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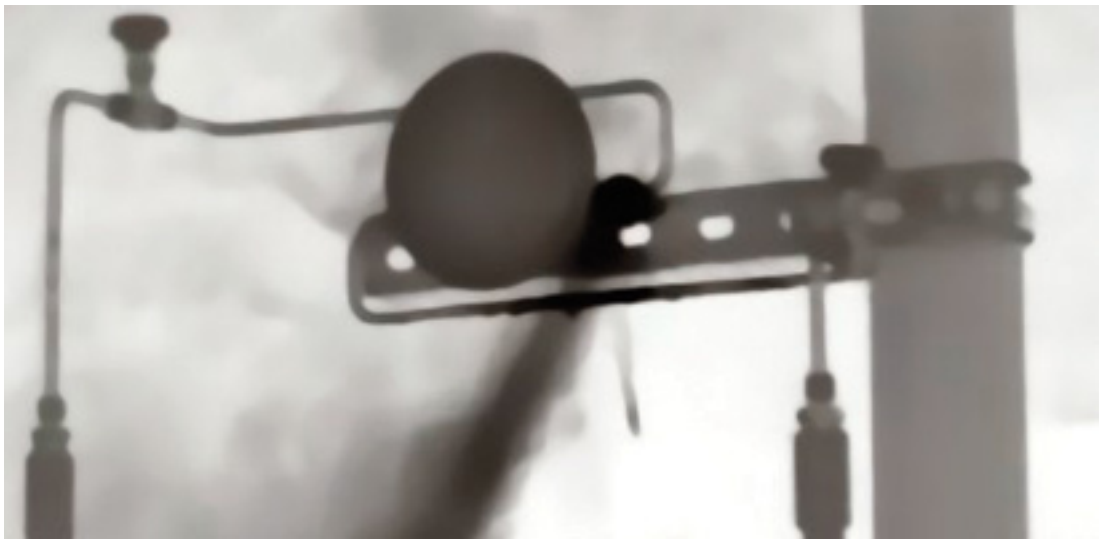


Gas leaks have been affecting peoples' lives since ancient times. Now, there's no excuse for many of them.

In ancient Greece, people traveled from far and wide to listen to the Oracle of Delphi, who claimed to be in direct contact with the god Apollo. They came in hopes of gaining special knowledge about themselves and their futures (including, for example, when to plant their crops). What would those trusting knowledge-seekers have thought if they had known that instead of speaking to and for Apollo, the Oracle had simply been exposed to harmful ethylene gas? This is just what modern-era researchers discovered: The Oracle's prophecies and popularity were associated with an ancient gas leak.

These days

While we no longer seek the council of Apollo, as a global society, we are still using a great deal of ethylene. Wikipedia defines ethylene glycol as an "organic compound, widely used as an automotive antifreeze and a precursor to polymers. In its pure form, it is an odorless, colorless, syrupy, sweet-tasting liquid. There appears to have been no commercial manufacture or application prior to World War I."

Some of the characteristics of ethylene—*a greenhouse-gas emission that is both odorless and colorless*—are common to many other industrial gases, thus making leaks hard (some would say tricky) to find. That's why a chemical called mercaptan is added to methane (perhaps the most widely used gas) to give it that sulfur-like or rotten-egg odor with which many of us are familiar. But often times, natural gas sold to industrial facilities does not contain mercaptan and remains odorless.

Industrial gas leaks tend to occur within a mass of valves, flanges and piping. It is not uncommon to have thousands—*sometimes tens of thousands*—of potential leak points that stretch for miles.

Adding to the difficulty is the highly flammable nature of many of these industrial gases. From one of the world's worst industrial gas leaks ever (the 1984 explosion in Bhopal, India), to the more recent Texas City Refinery explosion in 2005 in which 15 workers died, industrial (and even residential) gas leaks continue to cause large-scale financial and human losses.

Fig. 1. Gas valve leak

Game-changing technology

In June 2005, FLIR Systems introduced the GasFindIR infrared camera, today called the GF-Series and referred to by industry and the Environmental Protection Agency (EPA) as "optical gas imaging." Why is optical gas imaging such a game-changer for maintenance and reliability professionals? The answer is simple: For the first time in history, we have a means by which to see what had previously been invisible—*colorless gas vapors*. Prior to optical gas imaging, the Toxic Vapor Analyzer (TVA) was about the only tool available for the task.

Using a point contact-sensor or wand, a TVA would be placed near a suspected gas leak or next to a valve or flange. The instrument would then absorb a portion of the gas and provide a reading—*which explains why TVAs are still commonly referred to as "sniffers."* While relatively effective and widespread in its use, TVA technology has some significant limitations.

Fig. 2. Leakage from a failed ruptured disk

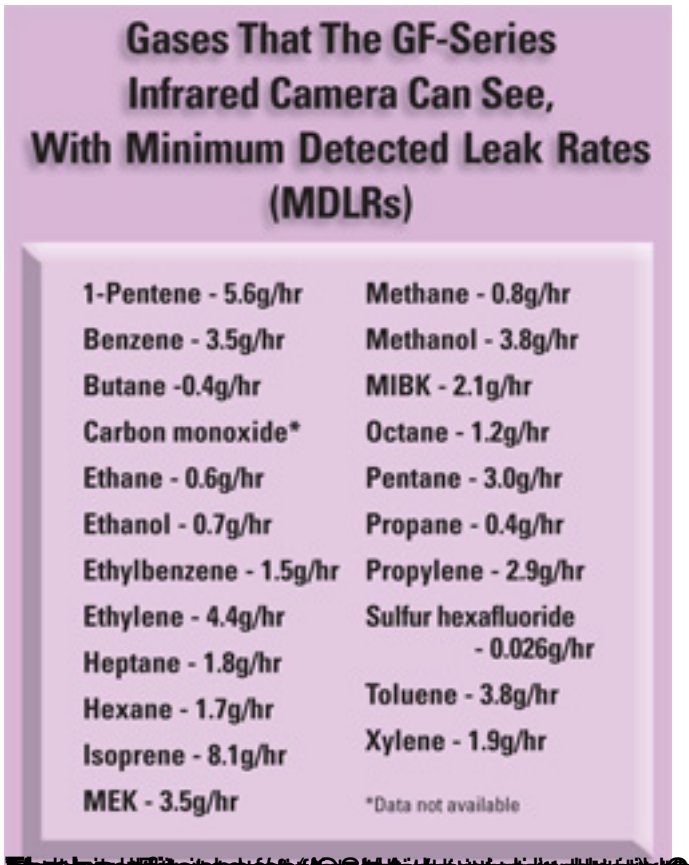
With a TVA, the wand must be placed fairly precisely to where the gas is blowing. If there is wind or air movement and the wand is even just a bit off, the instrument will not detect the leak. More importantly, since operators frequently don't know the exact locations of gas leaks, this "sniffer" method involves a great deal of guesswork.

The optical gas imaging infrared camera operates much like a consumer video-camcorder. It provides a real-time visual image of gas emissions or leaks. One simply scans an area and watches the video. Gas leaks will appear as black smoke on-screen. In this manner, gas leaks can be seen even if the camera is 30 feet away. Moreover, the GF-Series camera can see

exactly where the leak is occurring, helping to pinpoint its source.

Fig. 3. Leaking LPG treater

For a TVA to pay off, a worker must position the wand next to hundreds of valves and flanges, and do so with pinpoint accuracy—*yet there may be no feedback or knowledge as to whether a leak even exists.* Such efforts can require significant amounts of manpower and time, coupled with considerable room for error. With gas imaging, however, a worker just pans and scans to instantly see leaks. (Refer to Figs. 1, 2 and 3 to see what different leaks look like through optical gas imaging.)



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