

# Safety Bulletin

U.S. Chemical Safety and Hazard Investigation Board



## AFTER KATRINA: PRECAUTIONS NEEDED DURING OIL AND CHEMICAL FACILITY STARTUP

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### Introduction

The startup of major processes is a hazardous phase in the operation of oil refineries and chemical plants. Hurricane Katrina has now disrupted production at numerous petrochemical facilities in the Gulf Coast region and caused extensive water and wind damage to facilities in hard-hit areas.

Over the coming weeks and months, these facilities will be restarting. This is a time to make sure no more lives are claimed by this tragedy and no further delays occur in the production of essential transportation fuels and chemicals. Facilities should pay particular attention to process safety requirements during this critical period to assure a safe and expeditious return to operation.

As the industry recognizes, starting up a complex petrochemical process requires establishing stable flows, levels, temperatures, and pressures within large-scale equipment. Startup requires and receives a higher level of attention and care than normal processing, because numerous activities are occurring simultaneously and many automatic systems are run under manual control.

Of 38 significant process incidents investigated by the U.S. Chemical Safety and Hazard Investigation Board (CSB) since 1998, three catastrophic incidents occurred during the startup of continuous process equipment, causing 22 deaths and more than 170 injuries. Other tragic incidents investigated by CSB occurred during the startup of batch processes and during

maintenance operations that followed a power outage.

While these incidents had a variety of causes, their occurrence underscores the hazards of startup even under "normal" conditions. In the wake of the hurricane, adhering to appropriate safety management systems can spell the difference between a safe and uneventful startup and a serious incident.

### Rely on Established Safety Systems

As facilities resume operations, it is important to follow established startup procedures and checklists and carefully perform pre-startup

safety reviews. In addition, facilities should remember to:

- Use appropriate management-of-change (MOC) processes before modifying any startup procedures, equipment, or staffing arrangements due to the impact of the hurricane.
- Make sure that adequate staffing and expertise are available before starting up, recognizing that human performance may be compromised due to crisis conditions.
- Use up-to-date startup procedures and ensure that the available staff are trained in how to execute them.
- Evacuate nonessential personnel (including personnel in trailers) from the vicinity of process units that are starting up.



Photo Courtesy of National Oceanic & Atmospheric Administration

## Check Process Equipment Thoroughly

Equipment, tanks, and instrumentation should be thoroughly evaluated for damage prior to startup. In particular, facilities should remember to:

### *Examine large bulk storage tanks for evidence of floating displacement or damage*

- ✓ Foundation, chime ring, under-tank voids
- ✓ Overturning, shell shifting
- ✓ Floodwater leakage into tanks
- ✓ Piping connections distortion or damage
- ✓ Piping and component support displacement or damage
- ✓ Ladder support displacement or damage

- ✓ Floating roof submersion or damage
- ✓ Fixed roof distortion from support damage
- ✓ Debris impact damage
- ✓ Test grounding integrity

### *Examine pressure vessels and small storage tanks for evidence of floating displacement or damage*

- ✓ Support structure or foundation damage
- ✓ Floodwater leakage into vessels or tanks
- ✓ Piping connections distortion or damage
- ✓ Debris impact damage

### *Examine insulation systems for piping, vessels, and tanks*

- ✓ Floodwater trapped in insulation
- ✓ Damaged or missing insulation

### *Examine sewers and drains*

- ✓ Debris and silt obstruction

### *Examine furnace systems*

- ✓ Damaged or missing refractory
- ✓ Damaged or missing insulation
- ✓ Floodwater trapped in refractory or insulation
- ✓ Debris impact damage
- ✓ Fuel system and control damage
- ✓ Debris in firebox

### *Examine electric motors and drives*

- ✓ Floodwater leakage into housing
- ✓ Drive component damage
- ✓ Debris impact damage
- ✓ Test motors for ground faults (megohmmeter testing)
- ✓ Verify lubrication systems are functional on associated equipment

### *Examine switchgear, conduit, electrical boxes, electronic and pneumatic instrumentation, emergency warning systems, emergency equipment (e.g. eyewash stations, fire detection and suppression systems)*

- ✓ Floodwater leakage into devices and conduit
- ✓ Debris impact damage
- ✓ Conduct infrared scans to detect hot-spots in equipment upon energizing.

This list is not exhaustive and is not intended to substitute for any other procedures or checklists regularly used or developed in response to Hurricane Katrina. For further information on CSB investigations and safety recommendations, visit [www.csb.gov](http://www.csb.gov).

CSB Safety Bulletins offer advisory information on good practices for managing chemical process hazards.

The U.S. Chemical Safety and Hazard Investigation Board (CSB) is an independent Federal agency whose mission is to ensure the safety of workers, the public, and the environment by investigating and preventing chemical incidents. CSB is a scientific investigative organization; it is not an enforcement or regulatory body. Established by the Clean Air Act Amendments of 1990, CSB is responsible for determining the root and contributing causes of accidents, issuing safety recommendations, studying chemical safety issues, and evaluating the effectiveness of other government agencies involved in chemical safety.

No part of the conclusions, findings, or recommendations of CSB relating to any chemical incident may be admitted as evidence or used in any action or suit for damages arising out of any matter mentioned in an investigation report (see 42 U.S.C. § 7412(r)(6)(G)).

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