

Prioritizing Safety in Oxygen Environments: The Crucial Role of Cleanliness in Manufacturing

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In various industrial sectors, the potential hazards associated with the interaction between materials and liquid oxygen underscore the need for robust safety measures. This concern is particularly pertinent in industries such as refineries, ammonium nitrate facilities, oilfields, and vinyl chloride plants. This article aims to illuminate a critical aspect of risk mitigation – the cleanliness of systems – applicable across the industry.

The Significance of Cleanliness in Safety:

Rather than delving into factors like human error, management decisions, or equipment failures, this article underscores the importance of maintaining a "clean" system. A system is considered "clean" when it is entirely free of any organic or inorganic contamination. The emphasis on cleanliness as a safety measure is reflected in the industry-standard practice known as G93, initially developed by ASTM (American Society for Testing and Materials) in 1988, with subsequent revisions in 1996 and 2003.

Commitment to Safety Protocols:

Manufacturers across the industry recognize the importance of stringent safety protocols to mitigate risks associated with oxygen-related processes. This commitment extends to the selection of materials verified as safe for oxygen service applications.



Figure 1 – Photo showing typical handling of raw materials.

Collaboration for Safety Assurance:

To further bolster safety measures, industry players often collaborate with authoritative bodies such as BAM (Federal Institute for Materials Research and Testing) in Berlin, Germany. BAM conducts thorough testing on materials to ensure their suitability for both liquid and gaseous oxygen environments. Once a material passes the testing criteria, it receives industry-wide approval.

Stringent Testing Procedures:

Manufacturers employ various testing methodologies, including the Linde Impact Test, Calorimeter Test, and Bomb Test. Notably, materials subjected to these tests should demonstrate zero ignitions, instilling confidence in the safety of the products.

Production and Cleaning Standards:

Following successful testing, adherence to industry standards like ASTM G93 becomes imperative. Oxygen service parts must be appropriately labeled before entering the production floor, and employees handling them should adhere to safety protocols, wearing lint-free, oil-free, and powder-free gloves. Approved cleaning agents are employed on production lines, tools, raw materials, and finished products.

Final Inspection and Packaging:

A meticulous inspection process involves examining parts under ultraviolet light to ensure the absence of oil, dust, or debris. Once inspected, parts undergo cleaning with isopropyl alcohol, fanning with nitrogen gas, and subsequent packaging in sealable bags. Each bag bears essential information, including purchase order number, part number, quantity, date, and "Oxygen Service."



Figure 2 – Photo of the label up close and typical handling while packing the finished product.

Conclusion:

In industries where oxygen-related risks are inherent, the commitment to safety through cleanliness is paramount. The industry's adherence to stringent standards and testing procedures ensures that oxygen service products meet the highest safety benchmarks. This article emphasizes the systematic approach to cleanliness in manufacturing, contributing to the overall safety and reliability of oxygen-related systems across various industrial applications.