

SWEDISH PHASING OUT OF HALON FOR FIRE FIGHTING

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The regulations in force in Sweden concerning the phasing out of halon.

Elimination of halon for fire fighting is prescribed in the Swedish Code of Statutes, in Decree (1988:716) concerning CFC and halons etc, and a number of amendments and additions to this decree.

Commercial manufacture, sale, refilling and import of portable fire extinguishers containing halon 1211, 1301 and 2402 have been prohibited from 1 July 1991. The installation of new total flooding system containing halon has been prohibited from the same date. And from the same date, it has not been permissible for full scale tests on existing total flooding systems to be carried out by releasing halon from the system.

These prohibitions do not apply to fire extinguishers in

- aircraft and submarines
- combat vehicles of the Swedish Defence Forces
- underground or shipborne command centres of the Defence Forces.

From 1 January 1992, the person who has one or more fire extinguishers which together contain more than 20 kg of halon has been obliged to hand in the halon for final disposal or re-use when an extinguisher is taken out of service. Halon for fire fighting purposes cannot be exported from Sweden without a permit from the Swedish Environmental Protection Agency.

From 1 March 1994, all import of newly manufactured halon from countries outside the European Union has been prohibited.

From 21 April 1994 a person who has one or more fire extinguishers with a total halon content of more than 20 kg per building has been obliged to report the holding to the County Executive Board.

After 31 December 1997, halon must not be used commercially in fire fighting installations.

The quantity of installed halon.

In its environmental report No 1989:7, "Use of Halon 1301 and 1211 as extinguishing medium in the Nordic countries", the Nordic Council of Ministers estimated that the total quantity of halon 1301 and 1211 which is installed in total flooding systems and stored in portable extinguishers in Sweden is 1000-1500 tonnes. In 1989 when this estimate was made it was generally known in the profession that halon had serious effects on the ozone layer. A prohibition of the use of halon as fire extinguishing medium when total flooding systems are installed was introduced in 1991. This has meant that few systems have been installed since 1989 and imports of halon have decreased. In 1986 about 200 tonnes were imported, but only 9 tonnes in 1993.

According to Section 7 of Statute No SNFS 1993:7 of the Swedish Environmental Protection Agency, the owner of a fire extinguishing installation containing halon is obliged to report the holding to the County Executive Board. The reported data have been collated in the Swedish Environmental Protection Agency report "Evaluation of the phasing out of ODS".

It must be pointed out that even in a law abiding country like Sweden, there is negligence and defiance of the authorities, which means that not all companies have reported their holdings. In view of this, the report of the Environmental Protection Agency estimates that the total quantity of installed halon in Sweden is between 750 and 1000 tonnes. This includes the quantity which the Defence Forces have in their installations.

The way Sweden deal with halon.

The cost to the company of getting rid of its problem - the halon installation - comprises the cost of demounting the installation and the cost of disposing of the contents. The cost of demounting obviously varies depending on the size of the installation. The cost of disposal of the halon waste is at present about one hundred Swedish crowns per kg halon, which is about fifteen US dollars.

For the installations where alternative fire protection measures are required, the cost of these must naturally be added to the cost of eliminating the existing halon installation. This cost varies widely, mainly depending on the choice of fire protection but also on a number of other factors, and there is therefore no point in trying to estimate this cost.

Of the quantity of halon which has been eliminated or is stored in Sweden, none has been destroyed so far. This excludes the few kg which have been destroyed by Swedish Waste Conversion AB (SAKAB) in testing their halon destruction plant. The capacity of the plant is at present about 10 kg of halon per hour, which means that about 70 tonnes of halon can be destroyed per year. It may be possible to increase the destruction capacity of the plant by installing pretreatment apparatus.

It is expected that destruction of halon will go on for a long time after 1998. Unless the destruction capacity of the SAKAB plant is increased, or destruction is also carried out elsewhere inside or outside Sweden, it may take up to 10 years before all

halon has been destroyed. If halon is to be stored in its containers during this time, stringent demands will have to be met by the storage spaces and the storage environment. The halon containers installed in Sweden have a large number of valve types. This is yet another serious problem for those who must look after the containers and empty them of halon. There is also a substantially increased risk of leakage.

The circumstances which affect the rate of elimination.

It must be pointed out that only a small proportion of the quantity of halon has been phased out in Sweden, and that a large quantity of halon will be held by the users in **1996** and **1997**. Within the exempted areas, halon may be left in place for a considerably longer time. In order to find why installations have not yet been phased out, a study was made in **1995** in which a large number of the owners of existing installations were contacted.

Obviously, there were large variations in the reasons given for waiting with phasing out. but some of the regularly recurring reasons were as follows:

- It is considered that some new extinguishing medium with properties similar to those of halon will be available before **1998**.
- There is no intention to instal any other extinguishing system or to take other fire protection measures. The halon installation will have to stay and it is expected that demounting can begin towards the end of **1997**.
- No decision has yet been reached concerning phasing out procedure.

The most common alternatives to halon in Sweden.

The fire protection measures available in the Swedish market which can be used as an alternative to fire fighting with halon may be classified in the following groups:

- **Gaseous** fire extinguishing media
- Water sprinklers
- Foam sprinklers
- Powders
- Rapid detection combined with manual fire fighting
- Passive fire protection

Apart from the gaseous extinguishing media described here, there are other gaseous media available internationally. However, the use of gases which affect the ozone layer is not permitted in Sweden.

Gaseous fire extinguishing media

Carbon dioxide

In most cases, we use carbon dioxide in spaces which are normally unstaffed, such as switchrooms, transformer rooms and similar premises containing electrical equipment.

Argonite and Inergen

Argonite and Inergen are fire extinguishing gases which have no demonstrable effect on the environment.

We mostly use these gases as total flooding system in for instance computer rooms, archive rooms, machine rooms, etc.

FM 200 and Halotron II

FM 200 is the trade name of an extinguishing gas produced by Great Lakes Chemical Corporation. Halotron II is a gaseous extinguishing medium consisting of a mixture of three gases which has been launched as an alternative to halon. Both extinguishing gases are HFC compounds (incompletely halogenated hydrocarbons). The gases have no effect on the ozone layer but are greenhouse gases with an atmospheric lifetime of about 40 years. The gases are not electrically conducting or corrosive.

These gases are expected to be used as alternatives to halon in those special installations where no other alternatives are available.

Water sprinklers.

Some of the equipment in the rooms protected by halon is sensitive to moisture and is damaged by direct wetting. Even though water sprinklers have limitations as regards the protection of certain equipment, they can protect the building and may therefore be an alternative in many of the types of rooms which were previously protected by a halon extinguishing system, such as computer rooms, switchrooms, engine rooms and control rooms.

Water mist

A lot of research into this extinguishing system is at present being conducted both internationally and in Sweden, principally at the National Testing and Research Institute at Borås. Regulations for installation are expected to be published by NFPA (National Fire Protection Association) in the US in this year or in the spring of 1997.

Since it has been found that the droplets do not cause short circuiting or other damage to electronic components, this system can also be used in spaces housing sensitive apparatus.

Foam sprinklers

Water containing foam and foam sprinklers can be an alternative to halon, but consideration must be given to the corrosive action of foam and its limited ability to penetrate into confined spaces. Foam as an extinguishing medium is mainly used in rooms where flammable liquids may be present, such as engine and machine rooms and aircraft hangars.

Powder

Powder is not generally used for total flooding system, and it is therefore to be regarded mainly as an alternative to Halon 1211. A usual field of application for powder is localised protection of important machinery or engines.

Rapid detection combined with manual fire fighting

If the fire is detected at a very early stage, limited manual fire fighting action may sometimes be sufficient to stop the fire from spreading further.

In most cases, action in this early stage need not be extensive. If it is not possible to actually fight the fire, other measures which reduce the consequences of a fire can be taken, such as switching off the power, changing the process or changing ventilation.

This alternative to halon is mostly considered in or near rooms which are constantly staffed, such as control rooms.

Passive fire protection

The required fire protection for an installation can in some cases be provided by different types of non-active fire protection systems. The primary aim of these measures is to prevent the outbreak of fire, and their secondary aim is to reduce the consequences if a fire does break out.

For the likelihood of the outbreak of fire to be reduced, factors such as good order, good maintenance procedures, good organisation and risk awareness are important. Good order implies that rubbish and dust are removed, a good maintenance procedure may be lubrication of bearings so that they do not heat up, a good organisation is one where, once a defect or damage is detected, this is put right before there is a danger of fire. Risk awareness implies that staff and management are aware of the risks which are present in the plant.

In order to limit the consequences of a fire which does occur, measures such as a higher degree of compartmentation, reduction in fire load intensity and spreading of risk can be taken. Compartmentation can be effected by encapsulating sensitive equipment. Fire load intensity can be reduced by e.g. moving stocks away from production or by using less flammable solvents. Risk can be spread both organisationally and physically into different premises.

This way of providing fire protection for an installation is often adopted where limited damage can be accepted, such as in computer rooms, machine rooms, switchrooms, rooms containing electrical equipment, etc.

Combinations of the above

In many cases the optimum solution in replacing the halon extinguishing system is a combination of the above alternatives. In most spaces, for instance, one of the alternatives is combined with passive fire protection. The automatic extinguishing systems are often combined with facilities for manual action. Different automatic systems are also sometimes combined. The space below the computer floor may for instance be protected by carbon dioxide, while the computer room itself is protected by water sprinklers.

It will be seen from this summary that for the great majority of fire extinguishing systems based on halon there are acceptable fire engineering alternatives available. Generally speaking, the environmental effect of these alternatives is slight or insignificant in the context.

This is the way halon for fire extinguishment is being phased out in Sweden. This is the way we northerners, the descendants of the vikings, have in protecting ourselves in an environmentally friendly way against damage which can be caused by a fire.