



# U. S. Chemical Safety and Hazard Investigation Board

## RECOMMENDATION STATUS CHANGE

### SUMMARY

<b>Report:</b>	Airgas Facility Fatal Explosion
<b>Recommendation Number(s):</b>	2016-4-I-FL-R2
<b>Date Issued:</b>	March 17, 2017
<b>Recipient:</b>	Compressed Gas Association
<b>New Status:</b>	Closed – Exceeds Recommended Action
<b>Date of Status Change:</b>	April 1, 2021

#### Recommendation Text:

#### *Safety Management System for Nitrous Oxide Manufacturing*

*Develop and implement a safety management system standard for nitrous oxide manufacturing, to manage known process safety hazards, including nitrous oxide decomposition, which includes appropriate elements based on chemical industry good practice guidance, such as CCPS Guidelines for Risk Based Process Safety, Essential Practices for Managing Chemical Reactivity Hazards, and Guidelines for Implementing Process Safety Management.*

#### 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.

The CSB investigation found that Airgas lacked a safety management system to identify, evaluate, and control nitrous oxide process safety hazards. The CSB reviewed relevant industry standards by the Compressed Gas Association (CGA) and determined that a process safety management system for nitrous oxide manufacturing could provide guidance for better process safety in the nitrous oxide manufacturing industry. The CSB issued three recommendations to CGA. This status change summary is specific to CSB Recommendation No. 2016-4-I-FL-R2.

##### B. Response to the Recommendation

CGA stated that in May 2020, they published *CGA P-86, Guideline for Process Safety Management (CGA P-86)* that is applicable to the nitrous oxide industry. The document has 21 elements that fully implement a process safety management system necessary to manage known

process safety hazards such as nitrous oxide decomposition, as well as identify, assess, and manage other hazards.

It is also highly significant to point out that the scope of CGA P-86 extends far beyond addressing the hazards associated with nitrous oxide. In fact, the scope was expanded to address all processes within the industrial and medical gases industries. Additionally, the process safety management elements found in the CGA P-86 come from multiple sources. In addition to the Center for Chemical Process Safety (CCPS) it also includes information from the European Industrial Gases Association (EIGA) to make it a globally harmonized publication. These actions provide increased safety over several industry segments that includes the international community. This significantly exceeds what the recommendation intended and by far surpasses the objectives envisioned by the Board.

### C. Board Analysis and Decision

CGA published CGA P-86 which addresses all the recommendation requirements and then expanded the scope to cover all processes with the industrial and medical gases industries. As these actions enhance the extent of reduction of future risk well above the intent of the CSB recommendation, the Board applauds the actions of CGA and voted to change the status of **CSB Recommendation No. 2016-4-I -FL-R2** to **“Closed – Exceeds Recommended Action.”**