MSA Portable Gas Detection
Methane as a Pentane Simulant vs. Pentane Calibration

The Safety Company

Technical Bulletin

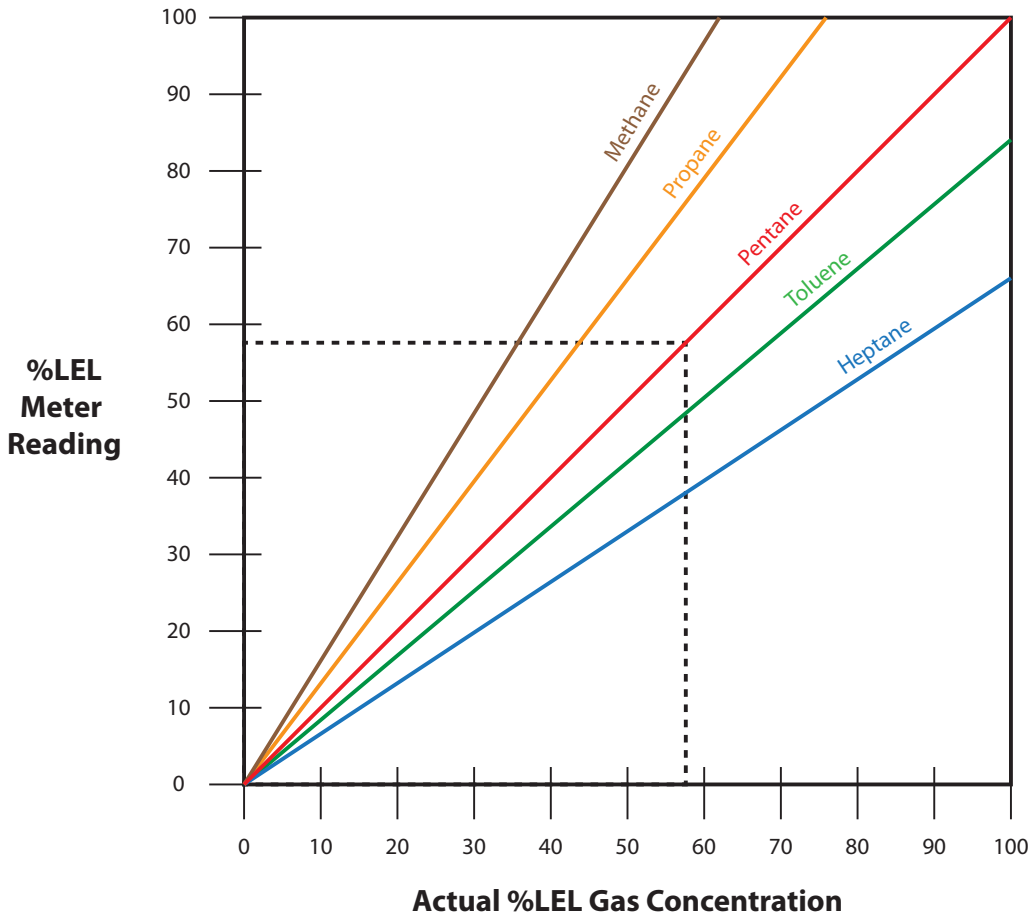
Which combustible gas is provided in MSA standard RP calibration gas cylinders?

The combustible gas contained within these cylinders is listed as pentane simulant, but the actual gas type is methane.

Why calibrate catalytic bead combustible sensors with pentane or pentane simulant?

Portable instruments can be used for many applications and must detect hydrogen, methane, gasoline, propane, and any number of additional combustible gases depending upon the application. When a gas comes into contact with a hot catalytic bead sensor, micro-combustion occurs and energy releases. The energy level released differs depending upon the gas; some gases respond at higher levels and some at lower levels. A pentane calibration provides a good reference point for many combustible gases.

Response factors for other gases are listed in the instruction manual for each instrument; these multipliers can be used when the gas being measured is known. For unknown mixtures, a pentane calibration offers the best indicator.



What is the advantage of using methane in the gas cylinder instead of pentane?

Two primary reasons exist for performing actual calibration using methane:

1) Pentane can easily liquefy when under high pressure (>1000 psi) and when temperatures drop below 50°F. If a pentane cylinder were used under these conditions, calibration could potentially be inaccurate, as some pentane contents would puddle in the bottom of the cylinder. Methane is more stable in withstanding pressure and temperature changes and does not degrade over time.
2) Methane is one of the more difficult gases for a catalytic sensor to combust, as it requires higher bead temperature and more catalyst than most other combustible gases. Once methane combustion occurs, substantial energy is released and high signal is achieved, meaning that methane sensitivity is very good as long as the bead is able to create catalytic combustion.

Exposure to low level poisons and inhibitors over time decreases the sensor's active catalytic sites, therefore decreasing overall sensor sensitivity. This sensitivity loss compensates through instrument calibration. Once sensitivity loss is too great to achieve compensation, the sensor fails calibration and must be replaced. Since methane is the most difficult gas to combust, a situation could occur where the bead no longer detects methane but still has enough active catalytic sites to read other combustible gases (pentane, propane, etc.).

As pentane gives you the best "middle of the road" calibration when various hydrocarbons are present, two options exist:

A) Calibrate using pentane and then verify response factor using methane after calibration. Furthermore, daily bump tests should be conducted using methane.
B) Calibrate using methane acting as a pentane simulant. Bump test with the same gas used for calibration.

Therefore, it is sensible to use methane as a pentane simulant to simplify calibration procedures by using one gas type, and minimize cost related to calibration.

Why calibrate with 58% pentane simulant?

Based upon lab testing with MSA-developed catalytic bead sensors, 58% is the optimum concentration that yields the most accurate results throughout the entire span of 0-100% LEL. Previously, calibration used 50% pentane simulant as it exists in the middle of the range, but further testing showed improved results at 58%.

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