

What Is an Acceptable LEL Detector Reading?

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▲ A storage tank at a refinery exploded during a routine cleaning operation. Image courtesy of the U.K. Health and Safety Executive.

A storage tank exploded as a vacuum truck was emptying it with a non-conductive hose. Four contractors were killed and another person experienced life-altering injuries. The company and the contractors were fined more than \$8 million, and plant operations were interrupted for weeks.

The workers had not expected to find flammable vapor in the tank. Due to a process change about ten years before the incident, flammable liquid hydrocarbons could slowly accumulate on top of the liquid in the tank. Multiple incidents in the past had warned of flammable materials in the tank.

The accident had several contributing factors, but this Beacon focuses on gas detection. The operator took a gas reading inside the tank's vapor space as he prepared the work permit and obtained a reading of 67% of the lower explosive limit (LEL) near the top of the tank. It is unclear why, but the work continued despite the high reading. The ignition source for the explosion was either an electrostatic spark or self-ignition of pyrophoric material; neither were recognized when preparing for the work.

Reference: U.K. Health and Safety Executive, "Chevron Pembroke Amine Regeneration Unit Explosion," www.hse.gov.uk/comah/chevron-pembroke-report-2020.pdf (2020).

Did You Know?

- Several regulators, including the U.S. Occupational Safety and Health Administration (OSHA), prohibit a confined space permit from being issued if the concentration of flammable vapors is above 10% of the LEL.
- Many flammable vapors are heavier than air, so they can be more concentrated at the lowest point — near the bottom of the tanks, in sumps, or in trenches.
- Sludge in the bottom of a tank may contain pockets of flammables, which can be released as the sludge is disturbed and cleaned out.
- The movement of fluids — and even solids — through hoses can generate static charge. It is important to bond and ground all equipment in or near hazardous locations.

What Can You Do?

- Perform the gas tests thoroughly by using a properly calibrated LEL meter and following your procedure for LEL testing.
- If a reading is above the limits in the LEL testing procedure, something is wrong. Do not proceed until the problem is fixed and you get acceptable readings.
- See the August 2020 Beacon on where to test for flammables and the March 2020 Beacon on vacuum truck hazards.
- Your site should follow good engineering practices for tank cleaning, such as the Energy Institute Part 16 "Tank Cleaning Safety Code" or American Petroleum Institute (API) Standard 2015 "Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks."

An LEL reading indicates that some flammable vapor is present!