



Ozone Systems on Ship

Background

The Norwegian Maritime Authority (NMA) has received a report of an incident where members of the crew on a vessel were exposed to ozone gas in the vessel's accommodation due to leaks in the system. The crew had to seek refuge in open air, and some of the crew members experienced great discomfort when they were exposed to the gas. Ozone is considered to be a dangerous chemical according to the NMA HSE Regulations.

The NMA and some classification societies have recently seen an increase in the use of ozone gas on board various vessels. On board fishing vessels and live fish carriers, ozone gas mixed in water is used to clean and disinfect tanks and pipes. This matter is also relevant in connection with the new international requirements for ballast water treatment. Several cargo vessels are now installing or intend to install ozone systems for this purpose.

Today's requirements

There are no particular regulatory requirements for ozone systems today, but the NMA would like to emphasize that all equipment taken on board and installed shall be **risk assessed with regard to health, safety and working environment**. In accordance with the [Regulations of 1 January 2005 No. 8 concerning working environment, health and safety of persons working on board ship](#) (the [NMA HSE Regulations](#)), there is a general requirement for risk assessment regarding the use of new working equipment and new technology in section 2-2 paragraph 1 of the Regulations.

This implies that

- **hazards on board shall be identified**
- **an assessment of the risk represented by the hazard shall be made**
- **relevant safety measures shall be implemented**

Furthermore, it is important to implement section 4 regarding work equipment in the risk assessment when such equipment is brought on board the vessel.



Chapter 11 of the NMA HSE Regulations also includes more detailed provisions on the protection of persons working on board against exposure to chemicals and biological agents which apply in addition to the general safety regulations.

Risk assessment shall be carried out in accordance with section 11-4 to avoid exposure of ozone and at any risk of exposure safety measures shall be implemented.

When using substances like ozone, it is important to be familiarized with the data sheet for the substance ref. section 12 of the same Regulations.

What are the dangers of ozone gas?

Ozone gas exposure can occur due to leaks from generators or from the supply hoses. Ozone gas exposure can also occur in areas near surfaces of water which is being ozonated.

Ozone in the air is poisonous to humans and can cause health problems and damage at very low concentrations (concentration limit of 0.1 ppm). The limit value in air is set to 1 ppm., but ozone gas can be smelled down to the concentration of 0.01 ppm.

The initial symptoms of poisoning are irritation of eyes and throat with subsequent coughing.

Higher concentrations can cause more serious health problems such as burning of lung cells and death.

How safe?

There may be various reasons for a leak, i.a the placement of equipment and incorrect use of facilities (training/ instructions, etc.).

Regular service and continuous maintenance is also very important in order to avoid inadvertent spread of ozone gas.

Important safety measures are

- **everyone on board must be trained in how to act and relate to ozone gas**
- **available protective aids (for instance respirator with active carbon filter)**
- **ventilation of the room (mechanical/natural)**

In the above-mentioned incident, one of the actions that the company took was to install an alarm in the vessel's accommodation space. An alarm for measurement of air quality (permanent/mobile) may also be necessary in other parts of the vessel where the crew are located.

Attachments:

Guidance note -Safe Installation of Ozone Systems on Ships. DNV-GL

Olav Akselsen
Director General of Shipping and Navigation

Lars Alvestad
Head of Department

This document is electronically approved.