Preventing Fires & Spills from Tank Overflow

International Society of Automation
Denver Section
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Overfill Has Caused Great Fires with Great Loss of Life & Property

- Molassas & Alcohol Boston, 1919
  - Overfilled
  - Killed 21

- Gulf Oil Refinery, Philadelphia, 1975
  - Hi Alarm & Gauging Failure
  - 8 firemen killed, Closed for a year

- Buncefield terminal, 2005
  - Gauge & Alarm Failure
  - Resulted in revised Codes
Philadelphia Gulf Refinery Fire

- Tanker filling crude tank under bridge; overflowed into bunker
  - Vapors flowed over bunker to boiler 300 ft away
  - Flashed Back
  - Burned about a week

- Budget didn’t permit purchase of a remote gauging/alarm interlock system in 1974

- Procedures were violated
  - Gauger did not observe procedures
  - Float alarms didn’t interlock & shut off flow

- Results
  - 8 firemen lost
  - Primary highway entrance to Phila closed for several months
  - Refinery closed months with lost production
Buncefield UK - 2005

- Unattended product terminal
- Overfill for hours from pipeline
- Gauge failed to indicate level rise for 2 hours
- Hi alarm switch failed
- Vapor cloud flowed over bunkers to ignition
- Triggered revised standards for independent level measurement & shutdown systems
  - NFPA 30
  - API 2350
Which Standard

• NFPA-30 when
  – Tanks have 1320 gallons or less
  – Single tank
  – Indoor

• API 2350 when
  – Tanks contain more than 1320 gallons
  – Tanks are filled from a pipeline
  – Multiple tanks in close proximity
API 2350
Management System Overfill Prevention Process

• Formal Risk Assessment: Individual & Overall
• Formal written operating procedures and practices with safety and emergency response
• Trained & qualified personnel
• Functional equipment
• Scheduled inspection and maintenance programs for instrumentation
• Systems to address both normal and abnormal conditions
• Management of change process
• A system to deal with overfill near misses and incidents
• A system to share lessons learned
API 2350 Detail

Categorize each vessel’s overflow risk

- Category 1 Manual
- Category 2 Sensor + Alarms Notify Operator
- Category 3 Redundant Sensors & Alarm
  - Notifies Operators
  - Shuts Off Flow
- Category 4 Automatic Shutoff
More Fuel Tanks in Buildings for Backup Power

• Often in basements or on rooftops
  – Some have overflowed

• NFPA 30 21.7 calls for
  – Audible & visual alarm at 90% full
  – Shutoff at 95%

• System strategy:
  – Monitor continuous level
  – Shutoff w/monitor + Independent
Fuel Tanks in Buildings for Backup Power

• Often in basements or on rooftops
  – Some have overflowed
• NFPA 30 for >1320 Gal Tanks
  – Independent sensor/alarms
  – Audible & visual alarm at 90% full
  – Shutoff at 95%
• System strategy:
  – Monitor continuous level
  – Shutoff w/monitor + Independent
Types of Level Shutoff Point Level

- Capacitance/RF
- Displacement
- Float
- Pressure
- RADAR
- Thermal
- Ultrasonic
Overflow Is Easy To Prevent

- Pays for itself in lower insurance rates
- Follow standards
- Plan protection
- Use Reliable, Redundant Sensing
- Integrate into a reliable interlock system
Prevent This