

# 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: H<sub>2</sub>S). 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
3. Monitor for toxic gases based on the hygienic limits.

Oxygen and explosive gases are easily determined as necessary to monitor, but deciding which toxic gases to monitor depends of 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 O<sub>2</sub> sensors recommended
- IMO 2 – Transport of crude oil and oil products  
LEL, O<sub>2</sub>, and H<sub>2</sub>S 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, O<sub>2</sub>, and H<sub>2</sub>S sensors.

## Slup Tanks

Slup tanks are normally used for carrying water to clean the cargo tanks. Entry into these spaces requires at least an O<sub>2</sub> 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 O<sub>2</sub> 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, O<sub>2</sub>, and H<sub>2</sub>S 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 O<sub>2</sub> 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, O<sub>2</sub>, and H<sub>2</sub>S) 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 O<sub>2</sub> (oxygen), LEL (lower explosive limit, combustible) and H<sub>2</sub>S (hydrogen sulfide) with a pump. They use the instrument as a deck monitor when they work close to drilling platforms (risk of H<sub>2</sub>S) 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 O<sub>2</sub>, LEL, H<sub>2</sub>S, 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 O<sub>2</sub> (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 O<sub>2</sub>, LEL, NH<sub>3</sub> (ammonia), Cl<sub>2</sub> (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.
- 2.** ToxiRAE O<sub>2</sub> monitors for Swedish Icebreakers in Stockholm harbor.
- 3.** ToxiRAE PID for vinyl chloride monitoring to Dow, Louisiana, and Maersk shipping line in Houston.
- 4.** H<sub>2</sub>S tube to offshore suppliers for North Sea and African and Middle Eastern markets.
- 5.** UltraRAEs to determine benzene content of offshore oil rig products in Louisiana.
- 6.** ToxiRAE PID for styrene exposure for Sun Ray, Arizona power boat manufacture, and Norwegian lifeboat manufacturer.
- 7.** Limited experience in Denmark with Car/lorry ferries for MultiRAE Plus for NO and Maersk shipping line for MultiRAE LEL/O<sub>2</sub>/H<sub>2</sub>S
- 8.** MultiRAE LEL/O<sub>2</sub>/H<sub>2</sub>S for HM Customs and Excise in UK.
- 9.** ToxiRAE PID for customs for methyl bromide fumigant.
- 10.** MiniRAE, ToxiRAE II, and MultiRAE Plus for US Marine Chemists for toxic vapor and THC's.
- 11.** VRAE and MultiRAE to US shipbuilders. Interest in VRAE due to no need of O<sub>2</sub> for % volume flammability measurements.

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