

Oxy-acetylene Welding Systems

This marine notice is issued to highlight the inherent dangers of oxy-acetylene welding systems onboard ships. A recent incident occurred when a trainee engineer was preparing a fixed oxy-acetylene system for a small hot work job. The engineer had opened the oxygen cylinder valve and as he was reaching up to the pressure regulator, two of the systems high-pressure hoses and the oxygen regulator exploded in a flash fire.

It was subsequently found that a high-pressure oxygen system fire had occurred after an unsuitable replacement hose had been fitted to the system. The replacement hose fittings were not designed for use in a high-pressure oxygen system. The hose liners had a low ignition temperature, were probably assembled in an oily environment and the hose material did not comply with the appropriate Australian Standards for high-pressure oxygen hoses.

An investigation concluded that when the oxygen cylinder valve was opened, the oxygen from the cylinder flowed into the manifold and compressed the oxygen that was already in the system until the pressures were equalised. This compression was accompanied by an increase in temperature in the oxygen within the system. This heated the hose liner to above its auto-ignition temperature, causing it to ignite in the pure oxygen environment.

Australian Standard AS 4289-1998 Oxygen and Acetylene gas reticulation systems states that the oxygen systems shall take into account the properties of oxygen, particularly at high pressure.

Safety practices in the design, manufacture, installation and operation of oxygen systems shall be of the highest order, and take into account, and minimise, the possibility of ignition. If oxygen systems are to be used in conjunction with fuel gases, the possibility of mixed gases forming in either system shall be considered.

Other applicable standards that should be taken into account are:

- Marine Orders Part 12 - Construction-Subdivision and stability, machinery and electrical installations;
- Australian Standard 4289-1998 – Oxygen and Acetylene gas reticulation systems;
- ISO 14113 Gas welding equipment – Rubber and plastic hoses assembled for compressed or liquefied gases up to a maximum design pressure of 450 bar;
- AS 1335 – 1995 – Hose and hose assemblies for welding, cutting and allied processes; and
- AS 4839-2001- the safe use of portable and mobile oxy-fuel gas systems for welding, cutting, heating and allied processes.

AMSA recommends that owners, operators and ship's crew ensure that:

- Replacement flexible hoses used in high-pressure sections (between cylinder valve and pressure regulator) of an oxygen system conform to ISO 14113 or equivalent, and are fit for purpose; and
- All welding hoses comply with AS 1335-1995, and are fit for purpose.



- Any personnel undertaking work on high-pressure systems are aware of the hazards associated with high-pressure systems and the standards for the fabrication of high-pressure hoses.
- Shipboard procedures for maintaining any high-pressure systems are in accordance with the requirements of the relevant Australian/ISO Standards and section 11 of Appendix 4 to Marine Orders Part 12 - Construction-Subdivision and stability, machinery and electrical installations.
- That the requirements of AS 4839-2001 are complied with, to the maximum extent possible, within the constraints of the welding system in use at the time.

The Australian Transport Safety Bureau (ATSB) conducted an investigation on this incident. A full

copy of the Investigation Report, can be found at:
http://www.atsb.gov.au/publications/investigation_reports/2006/MAIR/mair233.aspx

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