

# TEXAS CITY BP REFINERY EXPLOSION

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# ISOMERIZATION UNIT

- Isom unit is a raffinate splitter tower.
- Paraffins ( $C_nH_{2n+2}$ ) heated to drive off H to form  $C_nH_{2n+1}$ , isobutane to increase octane for gasoline.
- Hydrogen vented to Blowdown Drum if gas pressure too high.
- Isobutane product drawn off to Drawdown Tank

# LIQUID LEVEL INDICATOR

- Isom used a buoyancy-type detector, e.g.:
  - Displacer hangs from spring
  - As liquid rises, buoyant force allows displacer to rise
  - This movement is indicated in control room
  - If liquid rises above displacer, there is no indication in control room

# TIMELINE OF BP EXPLOSION

- March 23, 2005
- 0200 Operators started filling Isom unit with cold liquid paraffins to 6.5 ft.
- 0305 Primary Alarm; level indicator at 7.2 ft.
- 0310 level indicator at 10 ft. No backup alarm.
- 0330 Operator turns off input flow. Level indicator at 10 ft., actual level 13'
- 0730 Level indicator starts to decline as liquid warms and buoyancy decreases

# TIMELINE

- 0950 Operators circulate liquid, add more liquid and draw off liquid to drawdown tank. But drawdown valve left closed. Level rises to 138 ft.. Level indicator reads 10 ft.
- 1000 Operators light 4 burners to heat input liquid. Density goes down. Buoyancy goes down. Level indicator goes down.
- 1240 High gas pressure alarm. 2 burners turned off. Gas pressure relief valves do not open. Operator opens manual valve to flow gas to Blowdown Drum. Gas pressure goes down.

# TIMELINE

- 1300 Operator opens drain valve to Drawdown Tank. Hot liquid goes through heat exchanger, preheats input fluid by 150°C
- 1305 liquid feed now boiling. Density goes down more. Level indicator falls to 8 ft. Actual level near top of splitter
- 1310 Zero liquid flow to Blowdown Drum

# TIMELINE

- 1314 Hot liquid overflows, placing high head on gas relief valves. Relief valves open, flooding hot paraffin to blowdown tank. Level rises to top of Blowdown Tank. No high level alarm sounds. Paraffins spout from Blowdown Tank
- 1320 Explosion. 15 killed, 100 injured.