

HEALTH & SAFETY EXECUTIVE

DIVING EQUIPMENT – ADVISORY INFORMATION RESULTING FROM RECENT INCIDENTS

Introduction

The following information is provided as a result of recent incidents involving diving breathing cylinders investigated by the HSE.

Cylinder internal corrosion

Research indicates that the corrosion rates in diving breathing cylinders can lead to failure within the current 2.5 year inspection interval stated in Annex B to References 1 and 2. One cylinder is known to have failed catastrophically during filling due to the effect of internal corrosion. This cylinder showed no external sign of the significant corrosion present on its internal walls.

It is recommended that the periodic inspection (internal visual) interval be reduced from 2.5 to 1 year. The periodic inspection and test (full) to remain at 5 years.

Cylinder fillers should take every precaution to minimise the possibility of water ingress into cylinders. This should include momentarily cracking open the cylinder valve and gas supply system to blow out any debris/moisture before connecting charging whips.

Fitting of Cylinder Valves

Cylinder valves should always be fitted to cylinders by persons who are competent to do so and with reference to the appropriate designer, manufacturer, importer or supplier instructions, such as thread gauging and torque values, and using the associated special tools and materials required by the procedures.

The standard to be used for the fitting of cylinder valves is ISO 13341. It is noted that the scope of this standard excludes diving gas cylinders. However, as there is no other appropriate standard this exclusion should be ignored and the torque values stated used unless the manufacturer of the cylinder and / or the cylinder valve states a particular torque value.

Further to the requirements in this standard it is recommended that the cylinder should additionally be internally examined in accordance with BS EN 1802 or BS EN 1968. This will ensure that any contaminants, moisture or corrosion present are identified and eliminated before valves are fitted.

There have been a number of cases where cylinder valves manufactured to the EN standard (EN 144-1) are being fitted to cylinders where the neck form is to the DIN standard (DIN 477-6) and vice versa. Further, incorrect O-rings are sometimes used.

Mixing these standards is considered unsound engineering practice.

Cylinder Filling

When using a gas charging system wear appropriate Personal Protective Equipment. i.e. eye and hearing protection.

Cylinder charging should only be conducted by a competent person. Competent means having a combination of training, knowledge and experience such that the person can do the job required in a safe and efficient manner.

There is a risk of injury from charging whips lashing around should there be a failure of the whip or cylinder fittings during the charging process. Charging whips should be fitted with a restraining line to minimise this risk. An example is at the Enclosure.

SUMMARY OF KEY POINTS

It is recommended that the cylinder periodic inspection (internal visual) interval be reduced from 2.5 to 1 year.

Every effort should be made to reduce the possibility of water entering a cylinder. This should include momentarily cracking open the cylinder valve and gas supply system to blow out any debris/moisture before connecting charging whips.

It is recommended that prior to valve fitting cylinders should be internally examined in accordance with BS EN 1802 or BS EN 1968, as appropriate.

Mixing EN 144-1 and DIN 477-6 standards is considered unsound engineering practice.

Gas charging whips should be fitted with a restraining line.

Enclosure:

1. Example of a Charging Whip Restraining System.

References

1. BS EN 1802:2002 - *Transportable gas cylinders - Periodic inspection and testing of seamless aluminium alloy gas cylinders*. British Standards Institution ISBN 0 580 39412 3.

2. BS EN 1968:2002 - *Transportable gas cylinders - Periodic inspection and testing of seamless steel gas cylinders*. British Standards Institution ISBN 0 580 39413 1.

3. a. *The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004*. SI 2004/568 The Stationary Office ISBN 0 11 049063 0.

b. *The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations 2005*. SI 2005/1732 The Stationary Office ISBN 0 11 073031 3.
4. BS EN 144-1:2000 *Incorporating Amendment No. 1 - Respiratory protective devices - Gas cylinder valves - Part 1: Thread connections for insert connector*. British Standards Institution ISBN 0 580 36514 X.
5. DIN 477-6:March 1983 - *Gas cylinder valves for test pressures up to 300 bar and 450 bar; with cylindrical thread for valve stem and gas cylinder neck for breathing apparatus - Sizes – Threads*. Deutsches Institut für Normung.
6. BS EN ISO 13341:1998 *Transportable gas cylinders -Fitting of valves to gas cylinders*. British Standards Institution ISBN 0 580 29745 4.
7. BS EN 1920:2000 *Transportable gas cylinders - Cylinders for compressed gases (excluding acetylene) - Inspection at time of filling*. British Standards Institution ISBN 0 580 36473 9.