Narrowness, limited oxygen and hazardous substances: These are just some of the things that can await those who do maintenance in tanks, silos, shafts, and small spaces. This is why having the right equipment from the very beginning is so important.
Professional tips for working in confined spaces

200 global deaths through CSE a year

The cleaning, maintenance and repair of tanks, silos, vats, and barrels is a daily procedure within the oil & gas industry. This said the work should be seen as anything but routine. Entering these spaces is still considered one of the most dangerous of jobs while working at plants and refineries.

According to the official German definition a “confined space” is defined as: “A space that is mostly covered by permanent walls, which enclose the area, thus preventing adequate air circulation and providing a high, and beyond the norm danger potential from substances, impurities and other hazardous materials.”

Working within confined spaces not only requires an experienced team and practice, but also the necessary technical equipment. Only then can the rooms be measured for toxic or explosive substances and the necessary precautions taken. In many countries, workers required to work in CSE must first successfully undergo the necessary training. This includes the use of gas measurement devices and full knowledge of personal protection wear.

Danger lurks in closed areas.

The cleaning, maintenance and repair of tanks, silos, vats, and barrels is a daily procedure within the oil & gas industry. This said the work should be seen as anything but routine. Entering these spaces is still considered one of the most dangerous of jobs while working at plants and refineries.

According to the official German definition a “confined space” is defined as: “A space that is mostly covered by permanent walls, which enclose the area, thus preventing adequate air circulation and providing a high, and beyond the norm danger potential from substances, impurities and other hazardous materials.”

Working within confined spaces not only requires an experienced team and practice, but also the necessary technical equipment. Only then can the rooms be measured for toxic or explosive substances and the necessary precautions taken. In many countries, workers required to work in CSE must first successfully undergo the necessary training. This includes the use of gas measurement devices and full knowledge of personal protection wear.

What are the most common accidents?

The reasons leading to CSE accidents are varied. Among them: underestimating the degree of danger before entry, lack of knowledge, or workers with no CSE protection in spite of their duties. Other causes are human error such as the failure to disconnect the room from the energy supply or heating source or other chemical aspects. Underestimating the concentration of gas inside tanks (oxygen level OX, explosion risk EX, toxicity TOX), chemical reactions and the overall condition of the contents of the tank (substance, temperature, solidity, etc) also play a large role. The bringing of electric devises such as power tools is also dangerous in that sudden sparks can occur which could trigger the ignition of explosive substances. But no matter how high the degree of training, entering confined spaces will always pose risks to those required to do so.

Correct measurement is everything

Examples such as these show that whilst CSE workers may be trained in terms of how to act in narrow spaces, they may still lack experience in terms of properly using gas measurement devices. Knowledge, skill, and experience are often missing when it comes down to measuring the air inside a room before entry.
Often miscalculations are made due to measurements made at the wrong spot, or using the wrong sensor system. For example: An Ex-sensor only tells if gases have reached an explosive concentration. But some toxic gas concentrations are so low that they cannot be read by an Ex-sensor although they have reached a lethal level. This is because an Ex-sensor only measures the volume percentile in order to warn of a possible explosion, but not of toxic and lethal gases that can be in the ppm-range (parts per million). For such jobs, one should use special photoionization detectors (PID-Sensors), which can effectively measure these dangerous substances in the ppm range.

Ex-sensors are also susceptible to cross-sensitivity, which can cause inaccurate measurements, especially when it comes to difficult to detect substances, for example toluene, xylene or hexane. All these potentially life-saving aspects can only be employed when one has received the proper training and consequently has the knowledge and experience that come with it.

WHY ARE RESCUE MEASURES SO RISKY? NT?

Typical results of CSE accidents:

- Unconsciousness or suffocation due to lack of oxygen
- Poisoning or alkali burns through toxic substances
- Electric shocks
- Crushing and limited movement caused by mechanical or solid matter

That said - a large proportion of deaths concerning CSE are caused during rescue attempts. Often the actions of colleagues and helpers are rash and made without first assessing the danger of the situation. The result is that the rescuers often die of the same results that first killed the colleagues they were trying to rescue, for example quick unconsciousness caused by gas and inadequate protection.⁵

The typical obstacles seen in CSE incidents often impede rescue attempts – for example narrow entrances, poor vision and the frequent lack of proper equipment. To make matters more difficult is the fact that every second counts for those in CSE areas with toxic or oxygen-poor atmospheres.⁶

Always have a rescue plan in your head

An additional aspect that hampers rescue attempts is the lack of an emergency plan or one that exists but is largely unknown to workers. External help can also run into the problem of not having the right equipment or training for CSE recoveries. All this can lead to a recovery lasting longer than planned.⁷ Quick actions save lives. This is why it is crucial to have a detailed “What if” plan that can be implemented quickly by a well-trained and adequately equipped team.

How can accidents be better avoided?

Training programmes are an essential part of helping to avoid accidents in CSE areas. Not only theoretical but also the necessary hand’s-on training. This can include CSE simulations such as the initial measurement of gases, the correct way of getting into protective wear, followed by entry and exit practice. Those participating in the exercises should also learn how to correctly deal with stress, poor sight as well as the evacuation of unconscious colleagues. The CSE Emergency Procedure plan seen here can help in the preparation of one’s own rescue concept.
Professional tips for working in confined spaces

Request for work to be carried out in confined space

Can work proceed without entry?

- Prohibit entry from the confined space
- Authorise the work to be carried out from outside of the confined space

Refer to responsible person who authorises the permits to work

Is there any potential that dangerous materials, such as liquids, gases or fumes may enter the confined space?

- yes
- no

Isolate section and any plant from mechanical, chemical and heat sources
Test and continually monitor the atmosphere for toxic gas, flammable gas, high and low oxygen levels

Can sludge and deposits be removed?

- yes
- no

Control - Ventilate
Clean - Purge

Work to be carried out with approved breathing apparatus
Check that wearing breathing apparatus is practicable inside the confined space and during access and egress

Can work proceed without breathing apparatus being used?

- yes
- no

Check

- Personal protective equipment is available, of the correct type and worn in correct manner
- Rescue equipment and resuscitation apparatus is fit for use
- Emergency procedures are understood
- Communication methods and equipment are clear
- Additional team members are placed into position outside of the confined space as required
- Tools and equipment are safe for use
- Personnel are trained in the use of the equipment and understand the permit to work

Certify entry with approved breathing apparatus, harness and lifeline

Certify as being safe for entry without breathing apparatus

Enter the confined space and carry out the work

Work completed in time allocated
Return permit for cancellation
Return to service

Work not completed in time allocated
Issue the permit in time allocated
Refer back to the responsible person
Recheck control methods
Renew permit, issue new permit or cancel work
Professional tips for working in confined spaces

Work in progress – the new CSE-Handbook version

In spite of all existing regulations from worker’s safety organisations, federal offices such as the OSHA and other institutions injuries and even deaths while on the workplace occur. This has led the National Fire Protection Association (NFPA) in Quincy, Massachusetts/USA, to create new set of guidelines NFPA 350. The goal is to bring together experts and professionals with on-the-job experience in order to create a handbook for confined space entry. As a practical, “hand’s-on” manual, it will provide useful tips regarding personal protection and useful pre-entry measurement for confined spaces. The NFPA will publish the CSE-guideline manual in 2016. The NFPA guideline will be relevant for a wide number of industries and can serve as an important step in spreading life-saving knowledge and in helping to reduce the still high percentage of CSE deaths around the world.

5 TIPS FOR CSE ACCIDENT PREVENTION

1) Check in advance: Have the nationally applicable CSE-standards been met? According to the German Statutory Accident Insurance Guideline BGR (117), the entering of narrow spaces is allowed only with official company permission along with operating instructions and an official license. Permission can also be granted when work is frequently done whilst exposed to the same dangers and requires the corresponding safety wear/gear.

2) Does an alarm and rescue plan exist? Are the measures described therein completely thought out?

3) Are those responsible fully informed? Who does what? Who heads the plan and is everyone aware of whom they should contact should questions arise regarding safety?

4) Are those responsible for a particular area/aspect prepared and knowledgeable as to what their duties entail? Can they show all necessary certificates? Are they schooled in the use of PSA, rescue belts, rescue hoist, etc?

5) Pre-entry gas measurement: Are all important manuals and information present? Are all certified people and the corresponding equipment at the scene?

Education is just as important as equipment. Sometimes, businesses are not fully aware that confined spaces exist at their plants. Moreover, many “daily” potential dangers at a plant (falling, gases, water flow conditions, strong electricity, and mechanical devices, such as heavy mixer or hydraulic lifts) may seem to be easily dealt with and prepared for. However, when they are combined with poor air circulation or volatile substances, these dangers become far greater than ever before. A thorough danger assessment of an area can quickly determine whether a seemingly “harmless” duct, large tank, ship building element, or the inside of a wind turbine must be declared to be a confined space.
REFERENCES


2 source: http://www.hsimagazine.com/article.php?article_id=507, download date: April 24, 2014


4 Source: Comment of Frank Fox, Member of the Linked-In-Group Confined Space Safety, http://www.linkedin.com/groups/Atmospheric-Testing-Using-Portable-Gas-2246731.S.237145963?qid=6fb031bb-3ce-b4a8-bb899-e57e0401d36e&trk=group_most_popular-0-b-ttl&goback=.anp_2246731_1178728676118_1.gmp_2246731, download date: April 24, 2014

5 “[...] 60 percent of deaths in confined spaces result from would-be rescuers entering to help a fallen buddy.” http://www.huffingtonpost.com/2012/05/24/ca-workplace-fatalities_n_1542829.html?goback=.gmp_2246731.gde_2246731_member_260316403#download date: April 24, 2014


7 http://www.huffingtonpost.com/2012/05/24/ca-workplace-fatalities_n_1542829.html?view=print&comm_ref=false, download date: April 24, 2014
