What's all this BUMP TEST stuff about Anyhow?

True story: On a warm summer morning, the operations crew sat in the control room of a rural western US manufacturing facility. During their morning discussion, one of the operators noticed the smell of gas. The operators called the company safety department, reported the odor and asked that someone come to the control room to investigate. The safety department sent someone up stairs with a typical multi-gas monitor designed to detect carbon monoxide, hydrogen sulfide, oxygen and combustible gases. The monitor was turned on and placed on the control room counter. After a few minutes, the readings on the instrument showed all clear and the operating staff continued about their normal business. A short while later the workers agreed that the odor was getting stronger, despite the lack of any positive indication from the monitor. They decided to evacuate the control room. Evacuation wasn't sufficient for one curious operator however. Wanting to believe that the electronic gas detector was more efficient than his nose, he reached back inside the control room door as he left, pulled the cigarette lighter from his pocket and struck the arc. The ensuing explosion and fire tragically resulted in a number of serious burns and injuries. Fortunately the accident in this case wasn't fatal.

Fact: The *only* way that you can be certain that a portable gas monitor will respond appropriately to a potentially threatening gas hazard is to test it with a known concentration of the target gas.

In this case, the monitor was delivered directly from the safety office to the control room. It was never turned on. It was never checked. The investigation of the accident revealed that the instrument was used in a training class the day before and was improperly calibrated by a student, rendering it incapable of detecting the gas in the control room. Aside from the errant calibration, the instrument was in perfect working condition and remained so even after the fire. A simple, 30-second bump test of the instrument, including the combustible gas sensor, would have identified the problem and avoided the devastation.

What exactly is a bump test anyway? Very simply, it is a brief exposure, or bump, of the monitor with a known concentration of the target gas or gases which is used to verify that the sensor responds accordingly and the instrument functions properly. It is very important to understand that a bump test is not, nor is it intended to be, a measure of the accuracy of the instrument. In everyday use, it is the safety of the worker carrying the instrument that is critically at stake, not whether the instrument responds accurately to within analytical tolerances. In no case should an instrument which has failed to respond accordingly to a bump test be used further until the unit has been calibrated properly and the malfunction corrected.

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With the many technological advances in electronic equipment, as well as in gas detection, why is it still necessary to bump test instruments before use? There are actually a number of answers to this question, but let's stick to the technical one first. The signal produced by most gas sensors in a clean air environment, is the same as the signal produced by that sensor when it has lost its sensitivity to the target gas – it is ZERO.

Electrochemical and catalytic gas sensors are designed to have a negligible baseline (ie. clean air) signal. It wasn't until the early nineties that most gas monitoring instruments were even capable of distinguishing electronically that a sensor was actually installed in the instrument. In almost all cases, you could turn the instrument on, show a reading of 000on the display, open the instrument and remove the sensor, and still display the same 000 indication. The only way then to know that the sensor was actually present and working was, and still is, to test it with gas.

Now for the practical reasons. Gas monitors are used in tough environments. They are attached to a belt, hard hat or simply clipped on a pair of coveralls. They are jarred on ladders, machinery and other equipment. They are dropped from high places onto concrete, and into mud and water. They are exposed to rain, dirt, oil, grease and anything else the environment has to offer. Under these conditions, damage to the instrument does occur. Some of it is visible, some not. A protective sensor membrane may be clogged with dirt or oil blocking the flow of gas to the sensor. The sensor may have a broken electrode or contact. Any of these conditions take us back to the fact that the sensor signal without gas present is the same as the signal that exists if the sensor is incapable of responding to gas for any reason – it is ZERO. The only way to identify these conditions and that the sensor is not capable of responding to the presence of a gas hazard is to test it with gas.

Bump testing practices have changed over the years. Ten years ago, the term "bump" test was unknown in the gas detection world. Many gas monitoring instrument manufacturers

actually recommended that monitors were fully calibrated before each use. As the cries for reduced calibration and maintenance from instrument users became louder, the recommendations for calibration became relaxed and the "bump" test was born as an easy and efficient means of verifying that instruments were capable of responding and being used properly. In more recent years, those end users have spoken out against the practice of bump testing and the costs associated with it, causing some recommendations to be relaxed even further extending calibration frequencies to six months or more and eliminating the notion of routine functional testing altogether.

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Today however, many instrument users are revisiting and revising their bump test practices. Accident scenarios, such as the one described at the beginning of this article and others that have produced more fatal outcomes, have made safety professionals realize that the recommendations for verifying the operation of a gas monitor before each use are more than just manufacturer's rhetoric. More and more major industrial entities are mandating that gas monitoring instruments are function tested daily or before each shift. Some have gone to the extent of specifying that the instruments used by their workers must be capable of clearly indicating that they have been bump tested on a daily basis and must not resume normal operation until the bump test has been completed successfully.

The bump test which was once a manual process has now been automated by many manufacturers. Bump stations, or full instrument Docking Stations have been developed to manage the entire process and make the determination whether the instrument has passed for failed. This has been done to remove the human element and make the practice of a daily function test seamless. Some instruments now have a bump test mode that prompts the user to perform the test or place it on the docking station to have it done automatically. With everything that has been done to facilitate the process, why wouldn't you want to make the instrument bump test part of your everyday routine?

Suppose that before you left for work today that you would know beyond a shadow of a doubt that the gas monitor that you carried would be called upon to save your life. Would you be concerned about what happened with the instrument the day before or the shift before you picked it up that rendered it unknowingly inoperable? Would you want to test it before you went out to the job, just to make sure it functioned safely? It could be called on at any time on any given day. You will never know when.

Fact: The *only* way that you can be certain that a portable gas monitor will respond appropriately to a potentially threatening gas hazard is to test it with a known concentration of the target gas.

There simply is no other option to ensure your safety.

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