



COMPRESSED GAS ASSOCIATION, INC.

SAFETY BULLETIN

SB-36—2006

REAFFIRMED 2013

14501 GEORGE CARTER WAY, SUITE 103
CHANTILLY, VA 20151
703-788-2700
cga@cganet.com

PREVENTION OF CYLINDER LADING CONTAMINATION

Customers can unintentionally contaminate cylinder loadings and return them to gas companies. A contaminated cylinder is a cylinder that contains a substance other than, or in addition to, the original lading. These contaminated cylinders can cause serious safety or environmental incidents at customer sites or gas company production facilities. In many cases, the processing facility may not detect this contamination until the initiation of cylinder reprocessing or refill. It is also possible the contamination is not detected in reprocessing at all, and the contamination is sent with the product to the next customer. The contamination can be virtually any material, but the most hazardous contamination involves incompatible materials (i.e., fuels and oxidizers, acids and bases). Combination of incompatible materials can create a hazard requiring immediate action [1].

DANGER: *Failure to recognize the hazards related to contaminated cylinders has resulted in fatalities. Users who suspect contamination shall notify their gas distributor immediately.*

By using properly designed process equipment and following appropriate procedures, it is possible to prevent the risk of cylinder contamination.

Some process design considerations are:

- Avoid connecting incompatible materials to a common system unless reaction or combustion under controlled conditions is intended at the final use point;
- Incompatible materials should not share a common purge source;
- Check valves should not be relied on as a primary system safeguard;
- Prevent connection of gases where differences in pressure could introduce one gas to another gas and unintentionally mix gases; and
- Prevent process upset conditions such as potential power failure or mechanical failure.

Examples of how cylinder contamination occurs:

- Cylinder pressure is lower than the process pressure resulting in backflow of process gas into the cylinder;
- Cylinders are emptied below the recommended return pressure of 20 psi (138 kPa) or below the operating pressure of the system, whichever is higher [3];¹ and
- Interconnection of process fluids without properly maintained backflow prevention devices.

Examples of incidents:

- Nitrous oxide (an oxidizer) backflowed into a silane cylinder (pyrophoric) through poorly maintained check valves on a common purge system resulting in fatalities and injuries;
- Nitrous oxide backflowed into a silane cylinder detonated during processing at a gas analytical company resulting in fatalities and serious injury;

¹ kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per [CGA P-11, Metric Practice Guide for the Compressed Gas Industry](#) [2].

- Corrosive gas backflowed into an inert gas cylinder; personnel were exposed during venting and reprocessing of the cylinder at the gas facility; and
- Process liquids backflowed into corrosive gas cylinders, (e.g., water, sodium hydroxide solution, lubricants) resulting in internal cylinder corrosion.

It is important that information regarding the prevention of contamination of compressed gas cylinders be disseminated to users and customers.

References

Unless otherwise specified, the latest edition shall apply.

[1] [CGA P-22](#), *The Responsible Management and Disposition of Compressed Gases and their Cylinders*, Compressed Gas Association, Inc., 14501 George Carter Way, Suite 103, Chantilly, VA 20151. www.cganet.com

[2] [CGA P-11](#), *Metric Practice Guide for the Compressed Gas Industry*, Compressed Gas Association, Inc., 14501 George Carter Way, Suite 103, Chantilly, VA 20151. www.cganet.com

[3] [CGA P-1](#), *Safe Handling of Compressed Gases in Containers*, Compressed Gas Association, Inc., 14501 George Carter Way, Suite 103, Chantilly, VA 20151. www.cganet.com

PLEASE NOTE:

The information contained in this document was obtained from sources believed to be reliable and is based on technical information and experience currently available from members of the Compressed Gas Association, Inc. and others. However, the Association or its members, jointly or severally, make no guarantee of the results and assume no liability or responsibility in connection with the information or suggestions herein contained. Moreover, it should not be assumed that every acceptable commodity grade, test or safety procedure or method, precaution, equipment or device is contained within, or that abnormal or unusual circumstances may not warrant or suggest further requirements or additional procedure.

This document is subject to periodic review, and users are cautioned to obtain the latest edition. The Association invites comments and suggestions for consideration. In connection with such review, any such comments or suggestions will be fully reviewed by the Association after giving the party, upon request, a reasonable opportunity to be heard. Proposed changes may be submitted via the Internet at our web site, www.cganet.com.

This document should not be confused with federal, state, provincial, or municipal specifications or regulations; insurance requirements; or national safety codes. While the Association recommends reference to or use of this document by government agencies and others, this document is purely voluntary and not binding unless adopted by reference in regulations.

A listing of all publications, audiovisual programs, safety and technical bulletins, and safety posters is available via the Internet at our website at www.cganet.com. For more information contact CGA at Phone: 703-788-2700, ext. 799. E-mail: customerservice@cganet.com.

Work Item 11-021
Specialty Gases Committee

NOTE—No technical information has been changed from the 2006 edition. This reaffirmed edition may include minor editorial changes.

REAFFIRMED: 2013
FIRST EDITION: 2006

© 2006 The Compressed Gas Association, Inc. All rights reserved.

All materials contained in this work are protected by United States and international copyright laws. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopying, recording, or any information storage and retrieval system without permission in writing from The Compressed Gas Association, Inc. All requests for permission to reproduce material from this work should be directed to The Compressed Gas Association, Inc., 14501 George Carter Way, Suite 103, Chantilly VA 20151. You may not alter or remove any trademark, copyright or other notice from this work.