

Working with gas cylinders

► **Ian Constable**, general manager of Gas Safe Consultants Ltd, highlights some key issues to assist users of gas cylinders, cryogenic liquids and associated equipment to work in a safe environment.

Accidents involving gas cylinders can cause serious injury – or even death. It is vital that relevant and complete risk assessments are undertaken covering all aspects of the use of gas cylinders and cryogenic liquids. This includes storage, handling, transportation and general use.

As a gas safety consultant I visit a lot of

organisations and find that whilst most have conducted risk assessments on most key factors within their organisations, many have neglected to complete any specific risk assessments with regard to gas cylinder and/or cryogenic liquid use.

In addition, my colleagues and I find that in many workplaces it is the job of only one or two people to produce all risk assessments.

The problem with this approach with respect

to gases is simple; if the 'assessors' concerned do not understand the hazards that may be posed by the use of gases, how can they spot those hazards and calculate the risks?

Employers should always remember that if there is insufficient knowledge within their organisation to enable suitable and sufficient risk assessments to be conducted, they should contact appropriate external experts for assistance, and this rule definitely applies to employers using gases and related equipment.

SOPs

As well as conducting a suitable risk assessment, most activities or 'operations' that occur within a workplace should have a documented Standard Operating Procedure (SOP) (also referred to as a Method Statement), detailing exactly how the operation is to be carried out. This same practice applies to the use of gas cylinders and cryogenic liquids.

Any member of staff undertaking a task using gas cylinders/cryogenic liquids should be properly trained in that task (and that fact should be formally recorded in their training record). They should also have access to any relevant risk assessment document(s).





➤ **Gas cylinders should be moved using the correct equipment – and never rolled along the ground (inset) as the valve can be accidentally damaged by doing so**

Visiting different workplaces, my colleagues and I frequently come across users of oxy-fuel equipment who do not have access to any form of Standard Operating Procedure and have consequently been using incorrect and potentially dangerous light up and shut down techniques for years.

Another common scenario we encounter when visiting companies is to be told that operators are 'time served' and learned about welding at college or during an apprenticeship so they 'know' how to do the job properly. In response we ask to see their nozzle data charts, correct spark lighters and leak test solutions, which more often than not,



➤ **Check for leaks using an approved leak detector solution. Operators should never check for leaks using soapy water as the hydrocarbons present can cause an explosion if they come into contact with pure oxygen – unfortunately some people are incorrectly trained to use it**

they are unable to produce.

This means that operators are frequently using the wrong nozzle size for the job, not setting the correct pressures – which increases the risk of a flashback occurring – and then not checking for leaks prior to lighting up the equipment using the wrong type of spark lighter.

Employers should check that any member of staff undertaking a task using gas cylinders/ cryogenic liquids has been properly trained in accordance with the task's Standard Operating Procedure and that the training has been formally recorded in their training record. They should also check the employee has access to any relevant risk assessment document(s).

Training

Formal, documented training is essential to make staff aware of the hazards, risks and properties of the gases they deal with – and it is a legal requirement under the *Health & Safety at Work etc Act 1974*.

In my experience though, the majority of training undertaken by those who work with gases is done informally, whereby a new member of staff is asked to observe and listen to someone who has been doing the job for a number of years. This methodology produces an attitude of 'this is how we do the job' but frequently it does not show the correct way to do it.

For example, we find that most operatives have been taught 'on-the-job' to identify the contents of a gas cylinder by its colour. This is incorrect and potentially very dangerous and a number of accidents have occurred in recent years that could have been avoided if the people concerned had received proper formal training on this issue.

Additionally, it is not unusual for us to find operators (who don't understand how their cryogenic pressure vessel operates) decanting liquid nitrogen at pressures that are too high, without appropriate PPE and without oxygen monitoring devices.

The main hazards associated with gas cylinders are:

- asphyxiation caused by gas leaks
- impact from the blast of a gas cylinder explosion or rapid release of compressed gas
- impact from parts of gas cylinders that fail, or any flying debris
- contact with the released gas or fluid (such as chlorine)
- fire resulting from the escape of flammable gases or fluids (such as liquefied petroleum gas)
- impact from falling cylinders
- manual handling injuries

Source: *The safe use of gas cylinders. HSE*

We frequently find operators who have not received any manual handling training in relation to the lifting of gas cylinders and/or cryogenic vessels. These are all potentially dangerous practices.

Organisations should ensure all personnel who handle, store or use gas cylinders or cryogenic liquids have received proper formal training in line with UK legislation.

Equipment checks

Regular equipment checks and inspections are essential to ensure safe working with gas cylinders, cryogenic liquids and associated equipment. Gas regulators and other items of gas control equipment should receive a visual inspection each time prior to use and be inspected at regular intervals, with written reports on their inspection being produced and kept.

It is a common misconception that gas regulators, etc can be used indefinitely as long as they appear to be in good condition. In fact, regulators – and some other associated equipment – have a 'life-span' that is typically five years. Once they reach this age they must be replaced or professionally refurbished, irrespective of how much use they have had. It is not acceptable for organisations to state that they have not replaced equipment that has passed its expiry date based on the fact they felt "it was costly to do so".

In addition to the issue of equipment not being replaced, my colleagues and I often discover that whilst gas control equipment is being checked periodically, it is not being tagged to indicate the date of inspection and the 'next due' inspection date. In these instances it is not possible to demonstrate whether or not the equipment is safe to use.

Employers should check that all gas control equipment such as regulators are regularly inspected, tagged and replaced in accordance with their stated service life.

Piped systems

Piped systems can include boilers and steam heating systems, pressurised process plant and piping, heat exchangers and refrigeration plant. It is necessary to check whether any piped system or pressurised cryogenic vessel within your organisation is subject to the requirements of the *Pressure Systems Safety Regulations 2000* (PSSR) – the majority of piped systems are.

The purpose of PSSR is to ensure that industrial pressure systems are designed, installed, operated and maintained so as to prevent danger from the sudden release of stored energy.

One requirement of the regulations is for users and owners of pressure systems to have a Written Scheme of Examination (WSE) in place before the system is operated. A WSE should include:

- identification of the items of plant or equipment within the system;



➤ An up-to-date regulator should look like the brand new BOC oxygen one (above). The boxed image shows an out-of-date air regulator that was recently found still in use; it should have been replaced over 10 years ago.

To make matters worse, someone had replaced one of the gauges (that had been broken) with a gauge from an old nitrogen regulator. The modification of regulators in this way is not allowed

- those parts of the system which are to be examined;
- the nature of the examination required, including the inspection and testing to be carried out on any protective devices;
- the preparatory work needed for the item to be examined safely;
- where appropriate, the nature of any examination needed before the system is first used;
- the maximum interval between examinations;
- the critical parts of the system which, if modified or repaired, should be examined by a competent person before the system is used again;
- the name of the competent person certifying the Written Scheme of Examination;
- the date of certification.

In my experience, a good number of piped systems, including those cryogenic pressure storage vessels that fall under the scope of PSSR, do not have the relevant *Written Scheme of Examination* in place. This is a legal requirement; companies should not operate the equipment without one.

Additionally, few pipelines are inspected (examined) and pressure tested on a regular basis, which is also a legal requirement under the regulations. This situation results in pressure systems being used that do not comply with legislation.

Perhaps even more worrying is the practice of organisations installing their own piped systems which, unless they have the necessary experience and qualifications, is not permitted under PSSR. We frequently encounter systems that have been installed by non-professionals that present serious potential dangers to employees' health and safety.

Atmospheric monitoring

It seems that few gas users are aware of how important it is to carry out atmospheric air monitoring, simply because they are unaware of the consequences of a gas leak – possibly due to a lack of formal training.

Similarly, many gas users are unaware of the importance of appropriate ventilation and do not even know whether the gases they are using are lighter or heavier than air. This is fundamentally important if gas is leaking from damaged equipment or a poor connection and creating a potentially hazardous atmosphere. This is extremely relevant to users of cryogenic gases and operators who move gas cylinders in enclosed vehicles, but it applies equally to anyone using gases.

Organisations should ensure that before gas cylinders and cryogenic liquid storage



vessels are used, the need to monitor atmospheres has been considered, preferably at the risk assessment stage. 'Worst case scenario' calculations should be undertaken for all enclosed areas where gases are stored, handled, used or transported.

In this article I have highlighted six key issues which users of gas cylinders, cryogenic liquids and associated equipment should take notice of, in order to work in a safe environment. It is important to note that this is not an exhaustive list of all considerations, so please take some time to review gas usage in your organisation.

Further information

- **Safety of pressure systems. *Pressure Systems Safety Regulations 2000*.** *Approved Code of Practice (L122)*. HSE Books, 2000
www.hsebooks.com/Books
- **Pressure systems: *Safety and you*.** *Leaflet INDG261 (rev1)*. HSE Books, 2001
www.hse.gov.uk/pubns/indg261.pdf
- **The *Pressure Systems Safety Regulations 2000***
www.opsi.gov.uk/si/si2000/20000128.htm
- **Written Schemes of Examination**
www.hse.gov.uk/pubns/indg178.pdf
- **Safe use of gas cylinders.** HSE 2004
www.hse.gov.uk/cdg/pdf/safusgc.pdf

Ian Constable can be contacted on
tel: 01270 758890.
www.gassafeconsultants.co.uk