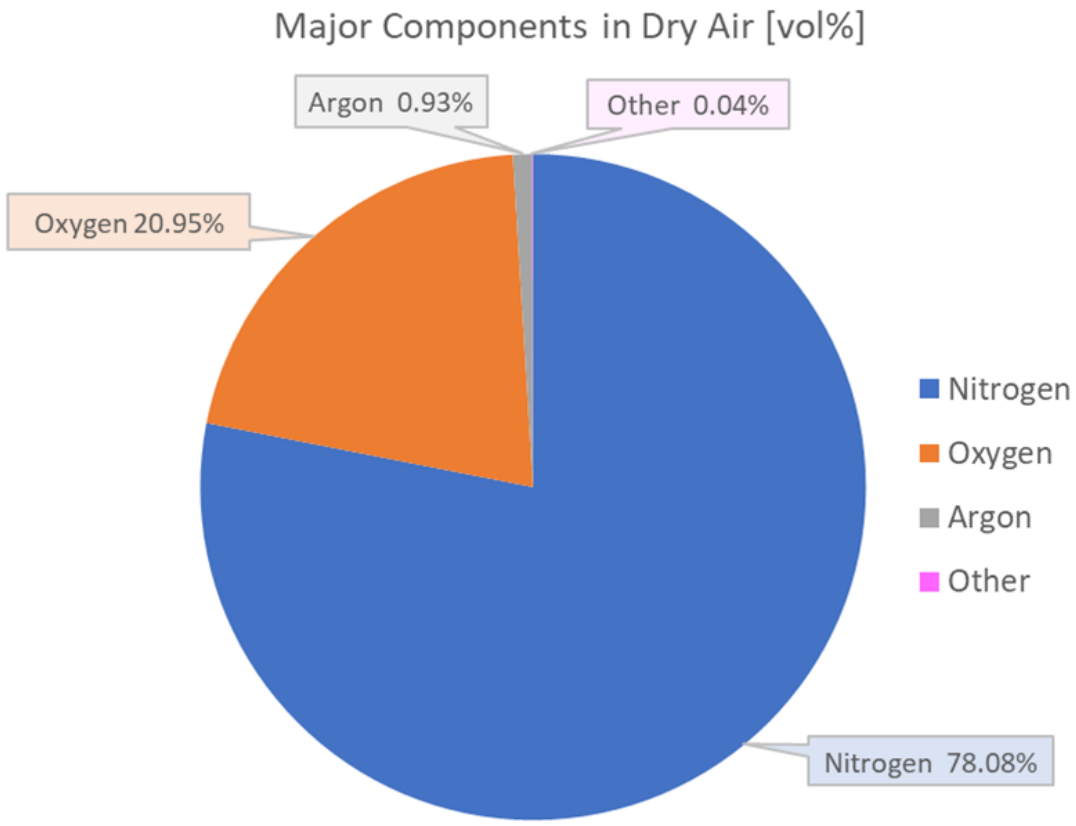
DAY TWO

SAFETY AND RISK

FOCUS ON ENCLOSED SPACES

The Air We Breathe



Effect of Reduced Oxygen Levels

Oxygen Percentage In Air	Effect
19.5%	Minimum Acceptable Oxygen Level
15% - 19%	First Signs Of Hypoxia - Decreased Ability to work strenuously and Impaired Coordination
12% - 14%	Respiration Increase, Impaired Coordination, Perception and Judgement
10% - 12%	Further increase in respiration, poor judgement, Bluish lips.
8% - 10%	Mental failure, fainting, unconsciousness, blue lips, nausea and vomiting
6% - 8%	4 – 5 Minutes Possible Recovery 6 Minutes 50% Fatal 8 Minutes 100% Fatal
4% - 6%	Coma in seconds, convulsions, respiratory failure and death

What Is An Enclosed Space

An enclosed space is a space which is not designed for continuous worker occupancy and has either or both of the following characteristics:

- Limited openings for entry and exit
- Inadequate ventilation

Enclosed spaces are not always obvious but can be deadly.

These are just a few examples of enclosed spaces:

- cargo holds
- pipe tunnels
- ballast tanks
- pump rooms
- peak tanks
- void spaces
- bunker tanks
- cofferdams
- fresh water tanks
- chain lockers
- battery lockers
- bottom tanks
- paint / chemical lockers
- boiler furnaces
- engine crankcases.

Confined spaces are a major risk not only aboard ships or in Ports.
Confined spaces are an issue across numerous industries.

1. Identify all confined spaces around the workplace.
2. Designate these spaces as confined spaces.
3. Operate a permitting system to control / restrict access.
4. Train personnel and communicate the dangers.
5. Establish a robust evacuation procedure should things go wrong and carry out regular drills.
6. Develop a Safety Culture

Enclosed Spaces Can Be Deadly

Enclosed Spaces Can Be Deadly

- An enclosed space may not contain enough oxygen to breathe properly or there could be a build-up of dangerous gases which can cause asphyxiation. This could result in serious injury, brain damage and death.

- Oxygen deficiency can be caused by:
  - corrosion (rusting)
  - organic matter
  - paint drying

- Hazardous gases can come from many sources, such as leaks or emissions from hazardous cargoes.

The Risk Is Serious

- When incidents do occur, they can be fatal and usually involve more than one person.

- **Often a second person comes to rescue the first person and becomes unconscious themselves.**

- Do not enter a space if you don't know if it is dangerous or not – enclosed spaces and dangerous atmospheres are an invisible killer.

Enclosed Spaces Can Change

- Even if a space appears to be safe, toxic gases or poor oxygen levels can accumulate in pockets. Even if the space has been ventilated and tested monitoring should continue whilst the spaces are occupied.
- Special attention is needed when dealing with cargo compartments, as some cargo can create hazardous vapours.
- Changing conditions within an enclosed space such as water ingress, oxygen-depleting work such as burning or welding, ventilation failure and vapours from paint or cleaning materials must be monitored.
- Conditions can also change due to external factors including the inadvertent actions of other ship or shore staff, work in adjacent or connected spaces, cargo work, pumping ballast or fuel transfers.

How To Reduce Risk

- ❑Carry out risk assessments and familiarise yourself with guidance
- ❑Familiarise yourself with the advice provided in the Code of Safe Working Practices for Merchant Seafarers (COSWP).
- ❑This is the simplest way to establish company procedure for entry into enclosed spaces.
- ❑In addition, you must carry out a risk assessment and issue a permit to work.

No Enclosed Space Should Be Entered Without Precautions

Before Entry

- a competent person should undertake a risk assessment and identify any potential hazards
- prepare the space
- secure the space for entry
- ensure persons undertaking the work are trained and have participated in appropriate drills
- test the atmosphere of the space
- complete a permit to work
- make a contingency plan in case things go wrong
- review risk assessments on a regular basis

- **On Entry**
- ensure you have a person assigned on standby for each entry
- the standby person should be equipped with rescue equipment including self-contained breathing apparatus and radio
- wear protective clothing and boots
- the standby person should ensure they maintain radio contact with the bridge or engine control room, or in port with someone who can help in case of emergency
- ensure the space is well ventilated - ventilation should continue during the period that the space is occupied and during temporary breaks

If Things Go Wrong

- if you see someone lying motionless do not rush to carry out a rescue by yourself - an unplanned rescue is likely to end in tragedy as personnel rush into lethal atmospheres under the misconception that they will be able to save colleagues
- stop, think – why are they unconscious, could this be an enclosed space?
- should an emergency occur, the alarm should be sounded so that back-up is immediately available to the rescue team
- never enter the space before help has arrived and a plan for rescue is confirmed

If Things Go Wrong - Rescue

- **do not** enter the space without the authorisation of the master or his deputy (on Board Ship) or Terminal Superintendent/ Incident controller (Ashore)
- **do not** enter the space without testing the atmosphere
- rescue equipment including breathing apparatus should be immediately available
- if the atmosphere is unsafe, do not enter unless it is an emergency - if it is an emergency, you must wear breathing apparatus
- emergency escape breathing devices (EEBDs) are NOT safe to use in enclosed space entries including for rescue
- self-contained breathing apparatus should be used for rescue
- Written rescue procedures should be established before entry - the rescue procedure should be specific for each type of enclosed space
- drills on enclosed space entry must include rescue procedures - they should be practiced frequently enough to provide a level of proficiency that eliminates life-threatening rescue attempts and ensures an efficient and calm response to any emergency

Real Life Examples

Example 1:

An engineer working on board a trawler was found collapsed inside a refrigerated saltwater tank. When he was found, three of his crewmates went into the tank to help him; they all suffered breathing difficulties and one also collapsed. Although the engineer was rescued from the tank, he could not be resuscitated. Two other crew members then donned breathing apparatus and rescued their struggling crewmates.

Example 2:

Three seafarers on board a vessel lost their lives as a consequence of entering an enclosed space. One entered the chain locker to secure a rattling anchor chain and collapsed. Another seafarer entered the chain locker in an attempt to help, but he also collapsed. A third tried to help the first two, but all three died due to the oxygen deficient atmosphere within the confined space.

Key Points

- Robust Confined / Enclosed space policy .
- Comprehensive Written procedures
- Training with regular refreshers.
- Risk Assessments
- Permit regime
- Testing
- Equipment
- Prevent Access
- Authority
- Responsibility
- Robust Rescue Plan if things go Wrong

Prevent Access

No Amount of policies and procedures will prevent confined space incidents occurring if people choose to ignore them. !!!

In order to address this issue it is necessary to prevent access altogether by securing the confined / enclosed space.

This can be achieved by implementing an Isolation Procedure using locks and “Danger Boards” to secure a confined space similar to the tried and tested electrical isolation procedures.

Danger Boards

Danger Boards issued to ship's officers with their own personal lock and key enabling them to lock down access hatches to ship's holds to prevent access by ship and or shore personnel until such time they have been checked and tested as fit for entry.

Securing and Testing

- Access Hatchways to a confined / enclosed spaces that have not been checked for air quality is locked by an authorised person until the air quality has been tested with a suitable measuring device.
- The access is locked using padlocks, chains and a Danger Board FOB with the name of the responsible person.

Testing & Monitoring

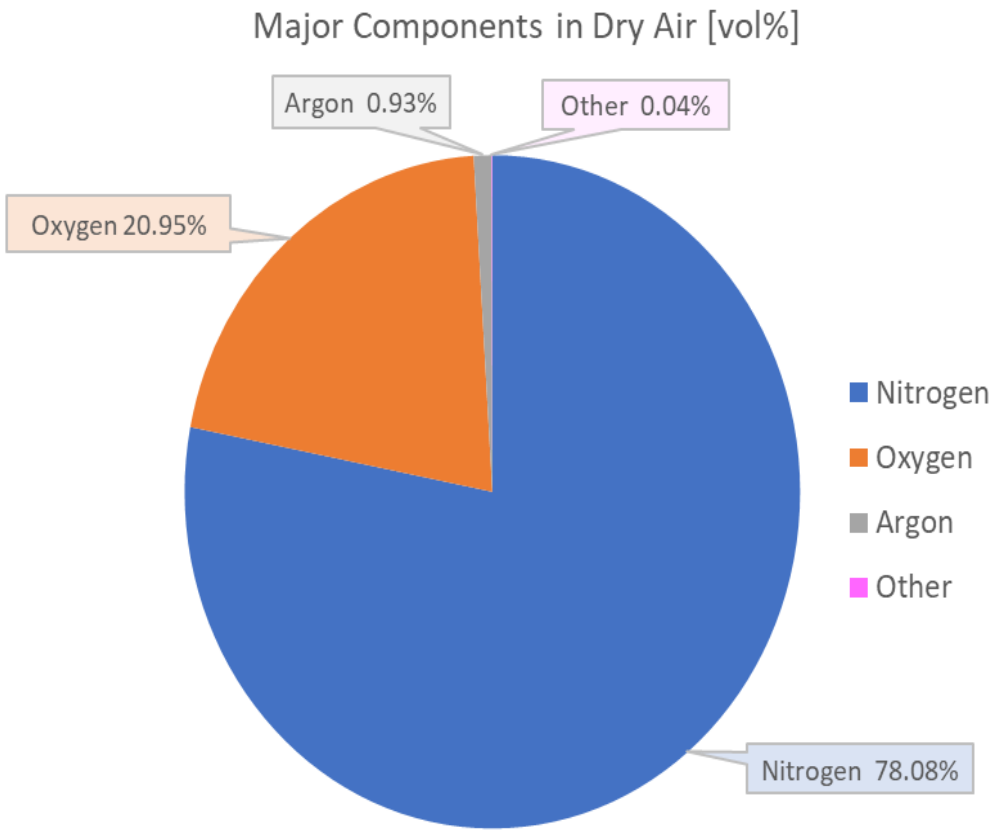
Personnel working in confined / enclosed spaces should be equipped with monitoring devices which will provide the wearer with early warning of the presence of harmful gases and or oxygen depletion.

PANEL DISCUSSION

Industry measures to combat enclosed space fatalities.

Discussion on the findings of the MAIB report into the fatalities of three stevedores on the Isle Of Man Registered Bulk Carrier “Berge Mawson”:


13.02.2017


Major Components in Dry Air [vol%]
Argon 0.93%
Other 0.04%
Oxygen 20.95%
Nitrogen 78.08%
Nitrogen
Oxygen
Argon
Other