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Reference to: [Regulations of 1 January 2005 No. 8 on the working environment, health and safety of persons working on board ship](#), [Regulations of 22 December 2011 No. 1523 on qualifications and certificates for seafarers](#)

Guidelines on requirements for training in chemical energy storage (maritime battery systems) on board Norwegian ships

The Regulations of 22 December 2011 No. 1523 on qualifications and certificates for seafarers (Qualification Regulations) do not contain specific competence requirements related to the introduction of new technology on board Norwegian ships.

Therefore, the purpose of this Circular is to provide guidance on requirements for training in chemical energy storage (maritime battery systems). The Circular is based on the requirement for training stipulated in the Regulations of 1 January 2005 No. 8 on the working environment, health and safety of persons working on board ship (HSE Regulations) section 2-6.

Background

Pursuant to the Act of 16 February 2007 No. 9 relating to ship safety and security (Ship Safety and Security Act) section 11, “[a] ship shall be so operated and maintained that it according to its purpose and trade area provides for satisfactory safety concerning life, health, property and the environment”. Furthermore, it is stipulated in the Ship Safety and Security Act section 22 that “[t]he work on board shall be arranged and carried out so as to safeguard life, health and working environment. In the arrangement of work, due regard shall be paid to the individual person’s qualifications to undertake the work in a safe and proper manner.”

Measures

For persons who will operate maritime battery systems used on board ships or perform inspection or maintenance of such systems, training is a key condition for carrying out tasks in a safe manner.

The HSE Regulations section 2-6 requires that persons working on board shall receive the necessary training to be able to carry out their work in a safe and proper manner. Furthermore, they must receive training before being given access to areas posing a significant or serious risk. Moreover, training is required when new technology is introduced.

In this regard, the Norwegian Maritime Authority sees the need to convey the content of the training for those who work on board.

We would like to point out that this training must be completed in addition to meeting the qualification requirements already described in the Qualification Regulations.

Persons who will operate maritime battery systems or perform inspection or maintenance of such systems must have:

- training adapted to function or tasks;
- required practical training in addition to theoretical training;
- regular maintenance of competence.

Goal

The training in maritime battery systems must include:

- potential risks and hazards related to the use of maritime battery systems;
- adapted safety training, procedures, plans and instructions, including any checklists to check the technical condition and suitability of the marine battery system before use;
- equipment-specific training.

The company must ensure that training, practice and instruction are adapted to:

- the individual's function (manage or perform);
- the individual's tasks;
- relevant issues for the individual maritime electrical installation.

The Norwegian Maritime Authority would like to stress that the training:

- may be undertaken on board, at other suitable locations, through relevant tasks or at practical courses; and
- must include relevant results from risk assessment required by the HSE Regulations section 2-2.

Training objectives

After completing the training, the person who will manage or perform tasks related to operation, inspection or maintenance of maritime battery systems needs to:

- be familiar with battery chemistry and the different types of battery cells;
- be familiar with a frequency converter;
- be familiar with important technical concepts for the battery system;
- be able to account for the dangers of the battery system from a safety point of view;
- be able to account for the dangers related to different hazards (temperature, poisoning and ignition);
- be able to account for the help system;
- be able to account for the important and critical alarms related to the battery system, both with regard to possible causes and consequences of the alarms;
- be able to account for the handling of hazards and incidents that could occur in maritime battery systems;
- be able to assess the risks associated with the battery system, both individually and in cooperation with others.

Training plan

The training plan shall be adapted to the crew's function (manage or perform) and category (operation, inspection and maintenance) and consist of at least the following elements:

- basic introduction to battery technology, including chemistry, risks and safety systems;
- system understanding:
 - basic knowledge of how a frequency converter works with a battery system;
 - Battery Management System (BMS) – State of Charge (SOC), State of Health (SOH);
 - Energy Management System (EMS);
 - control system, including understanding and interpretation of alarms and associated alarm management;
 - automatic manual operations;
 - help system;
- safety and security:
 - gas (poisonous, corrosive and explosive);
 - cooling and airing;
 - fire-extinguishing;
 - risk and safety assessments;
 - hazards related to:
 - Thermal Runaway (TR)
 - fire
 - explosion hazard
 - understanding of possible consequences of loss or disconnection of auxiliary systems (such as ventilation, cooling, fire detection, EMS, BMS);
 - key indicators of a potential unwanted event (temperature, cell temperature, cooling system, gas detection, fire detection);
 - management of hazards and incidents;
 - handling of battery modules;
 - cooperation with land-based fire and rescue in connection with an unwanted event;
 - situational awareness;
 - information flow between crew/company and shore-based fire and rescue service;
 - strategy for the removal of hazardous gas (toxic, corrosive and explosive).

Persons who work on board shall also be provided with:

- maritime battery system training adapted to manufacturers/system integrators;
- practical training with simulation learning related to the maritime battery system.

Documentation

Completed training must be documented in accordance with the HSE Regulations section 2-6.

Knut Arild Hareide
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