



MARINE SAFETY ALERT

Inspections and Compliance Directorate

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Alarming Trends Found on Fixed Gas Detection Systems

One critical safety measure on liquefied gas carriers is the fixed gas detection system. If gas vapors are detected in a monitored space, an alarm will activate and alert the crew of the dangerous condition. The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) requires the activation of alarms at specified vapor concentrations. However, during exams on three separate Liquefied Natural Gas (LNG) carriers in Boston, Port State Control Officers (PSCOs) discovered issues with the fixed flammable gas detection system that resulted in the issuance of deficiencies and delay of cargo operations. While witnessing tests, multiple sensors measured outside the tolerances established by the manufacturer and subsequent calibration checks failed. In each case, crewmembers were not following established procedures as specified in their Safety Management System (SMS).



Fixed gas detection panel



Electronic sensor sample point

Testing procedures and allowable tolerances should be understood by the crewmembers responsible for maintaining and testing the fixed gas detection system. Although the examined gas carriers' SMSs and manufacturers' instructions specified procedures for testing the fixed gas detection systems and stated the acceptable parameters for the sensors, many of the sensor tests observed by the PSCOs had readings outside of the established tolerances. In these types of situations, a "drifting sensor" often causes detectors to exceed tolerances specified by the manufacturer. Sensors operating outside of established tolerances pose a significant safety threat and could be grounds for vessel control actions, such as delayed departure from port, delayed cargo operations, or detention.

Another common discrepancy observed was the use of improper span gas on catalytic sensors. To prove proper operation of the fixed gas detection system, the span gas used to test the sensors or complete calibration checks must be appropriate for the type of sensor. There are three main types of sensors: catalytic, infrared, and electrochemical. Catalytic sensors rely on the presence of oxygen to function correctly. Absent the means to introduce oxygen into the sample, if the composition of the span gas used on a catalytic sensor does not include oxygen and is balanced with an inert gas, the sensor will not operate correctly. Tests or calibrations conducted with the incorrect span gas can cause the sensor to operate outside established tolerances.



Two example span gas bottles: left is 8% butane by Vol, balance nitrogen (N₂); right is 1.1% Propane by Vol, balance air (O₂)

The Coast Guard **strongly recommends** that liquefied gas carrier owners and operators ensure the following:

- Testing and calibration of fixed gas detection systems are completed per the vessel's SMS and manufacturer's instructions.
- Sensors are operating within established parameters as required by the vessel's procedures and manufacturer's instructions.
- The appropriate span gas for the type of sensor is correctly applied to the sensor, as established by the manufacturer and vessel's SMS.
- The crewmember responsible for maintaining the gas detection system has adequate training, is fully knowledgeable on the system, and is proficient in conducting system tests.

Investigating officers, inspection personnel, servicing technicians, and shipboard personnel are encouraged to maintain an acute awareness of these issues and initiate corrective actions as needed.

This safety alert is provided for informational purposes only and does not relieve any domestic or international safety, operational, or material requirements. Developed by Coast Guard marine inspectors at Sector Boston. Questions may be sent to the Coast Guard Investigations Center of Expertise at INCOE@uscg.mil.