Best Practices for Compressed Gas Cylinder Storage

Compressed gas cylinders store gases at high pressure and present several safety hazards if not stored properly. Inappropriate or haphazard storage can cause explosions or leaks, possibly resulting in physical injuries, environmental hazards, and non-compliance penalties. **OSHA 29 CFR 1910.101** specifies the compliance requirements for storing gas cylinders. While the guidance for used compressed gas cylinder storage mirrors practices for general storage, there are guidelines and considerations pertaining specifically to used or empty cylinders in locations like scrap yards and metal recycling facilities.

As industries increasingly rely on compressed gases for a variety of applications, the resulting surge in used cylinders makes their proper storage even more important. This paper outlines the challenges, best practices, and benefits associated with efficient on-site storage of used compressed gas cylinders.

Growth in Compressed Gas Cylinder Sales

In recent years, the use of compressed gases has grown in many industries like healthcare, manufacturing, research, and food services. Current projections for gas cylinder sales predict the global market will grow by a sustained compound annual growth rate (CAGR) of **8%** over the decade 2022-2031, nearly doubling the 4.5% sales CAGR of the previous five-year period.

Increased use results in an equal increase in spent cylinders requiring safe storage before reuse or disposal. With several benefits for convenience, control, and cost-effectiveness, on-site storage of used cylinders by users in different industries is gaining traction. Recognizing and understanding the necessary safety standards for on-site storage is crucial for companies to ensure a safe work environment and adhere to industry standards.

Challenges of Compressed Gas Cylinder Storage

The storage of compressed gas cylinders introduces several challenges and risks.

- Physical injuries may result from cylinders falling.
- Contents may be flammable
- Contents may present a health hazard
- High Pressure
- Accidental mixing of incompatible gases due to poor organization can lead to hazardous reactions.
- The leaking of certain gases into the atmosphere may pose environmental hazards.

From an operational perspective, haphazard storage can cause inefficiencies, with employees wasting time locating specific cylinders. Additionally, improper storage often results in breaches of regulatory standards, potentially incurring penalties and damaging a company's reputation in the process.

Essential Best Practices for Storing Used Gas Cylinders

Businesses that store used compressed gas cylinders can get information about safe storage and disposal from several sources, including:

- OSHA
- The **Compressed Gas Association** (CGA) — an international business association dedicated to promoting safe practices in compressed gas use and storage
- The **National Fire Protection Association** (NFPA)

These six best practices draw on safety literature published by these organizations.

1. Maintain a Safe Storage Environment

The storage environment plays an important role in ensuring the safety of used gas cylinders. Each cylinder must be securely fastened, using either brackets, chains, or designated cylinder stands, preventing them from toppling over or being damaged in walkways or vehicle paths. Designated storage areas should be well-drained and have fire-resistant surfaces.

To mitigate the risk of residual buildup, the area dedicated to storing used cylinders should be well-ventilated. This ensures any residual gas emissions dissipate effectively. Temperatures should be maintained at consistent levels, avoiding exposure to direct sunlight or other heat sources above 125° F, as these can cause internal pressure variations, even in used cylinders. In addition to the manufacturer's storage specifications and Safety Data Sheets (SDSs), **NFPA 55** defines safe distances from flammable materials and sources of ignition for different gases.

2. Properly Label All Used Cylinders

It's vital to mark used cylinders clearly as "empty" or "used" to differentiate them from full cylinders. While segregating based on gas type is always important, special attention should be given to used cylinders, ensuring that those with potentially reactive residual gases are kept apart. Labels indicating the cylinder's original content should remain intact, even when empty, to provide necessary information about potential residual hazards.

3. Seal or Vent Residual Gases as Necessary

All used cylinders should be treated as if they were full, with the assumption that some residual gas remains. Some residual gases can present hazards if released, making proper valve protection critical. Valves should be tightly closed, and protective caps must be in place, to prevent accidental release.

In situations where venting of residual gases is necessary, this process should be done in a controlled environment with proper ventilation, ensuring that the release complies with environmental standards and does not pose a safety risk to on-site personnel. The CGA publishes **guidance** for safe disposal methods for more than 140 gases and possible mixtures.

4. Inspection, Maintenance, and Disposal

Before repurposing, used cylinders should undergo a thorough inspection to identify signs of wear, corrosion, or damage. Cylinders deemed unfit should be marked and stored separately. Disposal or recycling should follow industry standards and regulatory guidelines, ensuring that the cylinder's lifecycle ends safely and responsibly.

5. Prohibit Unauthorized Refilling

Refilling of used cylinders poses risks if not conducted correctly. Companies should ensure that empty cylinders are not refilled unless they've been inspected, tested, and deemed safe by authorized personnel. Unauthorized refilling can lead to unsafe conditions, including overfilling, contamination, or mixing of dangerous gases.

6. Clear Communication and Training

Given the unique challenges associated with used cylinders, clear communication becomes pivotal. Businesses must provide employees with comprehensive training on the safety protocols for handling used cylinders, emphasizing the risks of residual gases. Regular training sessions and workshops should be conducted, so that staff members remain updated and well-informed about safety guidelines and compliance requirements.