



U. S. Chemical Safety and Hazard Investigation Board RECOMMENDATION STATUS CHANGE SUMMARY

Report:	Airgas Facility Fatal Explosion
Recommendation Number(s):	2016-4-I-FL-R4
Date Issued:	March 17, 2017
Recipient:	Compressed Gas Association
New Status:	Closed – Acceptable Action
Date of Status Change:	April 1, 2021

Recommendation Text:

Require Pump Run-Dry Safety Interlocks Apply ISA-84

Modify Compressed Gas Association (CGA) standard CGA G-8.3, Safe Practices for Storage and Handling of Nitrous Oxide to reference and require applying International Society of Automation (ISA) standard ISA-84, Functional Safety: Safety Instrumented Systems for the Process Industry Sector to safety interlocks such as the nitrous oxide pump “run-dry” shutdown.

Board Status Change Decision:

A. Rationale for Recommendation

On Sunday, August 28, 2016, at approximately 12:10 p.m., a nitrous oxide trailer truck exploded at the Airgas manufacturing facility in Cantonment, Florida. The explosion fatally injured the only Airgas employee present and heavily damaged the facility, halting nitrous oxide manufacturing at Cantonment indefinitely. The U.S. Chemical Safety and Hazard Investigation Board (CSB) determined that the most probable cause of the incident was that a pump heated nitrous oxide above its safe operating limits during the initial loading of a trailer truck. This most likely started a nitrous oxide decomposition reaction that propagated from the pump into the trailer truck, causing the explosion.

As a part of its investigation, the CSB reviewed relevant industry standards by the Compressed Gas Association (CGA). The CSB determined that CGA G-8.3, Safe Practices for Storage and Handling of Nitrous Oxide should reference the International Society of Automation (ISA) standard ISA-84, *Functional Safety: Safety Instrumented Systems for the Process Industry Sector*, and apply it to safety interlocks, such as the nitrous oxide pump “run-dry” shutdown. The CSB issued three recommendations to CGA. This status change summary is specific to CSB Recommendation No. 2016-4-I-FL-R4.

B. Response to the Recommendation

CGA informed the CSB that they published the third edition of *CGA G-8.3, Safe Practices for Storage and Handling of Nitrous Oxide* (CGA G8.3) in November of 2019. The newest edition clarifies that the requirements for dry running protection are considered critical for safety,

references ISA -84 and requires its application in evaluating safety interlocks such as dry running protection for pumps in the nitrous oxide industry.

C. Board Analysis and Decision

Based upon the information above, the Board voted to designate the status of **CSB Recommendation No. 2016-4-I -FL-R4** as **“Closed - Acceptable Action.”**