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PROGRAM INFORMATION BULLETIN NO. P11-47

FROM : LINDA F. ZEILER  
Acting Director of Technical Support

NEAL H. MERRIFIELD  
Administrator for  
Metal and Non-Metal Mine Safety and Health

SUBJECT: Compressed Gas System Leakage

**Who needs this information?**

This Program Information Bulletin applies to Mine Safety and Health Administration (MSHA) personnel, metal and nonmetal mine operators, miners' representatives, manufacturers of mine equipment and mining products, and repair shop facilities should have this information.

**Why is MSHA issuing this Program Information Bulletin?**

This Program Information Bulletin (PIB) is issued to inform mine operators and users of compressed gas systems of the potential for excessive leakage from compressed gas systems. The entire metal/nonmetal mining industry is being alerted because compressed gas systems are used in a wide variety of applications.

**Background**

Excessive compressed gas system leakage can be caused by component manufacturing defects, improper assembly (such as incorrect thread preparation), damage from transportation, use of incompatible leak testing fluids, and improper cleaning of system components during assembly. This PIB addresses a refuge alternative manufacturer's experience with excessive leakage on its 6000 psi breathable air cylinders. That particular situation has been resolved, and all of the leaking cylinders have been removed from service. MSHA's investigation into the excessive leakage condition was unable to determine whether the leakage was associated with manufacturing, installation, or transportation of the cylinder and valve assemblies. However, this experience highlights the importance of taking steps to ensure that there is not excessive leakage from gas systems.

## **Information**

### **Which compressed gas systems does this PIB address?**

All compressed gas systems are addressed with this bulletin. Compressed gas systems are used for providing compressed air, oxygen, and gases used in welding or other processes and systems used in mining.

### **What is excessive leakage?**

A minimal amount of leakage is inherent in all compressed gas systems. This PIB is intended to address systems that leak at a rate that would ultimately prevent a system from performing its intended function or that would dangerously enrich gas concentrations around the leaking system. Excessive leakage may be detected during manufacturing, shipment, or on-shift examinations.

Leakage can be detected using specially formulated leak detection fluid. If any bubbles are identified in the fluid during testing, the system being checked would be considered to be leaking excessively.

Other methods for detecting leakage are commercially available to manufacturers and mining operations. Any leakage that is identified at a rate that would ultimately prevent a system from performing its function before normally scheduled maintenance or replacement or that would create a hazard is considered excessive.

Pressure gauges are graduated such that small pressure changes between inspections may not be visibly noticeable. Therefore, any visible drop in pressure shown on the gauges normally would be indicative of excessive leakage.

### **What are the potential safety concerns with compressed gas system leakage?**

Excessive leakage from a compressed gas system can cause the gas to leak to a point where there is not enough compressed gas to perform its intended function in accordance with that system's requirements.

If compressed oxygen or air is used in breathing systems, leakage of these systems would diminish the amount of oxygen or breathable air available to provide protection. Compressed gas leakage could also result in enrichment of the area in which the system is housed. These areas should be ventilated to avoid enriching that space and increasing the risk of adverse health effects and/or fire or explosion. The oxygen safety hazard alert on the MSHA website contains more information concerning good practices for all compressed gas systems:

<http://www.msha.gov/Alerts/OxygenSafety11202009.pdf>

## **What action should be taken by compressed gas system suppliers?<sup>1</sup>**

1. Perform inspection of vendor-provided system components to assure compliance with specifications.
2. Consider the Compressed Gas Association (CGA) acceptable maximum leakage rates when determining the necessary number of cylinders to perform the intended system function, so that gas quantities are not materially diminished before scheduled, routine preventive maintenance activities, such as refill schedules and DOT inspections.
3. Follow the proper torque specifications when assembling the system's components.
4. Use the appropriate pipe thread preparation materials (e.g., pipe dope, Teflon®, etc.) for the compressed gas system being assembled.
5. Conduct leak inspections after the compressed gas system is assembled to assure that leakage does not exceed the CGA acceptable maximum rates before shipment to customers.
6. Leak inspections should be performed by using leak detection fluids or other means that are not potentially corrosive or otherwise damaging to the compressed gas system components. Use certified ammonia-free leak inspection fluids.

## **What action should be taken by mine operators?**

Mine operators should have spare compressed gas systems or components on-site in the event leaking compressed gas systems are identified and removed from service. The spare compressed gas systems or components will enable the mine operator to continue to provide protection in the event of a leak while maintaining mining operations. Maintenance should not be performed on pressurized systems located underground. This includes filling and changing of cylinders.

Mine operators should examine their compressed gas systems upon receipt and immediately after any transportation, and they must examine compressed gas systems under 30 C.F.R. § 56/57.18002(a) during on-shift examinations, to determine if the systems have any signs of damage or excessive leakage (see supplier action item nos. 5 and 6 above) that could adversely affect the safety or health of miners. In addition, under 30 C.F.R. § 56/57.13015, compressed gas systems must be inspected in accordance with the National Board Inspection Code. If mine operators identify an excessively leaking or damaged compressed gas system, they should contact the supplier to have the system re-examined for leaks and for sufficient quantities of compressed gas. If an examination reveals damage or excessive leakage that could affect the health or safety of miners, the system must be timely repaired or removed from service pursuant to 30 C.F.R. §§ 56/57.14100(b) and 56/57.18002(a).

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<sup>1</sup> Mine operators who purchase systems directly from manufacturers also should perform these actions.

**What must be done before a compressed gas system is returned to service?**

Under 30 C.F.R. §§ 56/57.14100(b) and 56/57.18002(a), compressed gas systems or components removed from service must be replaced or repaired for return to service so as to prevent excessive leakage and provide sufficient quantities of compressed gas. At the completion of each repair, the person conducting the maintenance or repair should make a record of all corrective actions taken.

**What is MSHA's authority for this PIB?**

The Federal Mine Safety and Health Act of 1977, as amended, at § 110(h) (30 U.S.C. §§ 820(h)); 30 C.F.R. §§ 56/57.13001, 56/57.13015, 56/57.13019, 56/57.14100, and 56/57.18002.

**Internet Availability**

This information bulletin may be viewed on the Internet by accessing MSHA's home page at <http://www.MSHA.gov> and then choosing "Compliance Info," and "Program Information Bulletins."

**Who are the MSHA contact persons for this PIB?**

Mine Safety and Health Enforcement

Don Braenovich, (202) 693-9551

E-mail: [Braenovich.Don@dol.gov](mailto:Braenovich.Don@dol.gov)

Technical Support, Approval and Certification Center

John Faini, (304) 547-2038

E-mail: [Faini.John@dol.gov](mailto:Faini.John@dol.gov)

**Who will receive this PIB?**

MSHA Program Policy Manual Holders

Miners' Representatives

Metal/Nonmetal Mine Operators

Manufacturers of Mine Equipment and Mining Products

Mine Equipment Repair Shop Facilities

Special Interest Groups