TECHNICAL PAPER

PHASE-OUT OF HALON 1301

REGULATIONS AND ALTERNATIVE FIRE FIGHTING SYSTEMS

PAPER SERIES NO. 2001-P002
February 2001

DET NORSKE VERITAS

1 INTRODUCTION

Considering the great number of questions received from the Maritime Market, Det Norske Veritas' Section for Maritime Fire Safety (MTP374) has prepared this paper for distribution to clients and persons interested in the information given.

Regulations controlling the use of Halon are identified in Chapter 2. Chapter 3 defines acceptable engine room fire extinguishing systems. Main advantages and disadvantages of these systems are outlined in Chapter 3.2. Links to DNV type approved systems are given in appendix A.

The paper has been prepared by Bjørn Lian and Anders Tosseviken.

2 REGULATIONS ON HALON AS FIRE EXTINGUISHING MEDIUM

The following international and national regulations regarding the phasing out and replacing of Halons (as fire extinguishing mediums) have been identified:

2.1 Montreal Protocol on Substances that Deplete the Ozone Layer

The Montreal Protocol of 1987 (with amendments) is an international treaty for the protection of the ozone layer. The means used are to restrict and eventually prohibit the production of Ozone Depleting Substances (ODS) and control distribution of ODS. All ODS produced are, in this context, considered lost to atmosphere, hence the protocol does not discuss collection and controlled destruction of ODS.

2.2 European Community Regulations

The purpose of these Regulations is to agree on how the intention of the Montreal Protocol can be met for the geographical area of the parties assigned as members of the European Community (EC). This is done by a set of EC Regulations concerning production, distribution, use and eventually decommissioning and destruction of OSD in order to meet the targets set by the EC. EC Regulation No.093/94 gave detailed means for controlling and phasing out the different ODS. However, this is replaced by EC Regulation No. 2037/2000, which was signed by the concerned parties on 29.06.2000 and entered into force on 1.10.2000. The Regulation in question will also cover the EEA area (Norway, Iceland, etc.).

Existing Halon fire extinguishing systems may be used and re-filled/topped up with re-cycled Halon until 31.12.2002. After this date any re-filling or use of Halon as a fire-extinguishing medium will be prohibited. By 31.12.2003, fire protection systems and fire extinguishers containing Halons shall have been decommissioned and Halons shall have been recovered as regulated by EC Regulation No. 2037/2000.

Det Norske Veritas interprets that this means that Halons shall not be utilised as fire extinguishing mediums after 31.12.2002 and as a consequence, alternative fire extinguishing systems and extinguishers shall be available on board prior to this date. This Paper does not address the implementation of the EU directive into national legislation. This may delay the process, but owners should not rely on that. The directive should not have an effect on non-EU flagged vessels entering EU ports.

2.3 National Directives

Countries, which have signed the Montreal Protocol (more than 160 countries), may in addition have developed their own national regulations. For vessels where DNV has no authorisation, please check with the Flag State in question.

2.4 International Maritime Organisation (IMO)

The IMO under UN is the major organisation taking care of regulations applicable for ships and floating units in international trade or operation. Taking into account the Montreal Protocol and concern for environmental protection, IMO discussed the measures that may be considered practical for international trade at sea.

New installations of fixed fire extinguishing systems and portable fire extinguishers using Halon were prohibited from 1.1.1994 on board all ships and floating units. IMO considers that the shore-based regulations on Halons will govern the phasing out of existing installations, as the availability of Halons decreases. IMO has thus not defined any target date for the phasing out of Halons.

2.5 Classification Societies

The scope of work, when acting on behalf of Flag Administrations, is to see that the intention of IMO and possible additional regulations enforced by the Flag Administrations are put into effect. Hence, the major classification societies and the International Association for Classification Societies (IACS) will follow IMO and have subsequently enforced that new installations of halogenated hydrocarbon systems were prohibited on all new ships and floating units from 1.1.1994.

2.6 Conclusions - Use of Halon on Board Ships and Floating Units (MOUs)

<u>For vessels flying the flag of Administrations that have ratified IMO regulations</u>

The installation of new fixed fire extinguishing systems and portable fire extinguishers with Halon on board ships and floating units is prohibited. A phase out scheme for existing installations has not been established.

<u>For vessels flying the flag of countries assigned as member states in EC</u>

The Administrations of these countries may enforce EC regulation No. 2037/2000, which allows use and re-filling of Halon until 31.12.2002 and requires decommissioning of fire extinguishing systems with Halon by 31.12.2003.

<u>For fixed offshore installations</u>

Shelf state regulations (national directives) will apply.

3 ALTERNATIVE EXTINGUISHING SYSTEMS

3.1 Rules and Regulations

Commercial ships are in general to comply with SOLAS Ch. II-2 and Flag State requirements. The Flag State requirements are often identical to SOLAS with minor additions and interpretations. Some alternative chemical gases have been proposed banned under national legislation.

SOLAS Ch. II-2, Reg.7 requires all machinery spaces with power output exceeding 375 kW (510 hp), all oil-fired boiler rooms and purifier rooms to be provided with a fixed extinguishing system. Some of the existing Halon installations have been installed as an additional safety measure in spaces not required to be protected and may normally be decommissioned without replacement.

SOLAS Ch. II-2, Reg.7 basically identifies three options for extinguishing systems for the spaces to be protected:

I. Water spray systems (SOLAS Ch.II-2, Reg.10)
II. CO2 extinguishing systems (SOLAS Ch.II-2, Reg.5)
III. High expansion foam systems (SOLAS Ch.II-2, Reg.9)

In addition to the above systems, alternative and equivalent systems have later been developed and acceptance criteria established in IMO Circulars referred to in Amendments to SOLAS 1974. The equivalent systems are subject to full-scale prototype testing, including fire extinguishing tests and mechanical testing of components. The systems can be categorised as follows:

IV. Water mist systems equivalent to SOLAS Ch.II-2, Reg.10 (equivalent standard: IMO MSC/Circ. 668/728)
V. Alternative gas extinguishing systems (equivalent standard: IMO Circ. 776)
VI. Inside air high expansion foam systems (equivalent standard: IMO MSC/Circ. 668/728)

One of the above systems I-VI is to be installed. Systems designed according to above item I are to be reviewed on a case by case basis. For systems II through VI, references to type approved products have been included in appendix A.

3.2 Comparison of Various Extinguishing Systems

The consideration given below is based upon fire extinguishing in enclosed spaces. Important factors when choosing the best extinguishing system would be:

- Effectiveness with respect to diesel fires (pool fires/spray fires/concealed fires) and fires in other combustible materials (switchboards, cables, organic materials, etc.)
- Reliability and robustness, including any need for emergency power supply and shutdown of ventilation (response time)
- Free surface effect on stability for water based systems (in particular for MOUs)

- Hazard for humans and environmental factors (ODS and Global Warming Potential)
- Cost
- Other (weight, availability of extinguishing media on world market, service suppliers, cleaning up after discharge, maintenance, on board testing)

The below assessment is DNV's perception as of February 2001. Makers of the systems may/will have different opinions. The best choice will partly depend on the owner's ranking of the above-mentioned factors.

I. Water Spray Systems

The system is to be designed according to SOLAS Ch.II-2, Reg.10 and IMO MSC/Circ. 847, 10. Increased water flow rates is to be applied on hazard objects. Use of low expansion foam premix is advised. Great care should be put into design, as water spray systems (at these low flow rates and pressures) will not effectively extinguish all concealed or spraying fires. Use of tested and type approved systems should be considered (see below type IV).

Reliability is considered to be fair. Emergency power required, whereas close down of ventilation may be done after the release of the system. A moderate or inexpensive system (may be combined with any sprinkler system/deluge system). Using water only, the system represents no hazard to humans or the environment. With the use of foam agent, no specific hazard to humans or the environment has been presently identified.

II. CO2 Extinguishing Systems

The system is to be designed according to SOLAS Ch.II-2, Reg.5 and IMO MSC/Circ. 847, 5. All oil fires will be extinguished at a net concentration between 30-35%. SOLAS regulations require at least 35% of gross volume. Extinguishment of smouldering fires cannot be guaranteed (as for other gas systems). The safety factor will vary with difference between gross/net volume, consequently, use of 40% design concentration is advised.

Reliability is considered to be fair. Emergency power is not required, whereas close down of ventilation and closing appliances is vital. CO_2 in the required concentration is lethal to humans. The protected space is to be evacuated before release. Two release controls, alarm and time delay device are required. Release of the system will be delayed due to safety procedures. Late response will increase the fire damage and corresponding repair costs and may, in some cases, impair the effectiveness of the extinguishing agent, thus reducing the probability of extinguishing the fire. The CO_2 system is considered to be an inexpensive system (often best with respect to cost). No specific hazard to the global environment (limited amount of CO_2).

III. High Expansion Foam Systems

The system is to be designed according to SOLAS Ch.II-2, Reg.9 and IMO MSC/Circ. 847, 9. Distribution of foam is critical and dedicated ducts and over-pressure ventilation openings are required.

Reliability is considered to be fair. Emergency power is required, whereas close down of ventilation is not important and closing appliances should be in open position. Drainage of foam will delay re-operation of engines. Moderate or expensive system (probably one of the most expensive systems considering the relatively small machinery spaces in question). The large duct may be difficult to fit into existing machinery spaces. May be dangerous and impair evacuation for personnel although not toxic. The protected space is to be evacuated before release. No specific hazard to the global environment.

IV. Water Mist Systems

The system is to be designed according to IMO MSC/Circ. 668/728 (which is based on full-scale fire testing). Tested systems are effective on oil spray and pool fires and to some extent able to extinguish concealed fires. Volume is critical and the two type approved systems are limited to 2000 m^3/7.5 m deckhead height and 1000 m^3/5.0 m deckhead height, respectively.

Reliability is considered to be fair. Emergency power is normally required and close down of ventilation and closing appliances should be carried out, although this may be done after release of system. Moderate or expensive system (probably one of the most expensive, but may be combined with for instance any sprinkler system). No hazard for global environment.

V. Equivalent Gas Extinguishing Systems

System to be designed according to IMO Circ. 776 (which is based on full-scale fire testing). Effective on oil spray and pool fires and also concealed fires if correct concentration is obtained.

Reliability is considered to be fair. Emergency power is not required, whereas close down of ventilation and closing appliances is vital. Moderate or expensive system. Inert gas systems (Inergen and Argonite) will normally require more storage space than CO_2 systems. Not lethal to humans (those type approved so far). Protected space is normally to be evacuated before release. This may delay use of system. Some chemical agents have a relatively high ODS or Global Warning Potential, though within international regulations.

VI Inside Air Foam Systems (for instance "Hotfoam")
System to be designed according to IMO MSC/Circ. 668/728 and requirements in type approval certificates. Foam generation is made inside the protected the space by using generators and foam liquid designed to produce foam at high temperatures. Dedicated ducts (as for system III) are not required. Considered being an effective system.

Reliability is considered to be fair. Emergency power is required, whereas close down of ventilation and closing appliances is not very important. In fact, close down of ventilation may reduce effectiveness of the system. Drainage of foam will delay re-operation of engines. Moderate or expensive system. Release of foam may impair evacuation of personnel, hence space is to be evacuated before release. No specific hazard to the environment.

Appendix A
DNV Type Approved Products

For alternatives II through VI, several products are type approved. See our Internet Site:

http://www.dnv.com

To navigate, click:
Classification - DNV Exchange - General Information - Approved Products & Services –
Type Approval Class (F) - DNV Fire Safety (F) - Product Lines/Areas:

- CO2 Extinguishing System and Associated Equipment
- Fixed High Expansion Foam Fire Extinguishing System (both system III and VI)
- Waterbased Fixed Fire Extinguishing System
- Fixed Gas Fire Extinguishing System

DET NORSKE VERITAS

Det Norske Veritas is an autonomous, independent Foundation with the objective of safeguarding life, property and the environment. The DNV organisation comprises 300 offices in 100 countries, with a total of 5,500 employees.

www.dnv.com

DET NORSKE VERITAS AS

Veritasveien 1, N-1322 Høvik, Norway

Tel: +47 67 57 99 00