Key Chemical and Physical Hazards
Petroleum and Natural Gas Industries

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Overview

• Extraction

• Processing

• Resources
The Sector

• Gas--the fuel of the 21\textsuperscript{st} century

• Overall Petroleum and Natural Gas industry grew, 2004-2012
  – ↑employment, production, consumption, reserves
  – on land, off shore
  » Source: Ministry of Petroleum\&Natural Gas
  » www.petrocum.nic.in.ng.htm

• International participation in Heath and Safety
  – MOU India Oil Industry Safety Directorate and AIChE Center for Chemical Process Safety, March 2013
Extraction

• Illustrations from Fracking
  • Relatively new technology to recover reserves
Vehicles at a Hydraulic Fracturing operation yard size and number of transport vehicles increases risk of vehicle accidents involving workers and residents.
Vehicles not restricted to those on tires
Rail yard
Rail transit can result in releases, explosion/fire

Lac Magintac, Quebec Canada 2013—rail cars from fracking fields

Photo credit: Canada Transportation Board
Damage to Town

Photo credit: Canada Transportation Board
Close up of rail cars

Photo credit: Canada Transportation Board
Falls from heights
Drilling site potential exposures include
Silica, NORM/TENORM, Temperature Extremes, Fatigue, Noise,
Diesel Particulate, BTEX, Acids/bases, Contaminated water
Storage tank monitoring
Hydrogen sulphide, BTEX, VOC
Falls
Size and movement maintenance equipment and pumping unit operation contribute to hazards of

Struck-by/Caught-in/Caught-between

Diesel Particulate emissions
Confined Spaces
Materials handling contributes to **Ergonomic stresses** and **Struck-by/Caught-between**
Hazard to residents
Potential for release to waterways and water supply
Hazard to Residents

Limited access if there is a release
Exposure to residents
Flaring VOCs and Particles
Extraction: Key Physical Hazards Summary

- Vehicle Accidents
- Struck by/Caught in/Caught between
- Explosions and Fires
- Falls
- Confined Spaces
- Noise
- Temperature extremes
- Ergonomics stresses
- Fatigue
Extraction: Key Chemical Hazards Summary

• Hydrogen Sulfide
• Silica
• BTEX (Benzene/Toluene/Ethyl benzene/Xylenes)
• Naturally Occurring Radioactive Materials (NORM)
  – Become Technology Enhanced NORM (TENORM)
• Acids and Bases
  – Note to also consider
    • Maintenance materials
    • Dermal exposure
Refining/Processing
Oil refinery
Key Physical Hazards

- Explosions and Fires/Uncontrolled processes
- Falls
- Confined Spaces
- Vehicle Accidents
- Struck by/Caught in/Caught between
- Noise
- Temperature extremes, including burns
- Ergonomics stresses
- Fatigue, including at computer control stations
- Work with Contractors, especially hot work activities
Key Chemical Hazards

- Acid gases, including Hydrogen Sulfide and Hydrogen Chloride
- VOCs
- Insulation materials
- Process-specific materials
  - Note to also consider
    - Maintenance materials
    - Dermal exposure
Gas processing plant
Key Physical Hazards

- Explosions and Fires/Uncontrolled processes
- Falls
- Confined Spaces
- Vehicle Accidents
- Struck by/Caught in/Caught between
- Noise
- Temperature extremes, including burns
- Ergonomics stresses
- Fatigue, including at computer control stations
- Work with Contractors, especially hot work activities
Key Chemical Hazards

- Acid gases, including Hydrogen Sulfide
- VOCs
- NORM
- Metals, including mercury
- Insulation materials
- Process-specific materials

- Note to also consider
  - Maintenance materials
  - Dermal exposure
Resources

• **India**

• **Canada**

• **British**
  – [http://www.hse.gov.uk/coshh/industry/offshore.htm](http://www.hse.gov.uk/coshh/industry/offshore.htm)
  – [http://www.hse.gov.uk/chemicals/manufacture.htm](http://www.hse.gov.uk/chemicals/manufacture.htm) (includes Petroleum)

• **US**