

Introducing the MSA Altair[®] Multigas Meter

by Captain Carlos Vazquez

On Sunday, October 7, 2007, a gas explosion at a Harlem apartment building injured 20 people. The earth-shaking blast sparked a fire that left four sisters and their mother fighting for their lives, while injuring 15 others. Bloody and dazed, several residents stumbled out of the five-story walk-up after the 4 p.m. blast. It appeared to be a gas leak that caused the explosion. A Con Ed spokesman stated that utility crews were investigating the source of the leak.

Each year, the FDNY responds to many calls related to unknown odors, fumes and gas leaks. How can Firefighters protect themselves and the public when responding to these gas emergencies? How can they promptly determine if they are in an explosive atmosphere and whether an explosion is imminent? What action should Firefighters take to minimize the impact and avoid the ignition of these gases?

In order to assist members in assessing these kinds of emergencies, the FDNY has distributed the MSA Altair meter to select ladder companies City-wide. This meter helps FDNY members identify the amount of oxygen and combustible gas in the air, so action can be taken before an explosion occurs. The SOC Support Ladder Companies currently have the MSA Sirius[®] and Five Star[®] meters, which also are capable of detecting combustible gases.

The MSA Altair meters were generously funded by Con Edison, via the FDNY Foundation. The FDNY Foundation funds unbudgeted fire safety education programs and the professional development, training and educational needs of the Department's members. For more information about the FDNY Foundation, visit the web site at www.FDNYFoundation.org.

What can the MSA Altair detect?

- The meter detects oxygen percentage.
- The normal percentage of oxygen in the atmosphere is approximately 20.8 percent.
- The fluctuation of that oxygen percentage is an indication that a hazard--which can cause either asphyxiation or an explosive fire--exists.
- A decrease in oxygen indicates that the oxygen in the atmosphere is being displaced by some other gas. Oxygen simply does not depart from an atmosphere; some other gas must take its place. Even if meters are not capable of identifying what gas is displacing the oxygen, it still signals the presence of an unknown gas, which necessitates donning SCBA (if not already on) and the response of Haz-Mat units with specialized meters.

High oxygen readings

- The MSA Altair detects from 0 to 25 percent of oxygen in the atmosphere.
- Should the MSA Altair meter display oxygen readings of “+++,” this would indicate an atmosphere where the oxygen is above the meter's maximum range of 25 percent and that an explosion or fire



Excess O₂ is indicated by the “+++.” An explosion or fire hazard exists.

hazard exists.

It is not unusual for oxygen to ignite. On January 27, 1967, three NASA astronauts--Gus Grissom, Ed White and Roger Chaffee--were killed after fire swept through the *Apollo 1* spacecraft. This tragedy was due to the oxygen-rich atmosphere used in the space capsules. The excessive oxygen in the atmosphere (more than 25 percent) was accidentally ignited by an electrical spark in the cabin.

The MSA Altair Meter.



Incidents such as this also have occurred in New York City hospitals, where oxygen-rich atmospheres are prevalent.

The MSA Altair also functions as a combustible gas indicator (CGI) by displaying the percentage lower explosive limit (LEL) of combustible gases. Lower explosive limit is defined as “the minimum concentration of a combustible gas, in air, that can ignite.” Not all combustible gases ignite at the same concentrations; different combustible gases have different lower explosive limits. The MSA Altair will alarm prior to reaching the flammable range.

Alarm settings

The MSA Altair, Five-Star and Sirius meters are set to alarm levels as mandated by OSHA:

- Low oxygen--19.5 percent of atmosphere
- High oxygen--23 percent of atmosphere
- Low LEL--10 percent of the LEL
- High LEL--20 percent of the LEL

When should the MSA Altair meter be used?

The MSA Altair Meter should be used at all suspected gas leaks, fumes, unknown odors, CO detection, etc. It should be employed in conjunction with the TIF 8800 combustible gas detector (which picks up natural gas) and BW Technologies



Astronauts Gus Grissom, Ed White and Roger Chaffee pose in front of their *Saturn I* launch vehicle. The astronauts later died in a fire, prompted by an electrical spark within the oxygen-rich atmosphere.

The TIF 8800 Combustible Gas Detector

The TIF 8800 has been used by the FDNY for several years and is capable of detecting hydrocarbons (methane, propane, gasoline), halogenated hydrocarbons (vinyl chloride), alcohols (methanol), ethers (methyl ether), ketones (acetone) and other gases (ammonia, carbon monoxide, hydrogen, toluene, chlorine, sulfur dioxide).

Traditionally, the FDNY has been successful in using the TIF 8800 to detect natural gas (methane) leaks. The TIF 8800 is capable of detecting small amounts of gases--as low as five ppm (parts per million)--and enables the user to pinpoint a leak to its source in the same way a Geiger counter is used. The TIF 8800, however, will not indicate the concentration of the product in the atmosphere.



If the amount of product is below the LEL range, it may not register a reading on the MSA Altair meter, even though an odor is present and the TIF 8800 is indicating that gas is present. (One percent of LEL of natural gas equals approximately 500 ppm.)



Excess combustibility is displayed in the percentage LEL of combustible gases.

If the environment is in the upper explosive limit (UEL) range, ventilation would lower the concentration of product in the atmosphere to its flammable range. Therefore, extreme caution must be taken to eliminate ignition sources prior to ventilation to prevent any fire or explosion.

A combustible gas reading of “+++” on the MSA Altair meter indicates that the atmosphere is above 100 percent of the LEL, placing firefighters in either the flammable or UEL range. This is an indication that an explosion hazard exists. Remember, the MSA Altair reads *only* the lower explosive limit range. It will not register a numeric reading for amounts in the flammable or UEL range.

Methane leaks and other FDNY meters

The MSA Sirius and Five Star Meters are carried by SOC Support Ladder Companies, Rescues, Squads, Haz-Mat Company #1 and Haz-Mat Technical Engines. Both meters are combustible gas indicators that are calibrated with pentane.

Pentane is used because it is a middle-of-the road gas; not too high and not too low, so its LEL readings in response to pentane will be accurately displayed. With the MSA Sirius and Five Star Meters, a conversion factor is used when it is known that methane is present. (The reading must be multiplied by 0.6 to come up with the proper reading for methane.)

There are different conversion factors for different types of gases. (The conversion factor information is found in the MSA manufacturer’s manual for the particular meter.) So, the MSA Altair Meter will detect the LEL of methane accurately because methane is used to initially calibrate the Altair.

Utility companies and natural gas detection

The FDNY normally works closely with utility companies. In order to avoid contradictions or confusion with readings obtained on the scene of a gas emergency, it is vitally important to understand how workers measure the release of natural gas.

Currently, Con Edison is using a GMI Gasurveyor 3 combustible gas meter. Con Edison’s meters are calibrated to methane, similar to the MSA Altair. Methane is used because it is the principal product with which Con Edison deals.

Unlike the MSA Altair meter, the GMI



BW Technologies GasAlert Extreme CO Meter.

GasAlert Extreme® CO Meter (which detects only CO).

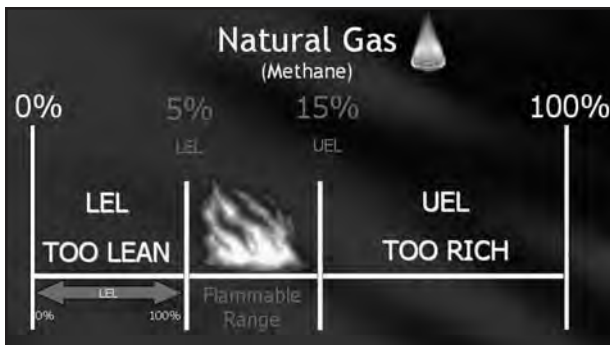
The MSA Altair Meter functions as a combustible gas indicator with an oxygen percentage sensor. It will *not* enable the user to pinpoint a leak, but it will alert to the presence of an atmosphere that is potentially explosive by displaying a digital readout of a percentage of the lower explosive limit.

The MSA Altair is the only FDNY LEL meter calibrated to methane, so its LEL readings in response to methane will be accurately displayed. A 10 percent low alarm will be a true 10 percent of the LEL of methane. The MSA Altair meter also is capable of detecting other combustible gases and vapors, such as gasoline, propane, etc., with some variation in accuracy.

LEL, flammable range and UEL

The ability to display a percentage of the LEL by the Altair meter is truly beneficial to FDNY members. When in a potentially dangerous atmosphere, there is no way of knowing the amount of product in the air or whether it has reached its flammable range unless Firefighters use a meter capable of quantifying the amount of product in the atmosphere. Once this information is obtained, the appropriate actions can be taken by members.

When Firefighters are operating in an environment that is within the LEL range, members’ actions should include ventilating the area to prevent the product from reaching its flammable/explosive range. This action would help to keep the public and FDNY members out of danger.



Lower explosive limit (LEL) of natural gas is shown at left.



MSA Sirius (left) and Five Star (right) Meters are combustible gas indicators that are carried by SOC units. The meters are calibrated with pentane to provide accurate LEL readings.



(Left) ConEd employees use a GMI Gasurveyor 3 (a close-up of which is pictured at the right).

Gasurveyor gas meter measures from 0 to 100 percent of combustible gas in the entire atmosphere, not just the lower explosive level range. This means that five percent of methane on Con Ed's meter would be equal to 100 percent of LEL on FDNY's meters.

National Grid (formerly KeySpan) provides gas services to Brooklyn, Staten Island and the parts of Queens not covered by Con Ed. They also use a meter similar to Con Edison's, a Bascom-Turner Model #RGA-411, which is capable of detecting percentage of combustible gas in the entire atmosphere, as well as percentage of LEL. The bottom line is, Firefighters must know what type of measurements the utility companies or other agencies are communicating. Members must verify with FDNY meters and take the appropriate actions.

Functionality of the MSA Altair

Power Button--Used to turn instrument *on* or *off* and to accept actions, such as the acknowledgement of the fresh air set-up (FAS). When the meter is turned on, it will prompt you with *FAS?* When acknowledged, the FAS automatically will calibrate the instrument to *zero*. Do not initiate the FAS unless you are in an uncontaminated environment. Inaccurate readings can occur, which falsely indicate a hazardous atmosphere is safe.

Page button--Used to shift through data screens, it will allow Firefighters to view different information the meter has detected:

- The *Main Page* is the page that Firefighters normally view. It indicates the current combustible/explosive (LEL) and oxygen readings.



Power button (arrow) on MSA Altair Meter turns the unit on and off.



Page button (arrow) on MSA Altair Meter shifts through data screens.



Main page on MSA Altair Meter indicates LEL and oxygen readings.



Peak readings page on MSA Altair Meter permit viewing of high readings.



Minimum oxygen page on MSA Altair Meter reveals the lowest oxygen reading.



Reset button (arrow) on MSA Altair Meter acknowledges and silences alarms.

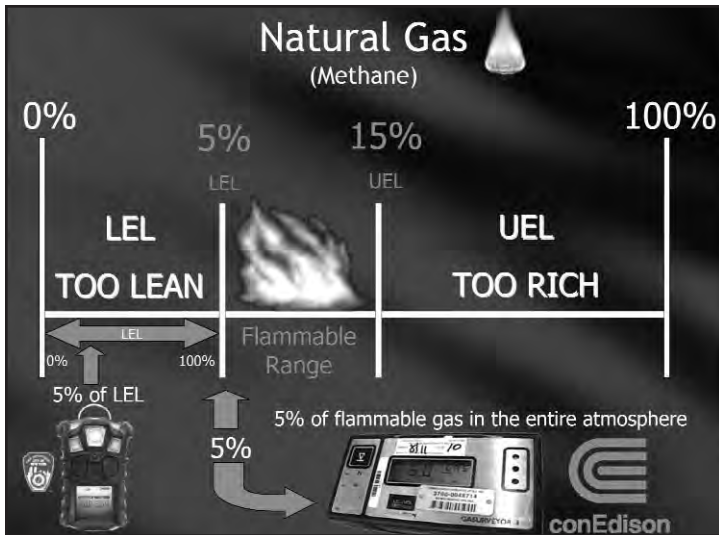
- The *Peak Readings Page* allows Firefighters to view all high readings previously attained, both in oxygen, as well as combustible/explosive (LEL).
 - The *Minimum Oxygen Page* allows Firefighters to view the lowest reading of oxygen detected by the meter.
- Reset Button**--Used to acknowledge and silence alarms, it also illuminates the screen. When the MSA Altair displays “+++” (readings above the meter's capabilities), it can only be reset by turning the instrument *off*, then back *on*.

Conclusion

It is preferable to make a gas investigation with a digital CGI. If an Altair Meter is not available on-scene, special-call a SOC unit or a unit that has one and call for additional units. The MSA Altair Meter will help protect FDNY members and the public from harm. Therefore, it is of the utmost importance that members understand and use the meters wisely at “routine” gas emergencies.

About the Author...

Captain Carlos Vazquez is a 24-year veteran of the FDNY. He has developed and instructed haz-mat training programs for the FDNY. He is assigned to Division 7. Prior assignments include Ladder 51, Engine 33 and Haz-Mat Operations. This is his first article for WNYF.



Natural gas' flammable range is from five to 15 percent.

Members are urged to review the following references:

- *Training Bulletin Emergencies 2* and Addendum 1 (Natural Gas Emergencies and Fires).
- “Utility Hazards, Natural Gas Hazards,” by Battalion Chief Frank Montagna and Matthew Palmer (Field Operations Planner for Consolidated Edison of New York), in the 3rd/2003 issue of *WNYF*.