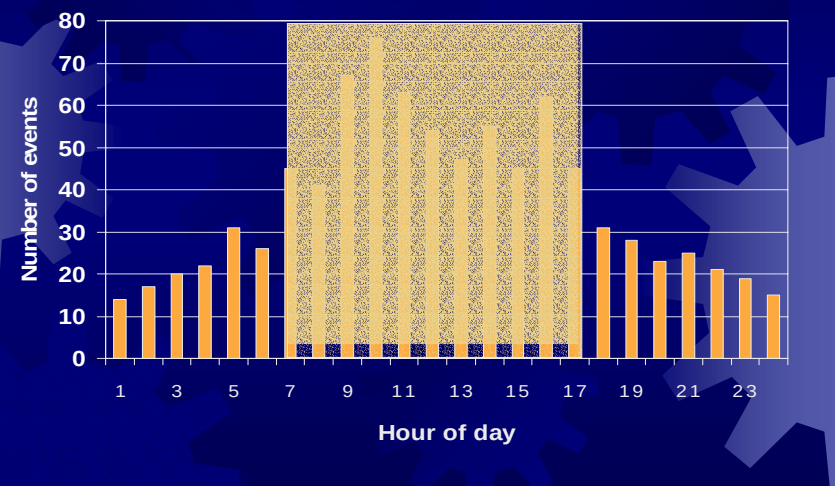

Texas HSEES Events
by Type and Month 1993-1999
Number of events
1600
1400
1200
1000
800
600
400
200
0
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec
Total
Fixed
Transportation
Preliminary Data for 1999


Texas HSEES Events by Type
and Day of Week 1993-1999
Number of events
3000
2500
2000
1500
1000
500
0
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Total
Fixed Facility
Transportation
Preliminary Data for 1999

Hourly Distribution of Events at Texas Fixed Facilities 1993-1997



Hourly Distribution of Texas Transportation Events 1993-1997



Industrial Hygiene Principles

Also strongly apply to process safety and risk management activities

1. Anticipate Hazards
2. Recognize Hazards
3. Evaluate Hazards
4. Control Hazards

Lessons Learned

Anticipate cycles with chemical releases

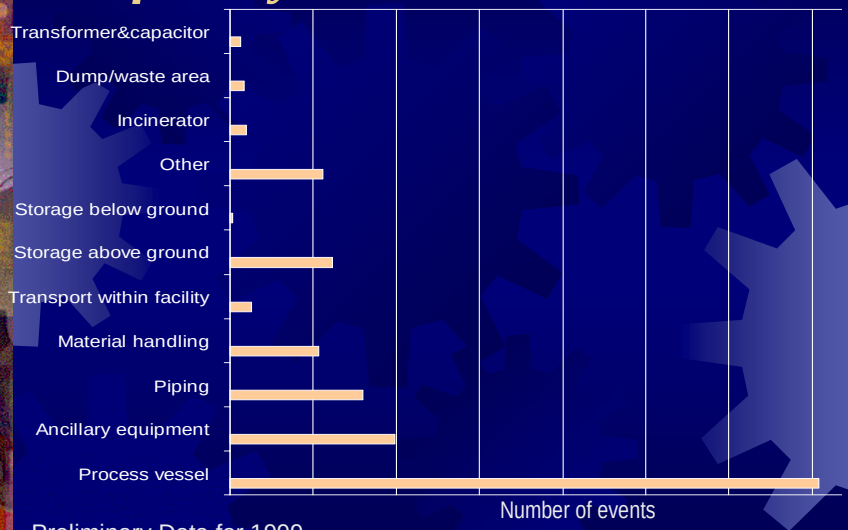
Work practices

- Better cross training for summer coverage
- Increased staffing or process monitoring
- More frequent maintenance cycles

Improve Process Design

- Back up power generation
- Redundant systems

*Area of Release for Texas Fixed-facility Events 1993-1999**



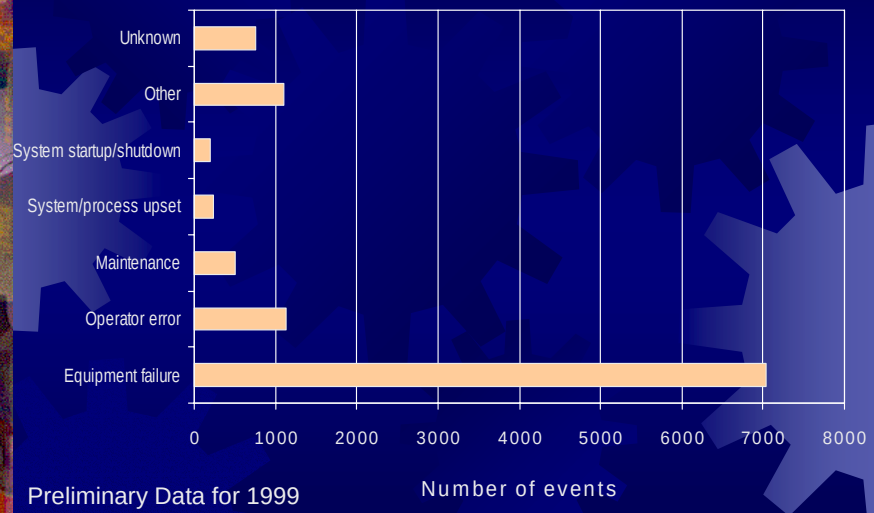
Preliminary Data for 1999

*Numbers will be greater than total number of events because up to two areas can be chosen per event.

Texas HSEES Data Analysis 1993 - 1999

- In Texas, the process vessel is the most frequent location for fixed-facility events
- Other prime locations for events are ancillary equipment, piping, storage above ground, and material handling (loading/unloading)

*Causes for Releases in Texas Fixed Facilities 1993-1999**



Preliminary Data for 1999

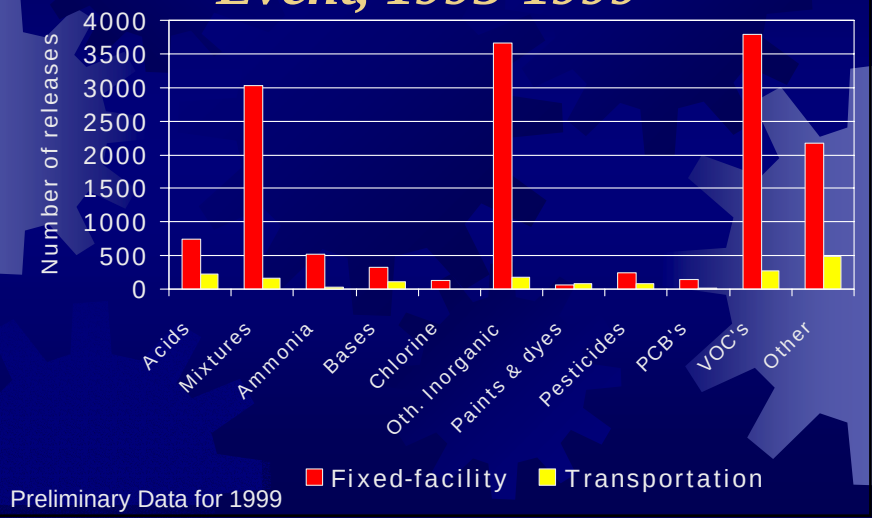
*Numbers will be greater than total number of events because up to two causes can be chosen per event.

Lessons Learned

- Texas data show the majority of events are caused by equipment failure or operator error
- Material handling is highly associated with operator error

- NOTE: These failures are mostly *Preventable*!

Number of Chemicals Released in Texas by Category and Type of Event, 1993-1999

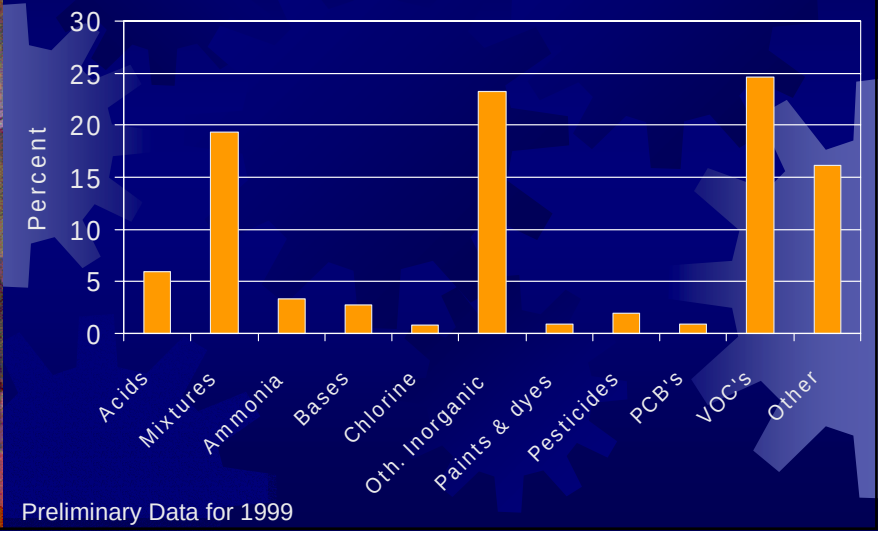


Preliminary Data for 1999

Texas HSEES Data Analysis 1993 - 1999

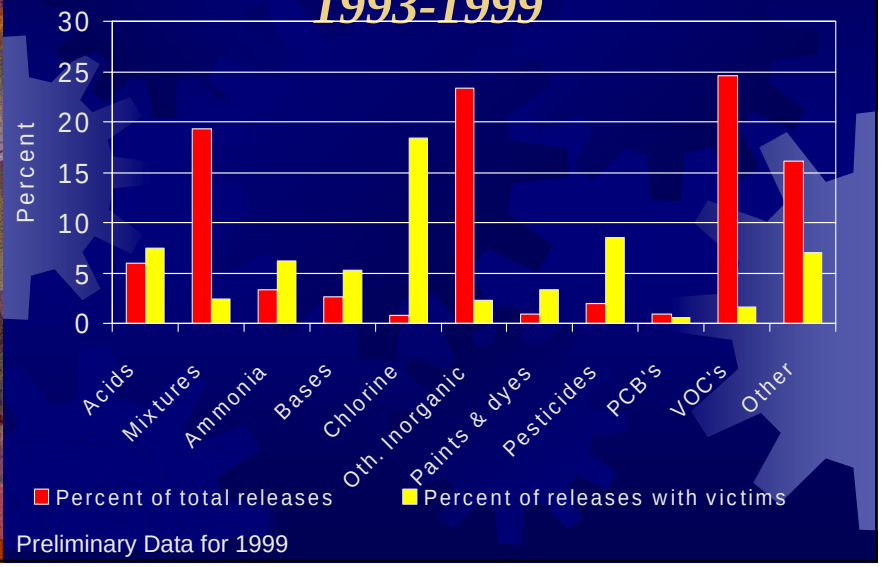
- The most frequently released substances for fixed-facility events are in the categories
  - "volatile organic compounds"
  - "other inorganic substances"
  - "mixtures"

Percent of Total Chemicals Released in Texas, by Chemical Category 1993-1999



Preliminary Data for 1999

Percent of Chemicals Released in all Texas Events and Events with Victims, 1993-1999



Preliminary Data for 1999

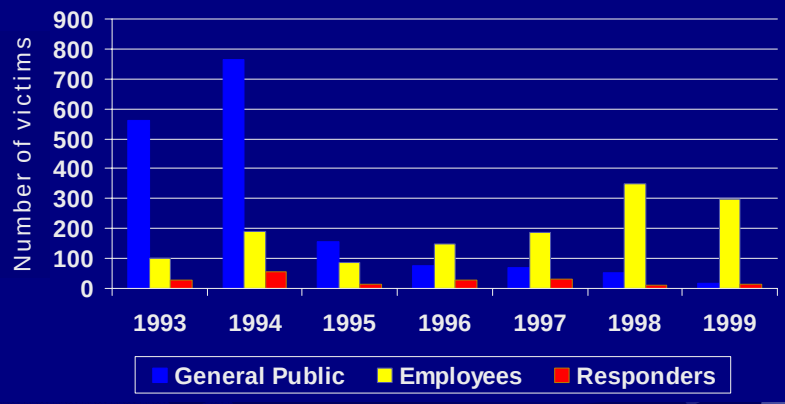
Texas HSEES Data Analysis 1993 - 1999

Hazardous chemicals highly associated with injuries:

- acids
- ammonia
- bases
- chlorine
- pesticides

Consequences

Texas Victim Trends by Year 1993-1999*

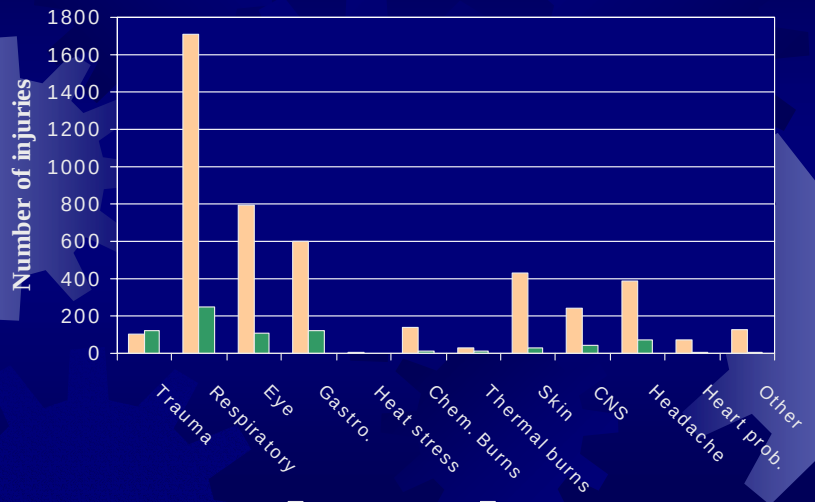


*21 victims were of unknown category.
Preliminary Data for 1999

Texas Victims and Chemicals 1993-1997

- The general public was most frequently injured in events involving ammonia (39%).
- Employees were most frequently injured in events involving other chemicals (18%), other inorganic substances (17%), and the multi-chemical category (17%).
- Responders were most frequently injured in events involving other chemicals (24%), followed by acids (22%), and pesticides (18%).

Injury Type by Type of Event in Texas 1993-1999



Preliminary Data for 1999

Texas HSEES Data Analysis 1993 - 1999

- The majority of victims were treated at a hospital and released
- There were no responder fatalities
- There were 51 deaths, 78% were employees and 22% were members of the general public
- 92% of the transportation-related deaths and 65% of the fixed-facility deaths were due to trauma

Texas HSEES Case Studies 1993 - 1999

Water Treatment Plant, 1993

Operator error caused 3,000 gallons of sodium hydroxide to be dumped into the public water supply.

- Injured 251 people
- Injuries included:
  - chemical burns
  - skin irritation
  - GI difficulty

Underlying causes:

- Poor system design
- Poor supervision and training

Water Treatment Plant, 1993 Lessons Learned

Lessons Learned?

- Implement standard operating procedures or checklist for processes and better training.

- Improve process control engineering

- Place automated sensor system linked to release cut off valve

Chemical Plant, 1994

During start-up, relief valve activated and released 3,000 lbs of ammonia in 8 min.

- Injured offsite: 580 general public
- Injured onsite: 2 employees and 1 unidentified victim
- Injuries included respiratory and eye irritation, and GI difficulty

Underlying causes:

- Improper startup caused overpressure in ammonia system triggering pressure relief valve

Chemical Plant, 1997

Relief valve on process vessel released almost 200 lbs diketene and was drawn into the building by the fresh air intakes for air conditioning system.

- "Shelter in Place" was ordered and 3 people evacuated for 1 hour
- Injured onsite: 58 employees
- Injuries included respiratory, eye, and skin irritation.

Underlying causes:

- Systems design problem
- Poor emergency response plan

Chemical Plants Lessons Learned

-**Lessons Learned?**

- Company installed pressure alarm on the vaporizer.

- Develop a step by step standard operating procedure/better training

- Improved and redundant engineering systems at critical points of control (ex: pressure sensors linked to flow cut-off valves, redundant recycling or containment capture controls).

- Be sure of workplace and community contingency plans

PVC Resin Mfg., 1998

Processing tank containing ethylene dichloride exploded and caused a fire releasing a mixture of 38,654 lbs of carbon monoxide/ethylene dichloride/acid gases.

- Evacuated 1,640 people, including 700 elementary school children for 5 hours.
- Injured 20 employees, 30 general public
- Mostly trauma injuries reported from flying debris

Underlying causes:

Poor control of processes

Foam Cushion Mfg., 1998

Hot pallet of curing foam overheated and spontaneously ignited

- **Cured polyurethane foam, toluene diisocyanate, methylene diphenyl diisocyanate, alcohol/amine polyurethane foam precursors**
- **>250,000 lbs released, plant operations destroyed.**
- **Evacuated 1,408 people (whole community) for 26 hours, plume visible for 75 miles**
- **No injuries**

Underlying causes:

- Poor control of processes
- Poor work place practices

Chemical Plants Lessons Learned

Lessons Learned?

- Fire control measures should have been anticipated
- Know the hazards of process reactants and degradation products
- Improved polyurethane foam curing techniques
- Implement structural or engineering systems to segregate curing polyurethane foam from stored foam

Summary Lessons Learned

Anticipate

- Identify processes likely to create on/off-site consequences (eg. ammonia, chlorine, acids)
- Prepare and exercise emergency response plans with plant and local emergency authorities

Recognize

– Operator error, equipment failure, and material handling situations are frequently associated with release incidents, AND are often PREVENTABLE.

Summary Lessons Learned

Evaluate

- Form Process Safety Control teams that include operators, maintenance, and process engineers.
- Review processes with high risk or frequency of upsets and past release incidents.

Control

- Use the research and expertise of the Process Safety Control teams to develop and implement integrated control systems using engineering and pollution prevention controls, good workplace practices, and drilled contingency plans.

Summary

Implementing comprehensive process safety strategies can impact:

Worker and community health and safety:

- By preparing workers and community members for chemical emergencies
- By reducing exposures and their consequences

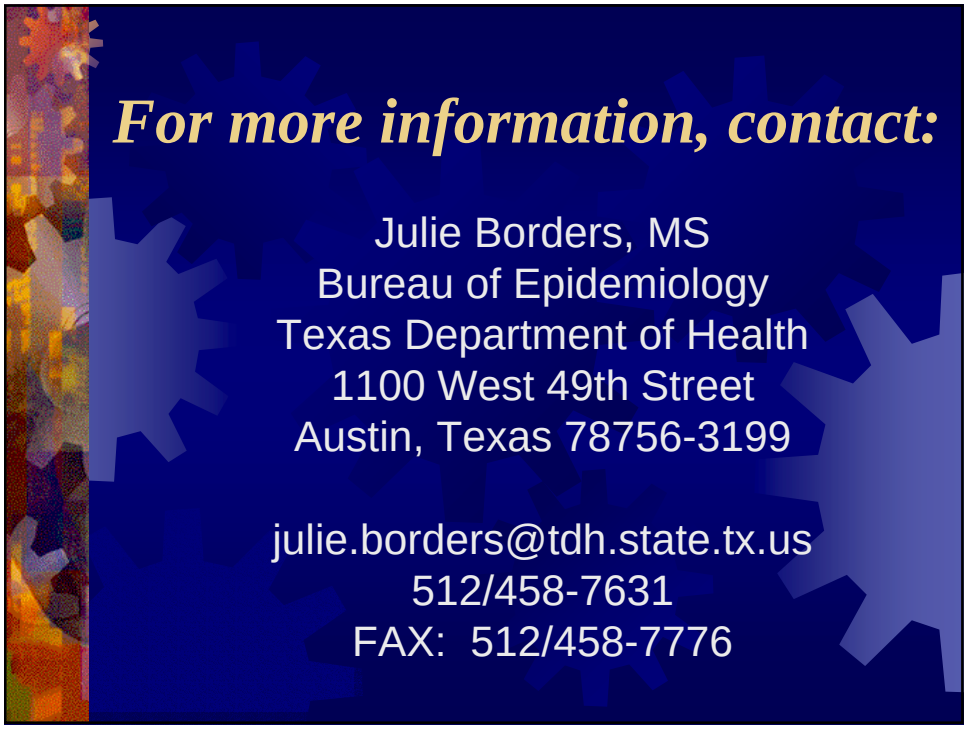
Summary

Avoiding or reducing process upsets/releases can impact:

Your company's bottom line:

- By reducing workers compensation and liability costs for on/off-site consequences
- By increasing productivity
- By reducing precursor and product loss
- By reducing environmental clean-up costs and agency fines

By analyzing Texas HSEES data and evaluating your plant's processes and past chemical events, industrial hygienists can develop strong selling points to managers for improved process safety management and pollution prevention.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