



GUIDELINES FOR THE MANAGEMENT OF WASTE ACETYLENE CYLINDERS

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Prepared by WG-5 Environment

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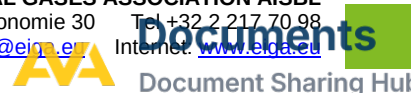
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Amendments to 05/20

Section	Change
	Replace term 'monolithic / porous mass' with 'porous material'

NOTE Technical changes from the previous edition are underlined

1 Introduction

This publication was originally produced in 1993 and has been regularly updated with developments in environmental policy and practice as well as advances in methods of destruction of asbestos. The main principles remain unchanged; a commitment to the identification of best industry practice and guidance to EIGA members on its implementation.

2 Scope and purpose

2.1 Scope

This publication sets out the standards for the safe treatment or disposal of acetylene cylinders and reflects the priority that EIGA gives to the protection of people and the environment.

The publication determines the standards to be achieved and describes methods by which these can be achieved. Methods should only be adopted where an equivalence of safety can be demonstrated.

3 Definitions

For the purpose of this publication, the following definitions apply.

3.1 Publication terminology

3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should

Indicates that a procedure is recommended.

3.1.3 May

Indicate that the procedure is optional.

3.1.4 Will

Is used only to indicate the future not a degree of requirement.

3.1.5 Can

Indicates a possibility or ability.

3.2 Technical definitions

3.2.1 Cylinder

Transportable container of up to 150 litres water capacity that can be filled with gas under pressure.

3.2.2 Pressure

In this publication bar shall indicate gauge pressure unless otherwise noted i.e., (bar, abs) for absolute pressure and (bar, dif) for differential pressure.

4 Guidelines

4.1 Background

Acetylene has been produced in commercial quantities for over one hundred years. As such, it was one of the original industrial gases and is still widely used throughout industry.

Acetylene is a high energy gas which is unstable when compressed in its free state. To ensure safe storage, it is dissolved under pressure in a suitable solvent. The most commonly used solvent is acetone for single cylinders and dimethylformamide (DMF) for cylinder bundles, although dimethylformamide has been used as an alternative for cylinders for some specific applications. All acetylene cylinders are filled with a porous material into which the solvent (acetone or DMF) is absorbed. The acetylene dissolves in the solvent which holds the acetylene in a stable condition.

The porous material is a complex matrix which must satisfy certain basic requirements:

- an ability to stop decomposition of the acetylene caused by 'flashbacks' in the system;
- a stable structure over a long period of time to prevent the creation of voids or cracks in the matrix for example by rough handling of the cylinder;
- a uniform structure which completely fills the cylinder volume; and
- a high porosity to ensure optimum fill ratios of the cylinders.

The first three points are crucial for the safe operation of acetylene cylinders. Defects would lead to instability and, in extreme cases, failure of the cylinder.

Measurements have demonstrated that no asbestos fibres are emitted during the discharge of acetylene from the cylinder. The safety benefits of using these asbestos containing porous materials have been proven by more than 30 years of use. Also, the quantity of asbestos in a typical acetylene cylinder is very small:

- The porous material occupies approximately 7 to 13% of the total volume of the cylinder.
- Asbestos is approximately 10% of the volume of the porous material.
- Hence, asbestos represents less than 1% of the cylinder volume.

As a result of developments in porous materials, the development of an asbestos free porous material become possible in the early 1990s. These porous materials have the same benefits and degree of safety as the asbestos based porous materials.

New cylinders no longer have any asbestos content in the porous material. Changes in European legislation prevent acetylene cylinders containing asbestos being placed on the market in Europe. Existing cylinders with the porous material containing asbestos may still be used providing they are in good condition and where this is allowed by the relevant national or international legislation.

Acetylene cylinders are high integrity high strength containers, made in accordance with relevant national and international standards or regulations. Any asbestos is therefore in a closed system and the cylinders still in service can be used to the end of their operational lives. Industry efforts should therefore be directed to the safe treatment or disposal techniques for any damaged or obsolete cylinders.

4.2 Objectives

This publication reflects the principles of duty of care for dealing with waste. Duty of care requires that all reasonable steps are taken to look after any waste generated and that illegal disposal by others is

prevented. Additionally, disposal of potentially hazardous waste should be consistent with Best Available Techniques Not Entailing Excessive Costs, otherwise known as BATNEEC.

This publication's guidelines have been developed to reflect the experience from EIGA companies.

The publication applies to the treatment or disposal of all designs of acetylene cylinders, including those not containing asbestos.

4.2.1 Principles

EIGA member companies who wish to are obliged to show an equivalence of safety to the containment of the cylinder in a licensed landfill. The main objectives of this publication are to show how:

- an equivalence of safety can be maintained;
- how the safety and environmental hazards can be controlled; and
- how the risks of the different treatment and disposal methods can be controlled.

Cylinders shall not be disposed of while they contain solvent since subsequent corrosion of the cylinder can cause the solvent to leak out. This can cause long term environmental problems. Provided that the asbestos is contained until after it has been stored in a suitably designed and licensed landfill site, it presents no pollution potential to any environmental medium. However, long-term liabilities associated with placing the cylinders in landfill shall be taken into account.

4.2.2 Code of practice history

The publication includes various methods of treatment or disposal and reflects changing legislative requirements. These methods have been included to reflect the philosophy behind the Landfill Directive (Council Directive 1999/31/EC *on the landfill of waste*) [1].¹ Landfill space is declining within the EU. In some countries the disposal to landfill of the cylinder with the porous material sealed within the cylinder is not acceptable even with the solvent removed. This is due to the legal pressure to recover recyclable materials and to treat waste before it is sent to landfill. Additionally, in some countries the waste remains the property of the producer, even following correct disposal.

This publication reflects advances in the techniques for the destruction of asbestos. Any method that recovers the cylinder by removing or destroying the porous material shall meet the criteria of the equivalence of safety and all the environment, health and safety risks shall be identified and controlled.

4.3 Selection of cylinders for treatment or disposal

A flowchart of the process described in 4.3 to 4.5 is provided in Appendix A.

4.3.1 Reasons for treatment or disposal

There are normally four possible reasons for disposing of cylinders:

- External condition – the cylinder shell could have been subjected to fire or physical damage and failed the inspection at time of filling, see ISO 11372, *Gas cylinders – Acetylene cylinders – Filling conditions and filling inspection* [2].
- Internal condition – for example contamination by water, carbon black, broken porous material.
- Commercial decision – for example the cylinder design has been superseded by a more recent design.

¹ References are shown by bracketed numbers and are listed in order of appearance in the reference section.

- Periodic inspection – failed to satisfy the prevailing periodic inspection requirements for example expiry date of the porous material, see ISO 10462, *Gas cylinders – Acetylene cylinders — Periodic inspection and maintenance* [3].

4.3.2 Identification

Whatever the cause of rejection the cylinders selected for treatment or disposal shall be identified as such, for example painted, or better, stamped with the word “*scrap*” and segregated in a restricted area, separate from the normal operational area.

4.3.3 Records

At this stage a record should be made of the cylinder details. This documentation shall follow the cylinder throughout the treatment or disposal process.

The record system shall be designed such that the treatment or disposal route can be audited in the future.

4.4 Removal of acetylene gas

4.4.1 Records

Check the weight of each cylinder and record the actual weight.

4.4.2 Residual pressure

Check residual pressure. This will result in two possible action routes (see Appendix A for 'flow chart').

4.4.2.1 Positive pressure indicated

Compare the pressure with the fill chart and the actual weight recorded earlier.

Reclaim the acetylene gas as much as possible (acceptable quality) to the minimum practical level of gas pressure in the cylinder, or that the acetylene recovery system can manage. This can be done, for example, by equalising the cylinder pressure to the pressure in the gasholder.

Otherwise, the residual acetylene may be treated via another authorised method. Reference should be made to EIGA Doc 30, *Disposal of Gases* [4]. Acetylene is flammable and considered a Volatile Organic Compound (VOC), as such there may be restrictions on venting.

Weigh the cylinder and compare with the tare weight to ensure the cylinder is virtually empty of gas. A difference in the weight is not always an indication of the presence or absence of gas in the cylinder. Other relevant factors, such as possible excess or loss of solvent, external corrosion or contamination with water, shall be assessed.

The remaining gas in the cylinder should then be discharged to equalise the cylinder pressure with atmospheric pressure. The most convenient and economical method is to dilute the waste gas into the air at a harmless concentration. This shall be carried out in a responsible manner to ensure no hazardous conditions are created, legislative requirements are met and there is no risk of damage to the environment.

Cylinders which have been opened and vented can still release further residual gas if brought into a warmer area (for example brought inside a building having been vented outside in a colder environment), due to the saturation of acetylene in the solvent. This is a potential safety hazard for which suitable precautions should be taken, as the resultant vapour will be saturated with solvent and heavier than air. For example, cylinders can be connected to a vent manifold or kept in a separate area.

During the venting process, the internal temperature of the porous material is reduced and due to its characteristics will take time to warm up again and be equalised with the room temperature. As the