The International Marine Contractors Association

Stainless Steel in Oxygen Systems

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www.imca-int.com

The International Marine Contractors Association (IMCA) is the international trade association representing offshore, marine and underwater engineering companies.

IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

Members are self-regulating through the adoption of IMCA guidelines as appropriate. They commit to act as responsible members by following relevant guidelines and being willing to be audited against compliance with them by their clients.

There are two core committees that relate to all members:

- Safety, Environment & Legislation
- Training, Certification & Personnel Competence

The Association is organised through four distinct divisions, each covering a specific area of members' interests: Diving, Marine, Offshore Survey, Remote Systems & ROV.

There are also four regional sections which facilitate work on issues affecting members in their local geographic area – Americas Deepwater, Asia-Pacific, Europe & Africa and Middle East & India.

IMCA Diving Division

The Diving Division is concerned with all aspects of the equipment, operations and personnel of offshore diving operations, including atmospheric diving systems.

www.imca-int.com/diving

Stainless Steel in Oxygen Systems

1 BACKGROUND

In he 1960s there was a disastrous oxygen (O_2) fire during the Apollo moon programme when 3 astronauts died on the launch pad. Like many O_2 fires, there was nothing left after the fire so the accident investigation team looked at all possible causes rather than identifying one specific cause.

One of the possible causes identified by the Space Agency was the use of a particular grade of stainless steel and the manner in which it had been configured for use.

As a result of that 1960s research the diving industry has had reservations about the use of low-grade stainless steel in O_2 systems and certain restrictions have been suggested on its use.

2 GENERAL PRECAUTIONS

As more knowledge on the fire hazards associated with O_2 has been acquired, an understanding of what needs to be done and what should be avoided has been developed. The main precautions to follow are:

- treat any gas with a 25% or more O_2 content as if it was pure O_2
- reduce pressure at source if possible. In general, try to reduce to 40 bar g or less at the quad
- ensure all materials, equipment, greases etc. are stated by the manufacturer as being suitable for use with O_2
- ensure that all traces of hydrocarbons are removed and everything is O_2 cleaned
- do not use quarter turn valves except in low pressure return lines or as emergency shut off valves
- eliminate sharp corners or tight bends from the pipework system
- train personnel in hazards associated with O_2
- ensure that there are no restrictions to the flow of O_2. Examples of common restrictions are Teflon thread tape, burrs at pipe end etc.

This list is not exhaustive but covers the main points.

3 SUITABLE GRADES

A specific question is often asked as to what grades of stainless steel are suitable.

It is difficult to use grades as a guide since the same steel may have been designated a different number under the US/British/German/etc. systems. It is therefore better to refer to material specification.

The two main certifying authorities for diving equipment are Lloyds and DnV. Contact should be made with the relevant certifying authority if there is any doubt about the suitability for use of the proposed specification of stainless steel.

4 IDENTIFICATION

The difficulty comes in trying to confirm exactly which steel specifications have been fitted to a system.

When a manufacturer, or a workshop, installs a system they know what fittings, length of pipe etc. they use. That body will have certificates to prove the specific material used is of a suitable type and may require a surveyor to stamp up all the relevant paperwork. In addition, the material, including the pipework, will be clearly marked with its description.

A problem can occur when the marking on the pipework is inadvertently erased or a fitting has been changed out. In such cases identification of each component's detailed material content may be difficult.

5 CONCLUSIONS

For the above reason, as well as for convenience, many contractors simply use 'Tungum' for all O_2 systems, normally with flared fittings. IMCA endorses this policy as the safest, as well as the most convenient method, for use in O_2 systems.

However where a contractor has used a suitable material specification of stainless steel and can demonstrate that the pipework and fittings etc are fully certified, this may also be considered as providing an equivalent level of safety.