

3M™ Novec™ 1230 Fire Protection Fluid, a clean fire extinguishing agent with excellent environmental characteristics, is generating much interest in the museum and archive world. As Tom Brodbeck of 3M Electronics Markets Materials Division explains, there are very good reasons for this.

Novec 1230 Fluid Protects the Treasures of the World

Archives and museums are repositories for some of our most precious, delicate and usually irreplaceable documents and artifacts. Protecting these objects is a high priority and, for this reason, most institutions have sophisticated fire protection systems. However, fire is not the only risk to these precious objects. Another major enemy is moisture.

It's very surprising that many museums and archives still rely on sprinklers or water mist for fire protection. In many instances, it's possible that water suppression could do more damage than the fire itself, and the situation is especially unfortunate if the discharge is triggered in error.

There are essentially two types of water-based systems. In the first type, called pre-action systems, the distribution piping remains without water but contains pressurized air to monitor system integrity until the system operates in response to a fire. This means that there is inevitably a delay between the call for water and its actual delivery. That delay is sufficient to allow the fire to establish itself, thus, increasing damage.

In the second type of system, called sprinklers, the pipes are charged with pressurized water at all times. This eliminates the potential for delay, but can lead to other problems. Over time, sludge and organic growths may accumulate in the distribution piping. When a discharge is initiated, the accumulation can restrict flow or, in the worst case, can block the sprinkler heads. Then of course, the discharge of such "dirty" water can cause significant damage to these often-irreplaceable pieces.

It's clear that water-based systems are not the optimal solution for use in museums and archives, but what are the alternatives? A few decades ago, the answer would have been the gaseous extinguishing agent, Halon. But due to its poor environmental characteristics, Halon was banned from new production in 1993, and even existing Halon installations are being removed to use more environmentally sound products.

Another possibility is carbon dioxide (CO₂). This is an effective agent, but it has one major drawback – in the concentrations needed to extinguish fires, it is lethal. Thus, it is not an acceptable choice for the protection of any areas where people may be present when a system discharges.

This leaves two final options – hydrofluorocarbons (HFCs), the widely used first-generation of Halon replacements, and 3M™ Novec™ 1230 Fire Protection Fluid, an innovative next-generation agent. When the virtues of Novec 1230 fluid were discussed at a recent NARA (United States' National Archives and Records Administration) conference, attended by many key U.S. conservators and archivists, it received an exceptionally enthusiastic reception, with some delegates even going so far as to describe it as a "magic fluid." Let's see why:

First, Novec 1230 fluid is a clean agent. It is safe for humans, and leaves no residues. It is an ideal choice for use in the protection of the most delicate and valuable artifacts. Secondly, the environmental characteristics of Novec 1230 fluid, a vital issue for all those working in the museum and archive sector, are even more impressive.

Like the widely used HFCs, Novec 1230 fluid has an ozone depletion potential (ODP) of zero, but when it comes to a consideration of global warming potentials, the contrast between HFCs and Novec 1230 fluid is more striking. The global warming potential (GWP) of the HFC most widely used in fire protection is 3,220 times that of the most common greenhouse gas, which is CO₂ (2007 IPCC assessment for HFC-227ea). In contrast, Novec 1230 fluid has a GWP of just one. The stark difference in GWP enables a 99.9% reduction in greenhouse gas emissions when employing systems using Novec 1230 fluid as compared to systems using HFCs. Further, the Novec 1230 fluid has an atmospheric lifetime (ALT) of only five days, compared with over 30 years for HFCs. The environmental impact of HFCs is clearly significant, and is therefore unacceptable in the environmentally conscious museum industry.

In fact, the high global warming potential and atmospheric persistence of HFCs are leading to concerns about whether their use will continue to be permitted. For example, F-Gas Regulations that have recently been introduced in Europe impose requirements specific to HFCs for technician training, inspections, testing, and reporting. It is entirely possible that HFCs may follow the Halon extinguishing agents that were so popular until the 1990s, when they became restricted. Halons are now banned from being manufactured and are being phased out in end use.

Measures addressing the use of HFCs are also being drafted in the USA. An early action item identified under the California Global Warming Solutions Act of 2006 includes a consideration that, from 2012, all new fire protection systems in California must use an agent with a global warming potential below a minimum threshold level.

The California Air Resources Board (CARB) proposal reflects the regulators' concern that, while emissions from this sector are currently low, the installation base is growing quickly and the emission potential of this ever growing installed base represents a significant future liability. Thus, the only meaningful way to limit this future liability is to reduce the use of HFCs.

These issues are particularly important to the museum and archive industry. If restrictions were introduced in the future, an HFC-based fire suppression system would either have to be replaced in its entirety, or substantially modified resulting in a considerable expense.

In contrast, 3M Company is so confident in the environmental characteristics of Novec 1230 fluid that it offers its unique Blue SkySM warranty. This guarantees that if Novec 1230 fluid is banned from or restricted in use as a fire protection fluid based on ODP or GWP during the next 20 years, the company will refund the cost of the fluid.

Novec 1230 fluid also has a very wide margin of safety for use in occupied areas, which makes it suitable for areas frequented by staff.

"Margin of safety" reflects the difference between the design concentrations necessary to put out a fire and the threshold concentration recognized by approval bodies as suitable for use in occupied spaces. In a typical application, it is used at a concentration of 4.2%, but it is acceptable for use up to 10%. Therefore, its safety margin is 138% - the largest margin of safety for any chemical Halon replacement.

It is very apparent to see the appeal of Novec 1230 fluid for museums and archives – it has a wide margin of safety, it won't damage artifacts and it has an excellent environmental profile. These factors have already led to it being adopted to protect some of the world's most highly prized treasures, such as the Library of Congress, the Smithsonian Institution, and the Alamo in Texas. Based on its safety and environmental characteristics there is no doubt that the use of Novec 1230 fluid will continue to grow. ■

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.

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Electronics Markets Materials Division

3M Center, Building 224-3N-11
St. Paul, MN 55144-1000
www.3M.com/novec1230fluid
1-800-251-8634

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