GAS DETECTION IN THE MARINE INDUSTRIES

Marine Industry regulations require that vessels have at least one portable gas monitor onboard for oxygen and explosives. In higher classifications, they also need an instrument for toxic gases (example: H₂S). Most regulations state that a vessel must also have a backup instrument. This means that one vessel usually requires two instruments. Marine applications are often very harsh. Extreme temperatures, humidity, operational grime, and hard surfaces are the main components of the harsh maritime environment in which RAE monitors operate.

POTENTIAL USERS
- Ships
- Ferries
- Navy
- Offshore oil rigs
- Shipyards - repair and manufacturer
- Marine chemists
- Customs inspectors
- Coast Guard
- Lifeboat and fiberglass boat manufacturers

MARINE CONFINED SPACE TANK ENTRY
The primary application for marine gas-detection monitors is tank inspection. These tanks do not usually have smooth interiors, resulting in spaces that can trap gases. Every vessel has tanks, and these spaces need to be entered for repairs, cleaning or general inspection. These tanks can be divided into four different groups and are considered standard confined space entry:
1. Cargo tanks (only on tankers and supply vessels)
2. Slup tanks (only on tankers and supply vessels)
3. Fuel tanks (all types)
4. Ballast tanks (all types)

What To Monitor For?
Instrument configuration is based on the tank and vessel type. The three main considerations are usually:
1. Monitor for sufficient oxygen
2. Monitor for explosive gasses
Oxygen and explosive gases are easily determined as necessary to monitor, but deciding which toxic gases to monitor depends on the tank and vessel type.

Cargo Tanks
Cargo tanks can carry a wide variety of liquids depending on the vessel’s IMO (International Marine Organization) classification. There are three levels of IMO classification. IMO class one covers the least corrosive or toxic liquids while IMO class three covers the most corrosive and toxic liquids.
- IMO 1 – Transport of vegetable oils
  LEL and O₂ sensors recommended
- IMO 2 – Transport of crude oil and oil products
  LEL, O₂, and H₂S sensors recommended
- IMO 3 – Transport of various chemicals (BTEX to MTBE)
  Colorimetric detection tubes are often used for entry into these spaces, but a portable PID monitor can often be more cost efficient and provide greater safety in the form of continuous monitoring. RAE Systems’ unique MultiRAE can combine the broad level detection of a PID with the protection of standard LEL, O₂, and H₂S sensors.
Slup Tanks
Slup tanks are normally used for carrying water to clean the cargo tanks. Entry into these spaces requires at least an O₂ sensor. Slup tanks are sometimes also approved for use as additional cargo tanks.

Fuel Tanks
These are used for the transport of fuel, and entry into these tanks requires a gas monitor with at least LEL and O₂ sensors.

Ballast Tanks
Ballast tanks use seawater to aid navigation. The seawater is drawn from the harbor and is usually full of plants, mussels and even fish that will start to rot inside the tank. LEL, O₂, and H₂S sensors are standard for entry into these spaces.

Container Vessels
Container vessels account for more than 3,000 of the marine industry’s vessels. These vessels require the standard LEL and O₂ sensors to clean, repair and inspect the fuel and ballast tanks. There are fumigants (methyl bromide), coolants (ammonia) many additional applications on board container vessels that require a monitor capable of monitoring both the basics (LEL, O₂, and H₂S) and a broad range of chemicals (PID).

EASE OF USE
Choosing portable gas monitors is often difficult, because they must cover many different vessels. Since crews are often shuffled between vessels, it is preferable to have standardized equipment on all vessels to ensure that the crews know the instruments. RAE Systems instruments are easy to use and multi-faceted in their usefulness, and every RAE Systems monitor operates in a similar manner.

DAMAGING DELAYS
RAE Systems offers the right price, size, performance, and ease of use, but, more important, worldwide service. If the instrument fails to work, there is a risk that the vessel cannot go into harbor. Because delays represent large costs, vessels cannot wait 72 hours for a new sensor. With RAE Systems’ worldwide distributor network, new instruments can be purchased at any port. Due to “type approval” and classification issues, replacement parts and units must be from the same company. This makes RAE Systems’ worldwide distributor network a valuable resource.

WHERE ARE RAE INSTRUMENTS CURRENTLY EXPERIENCING SUCCESS
Denmark, the seventh-largest marine market in the world, is a country full of ship owners, ship builders, shipyards, maritime industry and RAE instruments. RAE Systems has had remarkable success selling in this prime example of marine industry.

The top three marine markets worldwide are Greece, Japan, and Norway, with Sweden and the United States also in the top 10.

Supply Vessels and Oil Drilling
The main configuration for supply vessels working in oil drilling areas is O₂ (oxygen), LEL (lower explosive limit, combustible) and H₂S (hydrogen sulfide) with a pump. They use the instrument as a deck monitor when they work close to drilling platforms (risk of H₂S) and use the internal pump for confined space entry in ballast, fuel, cargo and slup tanks.

Chemical Tankers
We are also having success with monitors for chemical tankers configured with O₂, LEL, H₂S, and PID with a pump. It is used for tank inspections and as a deck monitor during the loading and unloading of chemical products.

Ferries (RoRo Vessels)
We have had excellent success with RoRo vessels (Roll on Roll off) such as ferries. These vessels use monitors configured with O₂ (Oxygen), LEL (Combustible) and CO (Carbon Monoxide) with a pump. An additional area of concern, on which to educate this group, is the importance of NO from diesel driven vehicles.

Gas Tankers
We have found that MultiRAE Pluses configured with O₂, LEL, NH₃ (ammonia), Cl₂ (chlorine) and PID with a pump actively meet the needs of gas tankers. They are used on deck during loading and unloading, which takes up to 30 hours. Note: It is a good idea to have two additional batteries and an external battery charger to accommodate extended monitoring during these long procedures.
PARTIAL RAE SYSTEMS MARITIME USER LIST:

1. MiniRAE 2000 for Esso, Canada, marine offloading to detect 50 and 100 ppm of gasoline and diesel vapors in Halifax, Canada.


3. ToxiRAE PID for vinyl chloride monitoring to Dow, Louisiana, and Maersk shipping line in Houston.


5. UltraRAEs to determine benzene content of offshore oil rig products in Louisiana.


7. Limited experience in Denmark with Car/lorry ferries for MultiRAE Plus for NO and Maersk shipping line for MultiRAE LEL/O2/H2S.

8. MultiRAE LEL/O2/H2S for HM Customs and Excise in UK.


11. VRAE and MultiRAE to US shipbuilders. Interest in VRAE due to no need or O2 for % volume flammability measurements.

Special Thanks to Michael Jorgensen of Instrumatic in Denmark for his knowledge and advice.