



Illioopolis, Illinois

Plastics plant explosion, April 2004



Perth Amboy, New Jersey

Acetylene explosion, January 2005



St. Louis, Missouri

Gas distribution plant explosion, June 2005



## U.S. Chemical Safety and Hazard Investigation Board

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### *Report on Chemical Incident Screening Database*

February 2006



CSB investigators deployed to a serious incident at the BP America Texas City oil refinery in March 2005. Fifteen people died and more than 170 were injured in the explosion and fire.

## Background

In January 2004, the Department of Homeland Security Office of Inspector General issued a report on *The Continuing Development of the U.S. Chemical Safety and Hazard Investigation Board* (report OIG-04-04). The first recommendation in that report requested that the CSB develop a plan to describe and address the gap between the number of incidents our agency investigates and the number falling within our statutory investigative jurisdiction. To satisfy this recommendation, we agreed to submit a report to Congress detailing

our incident screening process and the database of incidents that fall within our jurisdiction. The following report:

- includes the number of incident reports identified,
- lists serious chemical accidents evaluated,
- describes how we choose incidents to investigate, and
- explains why there is a difference between the number of incidents within our investigative jurisdiction and the number investigated.

In March 2004, the CSB created a new incident screening system to collect data on reported chemical incidents. A preliminary version of the system underwent a six-month trial beginning in June 2004, and it has since received formal Board approval. Each incident is logged, along with specific information about its location, facility, method of reporting, and impact. The table below is a small subsection of the screening database, listing a few actual incidents reported during summer 2004.

Reported Date	Company Name	City	State	Report Source	Incident Type	Injuries/Fatalities	Chemicals
6/30/2004	Amoco	Newberry	SC	Media	Release		Hydrogen, Peroxide, Nitrogen
7/6/2004	Titan Specialties	Pampa	TX	Media	Explosion/Fire	F/I	Unknown
7/14/2004	National Raisin Co.	San Joaquin	CA	Media	Release	I	Anhydrous Ammonia
8/10/2004	City of Lakeland	Lakeland	FL	Media	Explosion	I	Halogen
8/19/2004	Noramco, Inc.	Athens	GA	Media	Fire	I	Flammable Vapors

The CSB has a designated chemical incident screener on duty 24 hours a day, seven days a week. A combination of notification services including the National Response Center, the National Transportation Safety Board Communications Center, and various news outlets, serve as sources of information to identify chemical incidents as they happen. The incidents in the database do not comprise an exhaustive list of all chemical incidents that occurred in the country on any given day. Incidents logged in the CSB incident-screening database are scored using a formula that measures several factors relevant to its potential selection for investigation.

These factors include:

- injuries/fatalities
- public evacuation
- ecosystem damage
- potential for consequences
- learning potential
- property losses
- public concern
- history of the company

The factors assessing public and worker injuries and fatalities are given greater weight in the

scoring system. Once scored, the factors are averaged, and based on the numerical score the incident is then assigned a priority level. The priority levels are: high, medium-high, medium, medium-low, and low.

Additional information recorded in the database—such as the type of business or organization, the chemical involved, public impact, a brief description, and actions taken—all helps the incident screener score the incident.

Deployment decisions are made in accordance

with the CSB incident selection protocol. The decision to deploy a team of investigators to the site of a chemical incident often needs to be made before an incident can be scored with complete certainty. Consequently, incidents may be re-scored if new information is obtained on site.

The 1990 Clean Air Act Amendments, which authorized the CSB, require that special emphasis be placed on incidents that affect or have the potential to affect the public. If adequate resources are available, the CSB must investigate any incident where a member of the public is killed or seriously injured, although public injuries and fatalities are very rare. In most other cases, the Board needs to exercise discretion in deciding whether to initiate an investigation. Many more incidents are identified than can be investigated with the CSB's limited resources. In the selection process, the Board will rate incidents using the incident screening factors and scoring process, and the agency looks at broader considerations including: feasibility of the investigation, potential community impact, public recognition, the history and number of facilities of this kind, and learning potential from the incident.

The CSB began using the new scoring system

and incident database in June 2004. This report analyzes information gathered during the first year of using the new CSB incident scoring system. From July 1, 2004, to June 30, 2005, 645 incidents were reported and screened. The table below lists how the 645 incidents scored, the number of investigation deployments, and the number of investigations launched.

Score	Incidents	Deployments	Investigations
High	4	3	3
Med-High	1	0	0
Medium	13	3	2
Med-Low	53	1	0
Low	574	0	0
<b>Total</b>	<b>645</b>	<b>7</b>	<b>5</b>

## CSB Deployments— July 1, 2004, to June 30, 2005

From July 1, 2004, to June 30, 2005, the agency deployed teams of investigators to seven incident sites.

### August 19, 2004—Ontario, California

#### *Ethylene oxide explosion*

#### **Sterigenics International, Inc.**

*Inside the Sterigenics facility following the August 19, 2004, ethylene oxide explosion.*



Sterigenics uses ethylene oxide to sterilize medical equipment and other materials. Ethylene oxide is a probable human carcinogen and a flammable, colorless gas at temperatures above approximately 50 degrees F. In addition to its use as a sterilizing agent, ethylene oxide is used in the production of solvents, pharmaceuticals, antifreeze, and adhesives. Sterigenics International is the world's largest provider of sterilization services to the healthcare and food safety industries.

On August 19, 2004, at approximately 3:00 p.m., four workers were hurt when volatile ethylene oxide exploded inside a sterilization chamber in the plant. No one was in the immediate vicinity of the chamber when the incident occurred. However, the explosion severely damaged sections of the building wall and roof and shattered nearby control room windows. Some Sterigenics employees and neighboring businesses were temporarily evacuated, and four workers were treated for cuts from shattered glass from the control room windows.

This incident scored **medium** on the incident screening matrix. It first scored medium/low, but was later re-scored and assessed as medium because investigators discovered the substance involved and the amount of damage sustained.

The CSB deployed a team of investigators to assess the incident. Since then, the Board has been investigating this incident.

### August 23, 2004—Ferris, Texas

#### *Ammonium nitrate explosion and fire* **C & G Aircraft Services**

C & G Aircraft Services refurbishes and services aircraft parts. On August 23, 2004, a 50-pound bag of ammonium nitrate ripped open and spilled onto the floor of the facility, possibly mixing with an unknown chemical and causing an explosion. Two employees were sent to the hospital with serious injuries, and one of them later died. About a dozen workers were treated for minor injuries, and about 800 people were evacuated from the surrounding area.

This incident scored **medium** on the incident screening matrix.

The CSB sent a team of investigators to assess the incident, but decided not to pursue a full investigation because the learning potential would be low.

### October 30, 2004—Carteret, New Jersey

#### *Sodium hydroxide release*

#### **Kinder Morgan Terminals**

Kinder Morgan runs a petroleum and specialty chemical storage and shipping facility on the Arthur Kill River, just south of New York City. On October 20, 2004, several thousand gallons of sodium

hydroxide spilled into the river when a storage tank collapsed. Three people were taken to a hospital with mild burns.

The incident scored **medium/low** on the incident screening matrix.

The CSB sent a team of investigators to assess the incident. The Board later decided not to pursue a full investigation of this incident because opportunities to learn new information from this case were limited. The company is pursuing its own investigation of the case, and is furnishing the results to CSB investigators.

#### December 3, 2004—Houston, Texas

##### *Polyethylene wax explosion and fire* Marcus Oil and Chemical

Marcus Oil and Chemical is a polyethylene wax production facility located in Houston, Texas. On the evening of December 3, 2004, a storage tank containing polyethylene wax exploded violently. The blast could be felt up to 20 miles from the plant site, and it ignited fires that burned for several hours. Two firefighters were injured during the emergency response. Some buildings located near the facility—including two churches, a house, and a social club—suffered structural damage from the explosion.

The incident scored **high** on the incident screening matrix.

The Board deployed a team of investigators to the incident site and later decided to investigate the incident. Currently the team is conducting extensive testing of the equipment involved in the explosion so they can determine its cause.

#### January 25, 2005—Perth Amboy, New Jersey

##### *Acetylene explosion* Acetylene Services Company

Acetylene Services Co. (ASCO) is an acetylene manufacturing, repackaging, and distributing facility near Newark, New Jersey. Preliminary evidence suggests that acetylene gas exploded in an outdoor wooden shed that partially enclosed six large steel waste storage tanks. Three workers who were removing snow near the shed died in the explosion, and one was seriously injured.

The incident scored **medium** on the incident screening matrix.

Investigators arrived on scene the day of the incident, and the Board later decided to pursue an investigation of the incident. Investigators examined plant procedures, schematics, and blast damage and debris, and issued a safety bulletin in January 2006.

#### March 23, 2005—Texas City, Texas

##### *Refinery explosion and fire* BP America Texas City Refinery

Fifteen people were killed and more than 170 were injured in an explosion and fire at the BP America Texas City refinery. The incident, considered the most deadly occupational incident in the U.S. in over 20 years, occurred in the refinery's isomerization unit. This unit is the part of the refinery that increases the octane level of gasoline. Contract workers located in trailers adjacent to the unit were injured or killed in the fire and explosion.

The incident scored **high** on the incident screening matrix.

CSB investigators arrived on scene to assess the incident, and the Board soon decided to continue with a full investigation. In August 2005, the Board issued an urgent recommendation to BP's Global Board of Directors, calling on them to create an independent panel to examine corporate safety management and safety culture. In October 2005, the Board called on the American Petroleum Institute to develop a new safety guideline for the placement of trailers in petrochemical sites.

#### June 24, 2005—St. Louis, Missouri

##### *Gas storage facility explosion and fire* Praxair Inc.

Praxair operated a compressed gas storage facility in the city of St. Louis. Hundreds of missile-shaped containers of propane and acetylene exploded, were propelled into the air, and landed in nearby neighborhoods. The neighborhood was evacuated, and no one was injured.

The incident scored **high** on the incident screening matrix.

The Board sent a team of investigators to the site of the incident to conduct interviews with eyewitnesses and assess damage. Although the incident scored high, there was a limited set of safety issues involved, and most CSB investigators had already been committed to work on the BP Texas City investigation. Accordingly, the CSB is conducting research related to the Praxair incident, but the Board has not decided on the form of any final investigative product.

## Deployments Not Pursued Due to Resource Constraints

In the incident screening database, screeners document the basis for each deployment decision. Occasionally, a decision to deploy would have been made, but the agency did not send a team of investigators because they were deployed elsewhere. The database notes where deployments would have occurred if resources were available. During this initial phase of using the incident screening database, a decision was made not to deploy to or investigate 14 incidents due to resource constraints or competing priorities. They include:

**July 6, 2004—Pampa, Texas**

**Titan Specialties, Score: MEDIUM**

One worker died and two others were injured in an explosion at an oil well service facility.

**August 11, 2004—Bulan, Kentucky**

**Journey Operating, Score: MEDIUM**

Two men died and one was critically injured in a natural gas explosion at a pumping well.

**August 24, 2004—Paterson, New Jersey**

**Kirker Enterprises, Score: MEDIUM**

A 55-gallon drum of acetone exploded as it was being poured into a tank. One person was seriously injured at this nail polish remover manufacturing facility.

**December 14, 2004—Milwaukee, Wisconsin**

**Reiss Industries, Score: LOW**

Four people were injured when a tanker truck spilled diocyanate at a plastics manufacturing plant.

**December 16, 2004—East Point, Georgia**

**Brenntag Stinnes Logistics, Score: MED/HIGH**

Thousands of residents were evacuated from their homes when a 5,000-gallon tank of acetic acid issued a cloud of vapor.

**December 28, 2004—Muskogee, Oklahoma**

**Yaffe Metals, Score: HIGH**

Two employees died when a fire and explosion occurred in a large furnace at a scrap metal plant.

**January 7, 2005—Marshall, Missouri**

**MFA Oil Co., Score: MEDIUM**

An explosion and fire critically injured one person at a fuel storage facility in central Missouri.

**January 15, 2005—Anderson, Indiana**

**AMACOR, Score: MEDIUM**

A large stack of magnesium caught fire and forced the evacuation of over 5,000 residents.

**February 28, 2005—Harlingen, Texas**

**Wright Petroleum Co., Score: LOW**

One worker was killed when petroleum vapors in a tanker truck ignited during a cleaning operation.

**March 3, 2005—Levelland, Texas**

**Powell Oil Co., Score: MED/LOW**

A hot oil tanker exploded and critically injured one worker.

**March 4, 2005—Marshall, Texas**

**Mercer Well Service, Score: MED/LOW**

A gas well blowout killed one worker and injured three others.

**April 6, 2005—Fort Wayne, Indiana**

**National Magnesium and Aluminum,  
Score: MEDIUM**

A magnesium dust fire killed one worker and seriously injured three others.

**April 29, 2005—El Dorado, Arkansas**

**Great Lakes Chemical Co., Score: MED/LOW**

One worker died and a dozen others were injured when a bromine-based material was accidentally released.

**May 9, 2005—Portland, Oregon**

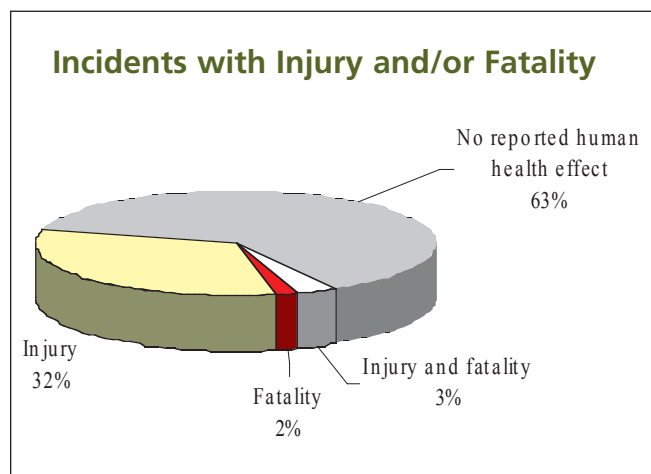
**Lacamas Laboratories, Score: MED/LOW**

An explosion injured three and leaked unknown chemicals into the Columbia River.

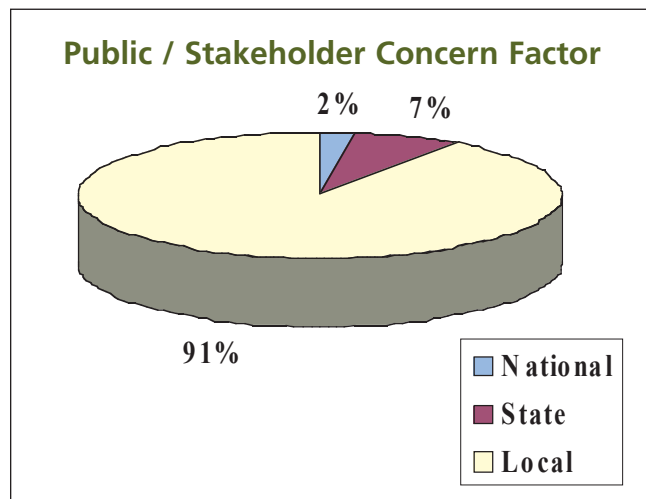
## Data Assessment

The following graphs present data in the incident screening database from July 1, 2004, to June 30, 2005.

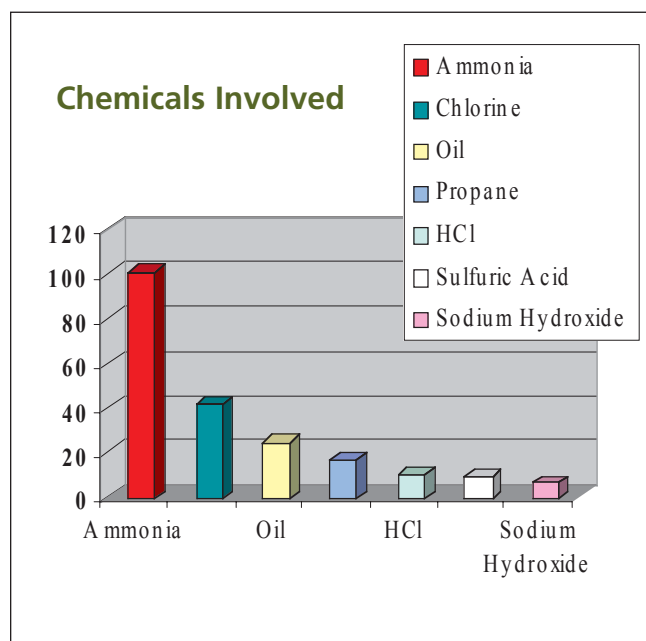
**Injuries and Fatalities**—During this time period, 34 incidents (5% of all incidents) screened by the CSB involved fatalities. Incidents with injuries (but no fatalities) or without injuries or fatalities were much more common.

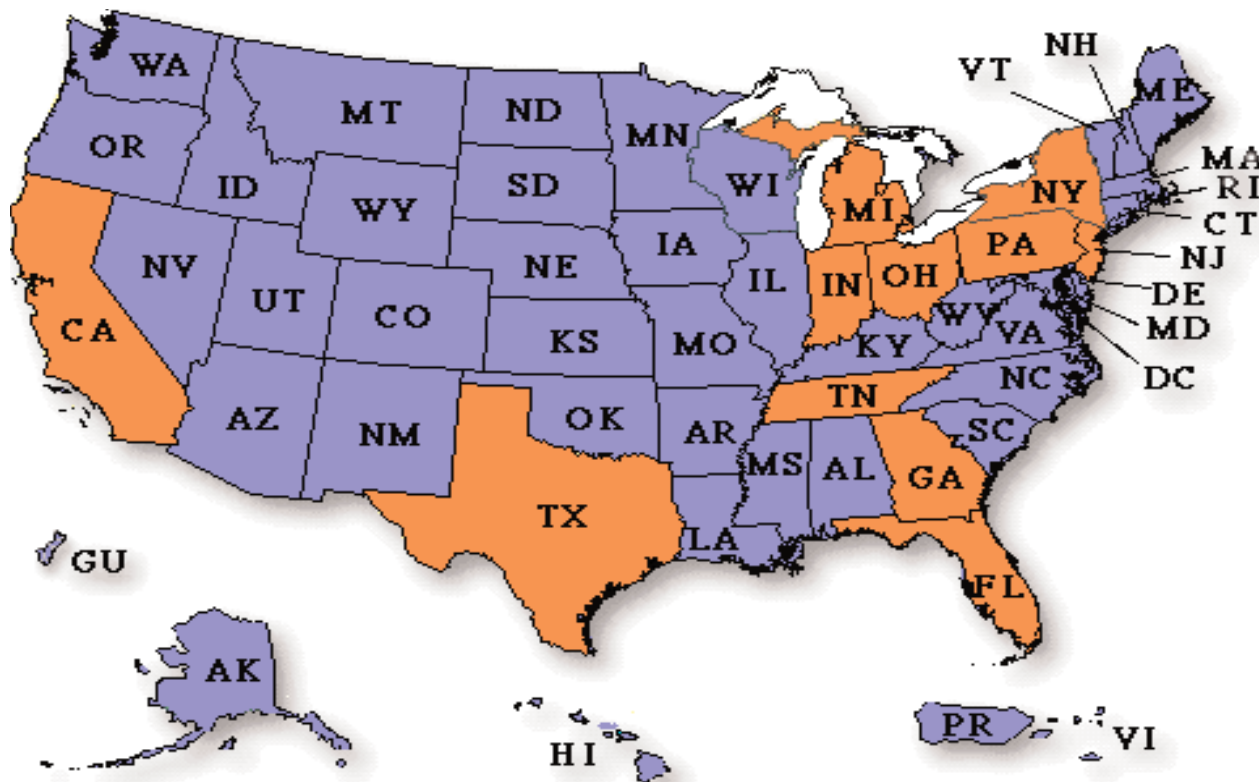


**Public/Stakeholder Concern**—Despite the severity and loss of life resulting from many reported incidents, most initial incident reports garner only local media attention.



**Chemicals Involved**—According to our data, most chemical incidents we screen involve substances that are initially unknown. Of those we can identify, the most common chemicals involved are ammonia and chlorine, followed by oil, propane, hydrochloric acid, sulfuric acid, and sodium hydroxide.





**Incidents by State**—Texas had the highest number of reported chemical incidents (69); Montana, New Mexico, and Vermont had the lowest number reported.

State	Incidents Reported
1. Texas	69
2. California	51
3. Pennsylvania	36
4. Ohio	33
5. New York	25
6. Florida	23
7. Illinois	23
8. Georgia	23
8. Indiana	23
9. Michigan	18
9. Tennessee	17
10. New Jersey	16

**Suspected Reactive and Dust Incidents**—

In 2002, the CSB completed a nationwide study on reactive chemical incidents, and is currently undertaking a study on chemical dust hazards. These studies were launched to assess the national significance of findings from various CSB incident investigations. Using this data set, we determined that more than thirty of this year’s reported incidents are related to chemical dust. We also estimate that over fifty of this year’s reported incidents involve reactive chemicals. These numbers indicate that the hazards of reactive chemicals and combustible dusts remain a significant national safety concern.







*The isomerization unit of the BP America Texas City refinery experienced serious damage after a March 2005 explosion and fire.*

## Conclusions

The CSB incident screening database contains information about all U.S. chemical incidents we have identified. CSB incident screeners and management are able to use the information to make informed deployment decisions, and later analyze data to estimate patterns in location, severity, substance involved, and media attention involved for the incidents. The agency has found that the database and scoring system greatly streamlines the deployment decision process. The CSB is continuing to use and refine the incident screening database and scoring system. As the tally of “low” score incidents shows, the majority of the 654 incidents reported from

July 1, 2004, to June 30, 2005, had relatively minor consequences. Thus, we believe that CSB investigations of these minor incidents would not be beneficial enough to justify their cost. This explains the apparent gap between the number of incidents within the CSB’s jurisdiction and the number actually investigated.

While the Board believes it would be useful to investigate additional incidents, such as those 14 incidents not assessed this year due to insufficient resources, the incident screening database is helping us focus federal funds where the most significant national safety benefits will be realized.