

## CONFINED SPACES Reducing the Risks of Entry With Remote Video Inspection Technology

By Bob Levine

**In January 2017, a worker entered a confined space and quickly became unresponsive. Two coworkers attempted a rescue and both were overcome by what was later determined to be carbon monoxide and hydrogen sulfide.**

**All three workers** died and three additional rescuers were exposed to the toxic atmosphere but survived (OSHA, 2017).

An all too common occurrence: a worker enters a confined space, collapses, and coworkers attempting rescue also become casualties of a toxic environment. Despite increased training, greater availability of safety equipment and rescue personnel, and written entry safety rules mandated by OSHA, workplace deaths involving confined spaces rose 15% in 2017, according to Bureau of Labor Statistics (BLS, 2018). One common thread in many of these fatalities is human error. Training has been conducted, safety equipment is available and rules have been written, but for various reasons workers still enter unsafe spaces. If only confined space entry could be avoided in the first place.

Enter technology, specifically, portable remote video inspection equipment, which not only can reduce the need for confined space entry but also can provide the ability to visually monitor the worker after entry has been made.

### Dangers of Confined Space Entry

Confined space entry is a major safety concern in the industry. OSHA (2009) defines a confined space as having:

Limited or restricted means for entry or exit and is not designed for continuous occupancy. Confined spaces include, but are not limited to, tanks, vessels, silos, storage bins, hoppers, vaults, pits, manholes, tunnels, equipment housings, ductwork, pipelines, etc. There are many processes and applications in industry that use an area that would be defined as a confined space.

They are exceptionally dangerous locations that have historically led to many deaths of the initial entrant as well as secondary victims: would-be rescuers.

Many atmospheric risks are associated with confined spaces. These include:

- oxygen deficiency;
- oxygen enrichment;



- toxic gas or chemical exposure;
- flammable or explosive atmospheres;
- liquid flowing or free-flowing solids;
- excessive heat.

Toxic atmospheres are the most prevalent risk to a worker who must enter a confined space. A toxic atmosphere may cause various acute effects, including impairment of judgement, altered mental status, unconsciousness and death.

### OSHA Safety Procedures

There has been a clear improvement in confined space entry safety in recent years. Many OSHA rules and regulations have been implemented to make entries safer. Unfortunately, even with these rules and regulations in place, confined space incidents still occur.

There are many reasons these incidents occur, but one of the predominant reasons is human error. Incidents that result from human error occur as a result of overconfidence, deliberate neglect of procedures, forgetfulness, distractions and lack of preparation. Proper entry training is critical to safety, but it does not guarantee an incident-free workplace. Even a seasoned worker with a stellar safety record can, at some point, fall victim to his/her own human nature with tragic consequences.

The only absolute method to reduce the occurrence of confined space incidents is to reduce or eliminate the need to enter them. Safety is a numbers game: the less risk the

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worker is exposed to will directly correlate to fewer incidents and increased safety.

### Why Do People Enter Confined Spaces?

In one NIOSH study, it was discovered that out of 100 confined space entry incident fatalities investigated, the primary reason the workers had entered the confined space was to perform routine maintenance, repairs, and inspections of equipment or conditions within the space (Koester, 2018). This is where portable video inspection systems can play a significant role. They can be used to dramatically reduce the need to enter a confined space when performing some or all of the tasks associated with certain types of maintenance-repair activities.

### Remote Video Inspection

The basic description of a remote video inspection system used for confined spaces is a video camera mounted on a pole or cable that can be inserted into a confined space. The images produced by the video camera are viewed remotely on a display by an inspector who is situated outside of the space. Besides providing a safer, lower-risk method for observing conditions, cameras can generate images that go beyond human capabilities of using eyesight alone. Different cameras allow the inspector to see things that the unaided human eye cannot, such as thermal images, multispectral and optical magnification.

## How Portable Remote Inspection Reduces or Eliminates Entry

Remote video inspection systems can perform this first look of conditions. If no problem is seen during the inspection, then the individual may not need to enter. If a problem is observed, the visual information from the inspection can show what the problem is in advance of entry, and what tools and materials are needed for a repair. This can reduce the number of entries required to complete a maintenance operation. When workers enter, they already have the equipment needed for a repair. They do not have to go into the space to see conditions, then exit the space, gather the appropriate tools and materials, then reenter. In addition, this initial visual inspection from outside of the confined space envelope can increase safety by alerting the inspector to any hazards that may be present in the environment before entry.

## When Entry Is Necessary

The same remote video inspection tools can also play a role in increased safety during a confined space entry operation. OSHA regulations require that the individual who enters the confined space, the entrant, must be supported by an individual who remains outside of the confined space, the attendant. It is the attendant's duty to ensure the safety and well-being of the entrant. OSHA mandates that an employer provide all communication equipment and means necessary to ensure that the attendant (often referred to as the hole-watch) can communicate effectively with entrants in a permit-required confined space. If, following the video inspection operation, it is deemed necessary to have an individual enter the confined space, some remote video inspection systems are designed to be mounted or positioned so that they can generate images of the entrant in the space that would be viewed by the attendant. This real-time, visual information can help ascertain the well-being of the entrant while in the space.

## Other Practical Benefits

In addition to safety, there are other practical benefits for using video technology to monitor confined spaces. It can provide a means of increasing efficiency for many industrial processes.

Remote video inspection systems can also record images of internal conditions to include in reports or for archival purposes. This can help limit liability. As an example, if a contamination event occurs in a tanker truck loaded with product after the inspection, images with a time and date stamp

Portable remote video inspection systems allow workers to visually assess the status of the environment and equipment in the confined space without entry.



Images with a time and date stamp can offer proof that tank conditions were acceptable at a particular time and location.

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In some cases, input from other individuals is required to render an opinion on the status of equipment or conditions in the confined space. This may be because a decision requires the input of someone with more experience or who has a higher level of authority. Video of the inspection operation can be made available in real time, allowing others to see the space without the risk of entry, or without being physically present at the same facility. Video inspection systems can wirelessly stream the video over networks or the Internet for others to view who may be in a better position to determine a course of action.

In many instances, these benefits can provide further support to justify the cost of additional safety equipment.

## Conclusion

Confined spaces are found in many industries. Entry into these locations continues to be a major risk to the safety and health of the many workers who are tasked with maintaining the environment and equipment in these spaces. Most maintenance and repair operations are initiated by an individual who must first observe the location and equipment in question. Portable remote video inspection systems can increase the safety of those involved in these operations by allowing them to visually assess the status of the environment and equipment in the confined space without the need to make an entry. In addition, following a remote video inspection, if it is determined that entry is necessary, the

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advance knowledge of the problem allows the worker to enter with the tools and materials needed to render a repair. The video inspection can also provide insight into any potential safety hazards before the entry. Some video inspection systems can also help ensure the safety and well-being of an individual in a confined space by providing a real-time visual of the entrant in the space that can be viewed by the OSHA-mandated attendant. This video allows the attendant to take quick action if an unforeseen event affects the individual working in the confined space.

Technology-based remote video inspection systems can reduce the overall level of risk and increase safety by reducing the number of confined space entries, ensuring more accurate and efficient inspections, and providing better monitoring of entrants. **PSJ**

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