

The consequences of fire on board a ship are always costly and sometimes tragic. Effective fire protection systems are, therefore, essential but many extinguishing agents that have been popular in the past are now known to have serious shortcomings. Joe Ziemia of 3M Company introduces a new and attractive alternative.

Enhanced Fire Protection for Marine Applications

The requirements for on-board fire protection systems for sea-going vessels are, in many ways, the same as those for land-based installations. The system must be capable of extinguishing a fire rapidly, safe for personnel in the vicinity, and it must be clean in operation, so that residue from the extinguishing agent itself does not add to damage caused by the fire.

Marine applications do, however, have additional requirements. The extinguishing agent must be easy to transport, and it must take up the least amount of storage space. Ideally, it should also be possible to re-charge the system while the vessel is at sea to quickly restore operations and maintain protection even after a fire.

For many years, the extinguishing agent that came closest to meeting these requirements was halon, and it was very widely used. Indeed, many existing shipboard installations are still halon-based. Halon, however, has severe environmental shortcomings – it causes significant damage to the ozone layer, and it has a high global warming potential.

For these reasons, its production has been banned in developed countries since the early 1990s, which means that halon-based systems still in use can only be recharged using recycled gas. In addition, since no new systems of this type have been manufactured for more than a decade, spare parts that may be required for maintenance are now becoming more difficult to obtain. Consequently, those specifying new marine fire protection installations have relied on halon alternatives for many years, and the time is rapidly approaching when operators of vessels with existing halon extinguishing systems will have to follow suit due to a rapidly diminishing supply of available halon.

But, what are the alternatives to halon? The most popular class of compounds has been hydrofluorocarbons (HFCs). These agents have the required zero ozone depletion potential, but their high global warming potential and long atmospheric lifetime means that they still give rise to environmental concerns.

Indeed, consistent with the Kyoto Protocol regulatory entities around the globe have already implemented or are investigating strategies to reduce emissions of HFCs. Whether these strategies include

reporting requirements, leak testing, or outright restrictions on use, it is clear that substantial barriers for use of HFCs are or will impact this sector. This means that anyone installing an HFC-based system today may well face the need for expensive upgrades and modifications during the lifetime of that system.

Fortunately, there is an advanced extinguishing agent that provides an effective sustainable alternative to halons and HFCs in marine and many other applications. This agent is 3M™ Novec™ 1230 Fire Protection Fluid.

Let's start by examining its environmental credentials. Just like HFCs, Novec 1230 fluid has zero ozone depletion potential, but it also has the extremely low global warming potential of just one, compared with around 3,220 (2007 IPCC) for the most common HFCs. Novec 1230 fluid has an atmospheric lifetime of just five days, whereas the corresponding figure for HFCs is nearly 30 years.

In fact, 3M's confidence in Novec 1230 fluid is backed by a unique warranty. Under the terms of 3M™ Blue SkySM Warranty if, during the 20 years after system commissioning, Novec 1230 fluid is banned or restricted in use as a fire protection agent because of its ozone depletion or global warming potential, 3M will refund the price of the fluid.

The merits of Novec 1230 fluid are by no means confined to its environmental characteristics – it also offers a wide margin of safety.

To be effective in extinguishing fires, Novec 1230 fluid needs to be used in concentrations of between 4% and 6%. Its no observable adverse effects level (NOAEL) derived from safety studies is, however, 10%. Therefore, there is a large margin (67%-150%) of safety between typical design concentrations and the NOAEL for Novec 1230 fluid.

In marine applications, this is important, because the complex geometry of shipboard rooms, and the frequent presence of pipes, ducts, etc., makes it difficult to accurately calculate the volumes of spaces to be protected. This, in turn, makes it difficult to determine effective design concentrations. Therefore, design engineers are afforded more flexibility with extinguishing agents that inherently provide a large margin of safety.

Novec 1230 fluid extinguishes by its cooling effect. It is designed for use in flooding applications. It is non-conductive and non-corrosive, so it is suitable for use even in the presence of delicate equipment, such as radar, computer and telecommunications installations. In addition, unlike foam and powder extinguishing agents, it leaves no residue, so no costly and time-consuming clean up is needed after it has been discharged.

Unlike almost every other extinguishing agent, Novec 1230 fluid is a liquid at room temperature and forms a gas when it is discharged. This brings big benefits because as a liquid, it can be shipped and stored in non-pressurized containers. It also means that installations can be recharged by liquid transfer.

This is a big advantage for shipboard use, as the fire protection system can be put back into full operation after a discharge without requiring the vessel to return to port. Plus, the cylinders of Novec 1230 fluid occupy much less space than CO₂ and no more space than other in-kind gaseous extinguishing agents.

For new marine fire protection installations, halon is clearly no longer an acceptable choice as an extinguishing agent, and there are already serious environmental concerns over HFCs. Novec 1230 fluid, however, with its excellent environmental profile, is a sustainable technology. It offers many added benefits: ease of transport and handling, a large margin of safety and top performance, making it a viable choice for marine fire system designers and specifiers, ship owners and operators. ■

The 3M™ Novec™ Brand Family

The Novec brand is the hallmark for a variety of patented 3M compounds. Although each has its own unique formula and performance properties, all Novec products are designed in common to address the need for safe, effective, sustainable solutions in industry-specific applications. These include precision and electronics cleaning, heat transfer, fire protection, lubricant deposition and several specialty chemical applications.

3M™ Novec™ Engineered Fluids • 3M™ Novec™ Aerosol Cleaners • 3M™ Novec™ 1230 Fire Protection Fluid • 3M™ Novec™ Electronic Coatings • 3M™ Novec™ Electronic Surfactants

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