



Horizons

New ways to balance safety, sustainability and performance, from the makers of 3M™ Novec™ Products

Newsletter

NOVEC

3M™ Novec™ 1230 Fire Protection Fluid

Living 3M's Commitment to Sustainable Development

3M has a longstanding commitment to sustainable development through environmental protection, social responsibility and economic progress. To us, that means meeting the needs of society today, while respecting the ability of future generations to meet their needs. At the same time, we recognize that only by continuing to be a viable and successful enterprise can we continue to be a positive contributor to sustainable development.

3M's strategies for sustainability include:

- Promoting sound environmental, health and safety management at our locations worldwide.
- Making pollution prevention pay through the development of new technologies and products.
- Developing products that help our customers address their environmental challenges.
- Driving 3M's future economic success by satisfying our customers with innovative technology and products and providing our investors an attractive return on their investment.

3M™ Novec™ 1230 Fire Protection Fluid – A Sustainable Technology

There may not be a more crystallizing example of sustainable development than the recent shifts in the fire suppression market, specifically shifts in the clean extinguishing agent market.



Traditional chemical clean extinguishing agents such as halon, hydrofluorocarbons (HFCs), and hydrochlorofluorocarbons (HCFCs) have the environmental liability of being either ozone depleting substances (ODSs) or substances with high global warming potential (GWP). Novec 1230 fluid, as shown in the table below, is neither – providing the long-awaited solution for this industry that addresses both of these issues.

History suggests that markets may migrate to environmentally sustainable technologies more slowly and less completely when left to their own initiative. The transition to sustainable technologies dramatically increases once signals are provided by the policy and regulatory communities.

For example, the California Air Resources Board (CARB) has identified “Alternative Suppressants in Fire Protection Systems” as an early action under the California Global Warming Solutions Act of 2006 (AB-32). Ultimately, the only policy that fosters sustainable development in the clean fire protection sector is a policy that minimizes growth of, and eventually reduces, the installed base of unsustainable solutions, such as HFCs. Such a policy dramatically reduces end user exposure to future regulatory risk. On this basis any alternative clean extinguishing agent needs to adequately address the environmental liabilities of the traditional agents. Because Novec 1230 fluid thoroughly addresses these environmental challenges, it is widely recognized as a sustainable technology that enables substantial reduction in greenhouse gas emissions from the fire protection industry. The transition of the industry to Novec 1230 fluid

Environmental Properties of Clean Agent Fire Suppressants

Trade Name	Novec 1230 Fluid	FM-200, FE-227	FE-25, ECARO-25
ASHRAE Name	FK-5-1-12	HFC-227ea	HFC-125
Ozone Depletion Potential	0	0	0
Global Warming Potential	1	3420	3500

Continued on page 2.

From the Editor

Growing public awareness and concern about the environmental impact of all human activity has made “sustainability” one of the key watchwords of our time. More and more, people are re-examining their consumption patterns and product choices in the light of how they will impact future generations.

In business, sustainability also has an economic component. Users of chemical products, for example, must weigh the low cost of using a flammable, hazardous or high global warming material today against the potentially higher future costs of regulatory restrictions, equipment modifications and pollution abatement measures. And, certainly, protecting the health, safety and productivity of workers exposed to these materials can also have a significant impact on profitability.

These are all issues that the 3M™ Novec™ family of products was designed to address – and is why sustainability is a recurring theme in this issue of Horizons. From ensuring the long-term viability of valuable fire protection systems to eliminating combustibility concerns in pharmaceutical manufacturing plants, you'll read how Novec fluids are increasingly being recognized for their ability to deliver safe, effective and sustainable solutions in a broad range of challenging applications.

Sincerely,

Craig Schwartz



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The Big Chill

3M™ Novec™ Heat Transfer Fluids can significantly reduce combustibility concerns in pharmaceutical freeze dryers

Freeze drying, or “lyophilization,” is a common method used in pharmaceutical manufacturing for preserving injectable drugs and vaccines. In this process, partially opened vials of material are placed on shelves in a freeze drying chamber. Chilled heat transfer fluid piped through the shelves lowers their temperature, typically down to -50°C or lower, freezing the contents in the vials. Air is then evacuated from the chamber, and water or solvent sublimates from the vials. The vapor is diffusively transported (“pumped”) by the condenser, cooled to a minimum temperature of -70°C.

Traditionally, compounds such as trichloroethylene, methylene chloride and silicone oils have been used as heat transfer fluids in pharmaceutical freeze drying. The issue is, many of these fluids are combustible; others are toxic; while still others are restricted in use, due to their unfavorable environmental profiles.

Issues with silicone oil

Silicone oils are presently widely applied as heat exchange fluids in freeze dryers but have some severe shortcomings in freeze-drying applications. Silicone oils, for example, are highly viscous at low temperatures, requiring more pumping power and making it difficult to maintain turbulent flow of the fluid, reducing cooling efficiency.

Even more critical, however, is the fact that silicone oils are combustible, with a flash point

that decreases (thereby increasing the fire hazard) for oils that have lower viscosities. Low viscosity is a critical property in this application.

In recent years there have been reports from facilities around the world of fires occurring with silicone oil-based chillers, resulting in a number of serious injuries and facility damage. These hazards have been shown to be particularly acute when systems are drained for repair and maintenance, and during system restart.

While these hazards can be mitigated through implementation of engineering controls and Safe Operating Procedures, these solutions add cost and can be disruptive to production. New regulatory restrictions on combustible heat transfer fluids are also under discussion in a number of regions around the world, which has the potential to drive up costs even further.

Finally, the relatively low vapor pressure of silicone oils makes small leaks that might exist in a shelf stack assembly very hard to detect by rate-of-rise pressure testing. This could cause these leaks to go undetected over a period of time, thus potentially compromising the quality of the product.

A balanced heat transfer solution

In an effort to improve safety, performance and environmental sustainability, many users of pharmaceutical freeze drying systems have switched, or are investigating the conversion from silicone oils and other combustible fluids to 3M™ Novec™ Engineered Fluids such as Novec 7500 fluid. These fluids comprise a family of nonflammable compounds whose unique properties make them ideal candidates for demanding heat transfer applications such as those used in pharmaceutical freeze-drying.

As mentioned previously, silicone oils and other heat transfer fluids can become highly viscous at the extremely low application temperatures required in today’s freeze drying applications. This makes it difficult to maintain turbulent flow in the system, thereby affecting the ability to maintain precise control over the temperature distribution – a critical factor in the freeze drying process. Higher viscosities may also require the use of larger pumps and heat exchangers to move the heat load, increasing costs.

Novec fluids, on the other hand, maintain a relatively low viscosity at temperatures as low as -120°C, reducing pumping power demands and making it easier to maintain precise temperature control. They are stable, non-corrosive and compatible with a wide range of materials. And, because they have zero ozone depletion potential, low global warming potential and a low toxicity profile, they offer a long-term, sustainable solution in many critical heat transfer applications. Novec fluids 7100 and 7200, both recommended for use below -100°C, are approved for use without restriction under the U.S. EPA’s Significant New Alternatives Policy (SNAP) and are exempt from the EPA’s definition of volatile organic compounds (VOCs).

Novec fluids have a vapor pressure several orders of magnitude higher than most silicone oils. This makes leaks very easy to detect, which is a great advantage in pharmaceutical processing.

Perhaps most important, by significantly reducing the combustibility hazards associated with the low viscosity silicone oils, Novec fluids can help maintain a safer, more productive work environment – while helping to improve the level of precision and control required by today’s critical pharmaceutical manufacturing processes.



Living 3M’s Commitment to Sustainable Development *Continued from page 1.*

provides a perfect illustration of the importance of continuous improvement in technology in the process of sustainable development. That is, the environmental impact of fire protection systems installed today will, in large part, need to be managed by future generations. This is due not only to the fact that fire protection systems are generally installed in infrastructure meant to remain in service for many years, but also because traditional agents, once emitted, persist

in the atmosphere for decades. The continued use of HFCs in fire protection systems adds to a growing bank of greenhouse gas potential that will compromise the ability of future generations to manage these environmental challenges.

Employing the Novec 1230 fluid technology enables both immediate and future reductions in the emissions of fluorinated greenhouse gases without compromising the management

of other environmental issues or the performance requirements and economics of the industry. As regulatory frameworks such as the EU F-gas regulation and CARB’s early action continue to evolve for the purpose of reducing emissions of fluorinated greenhouse gases, Novec 1230 fluid will increasingly be recognized as the clean agent of choice because of the very small footprint left for future generations.

To Catch a Thief

Law enforcement builds airtight case for 3M™ Novec™ Fluid technology

The unique performance, safety and sustainability characteristics of 3M™ Novec™ Engineered Fluids have resulted in their finding utility in a growing number of industrial applications, ranging from electronics cooling to cleaning precision aerospace components.

These same characteristics are also of interest in the field of law enforcement, where Novec fluids are increasingly being used as a carrier solvent in formulations used to develop fingerprints.

For over thirty years, law enforcement agencies around the world have used the amino acid reagents DFO and ninhydrin to develop latent fingerprints on porous surfaces, such as paper. In their original formulas, the reagents were dissolved in CFC-113, which is a nonflammable and fast-drying solvent.

CFC-113, unfortunately, is also an ozone-depleting substance, and as such was banned or scheduled for phaseout in most developed countries by the 1987 Montreal Protocol. Since that time, a number of alternative solvents have been tried, including acetone, petroleum ether and heptane. The problem is, all of these solvents are flammable, and many pose risks to health and safety.

In addition, many of the solvent substitutes tested, such as acetone and petroleum ether, can cause inks to run, bleed and smear. Not only can this destroy the integrity of evidence, it can destroy or smudge undeveloped fingerprints, as well.

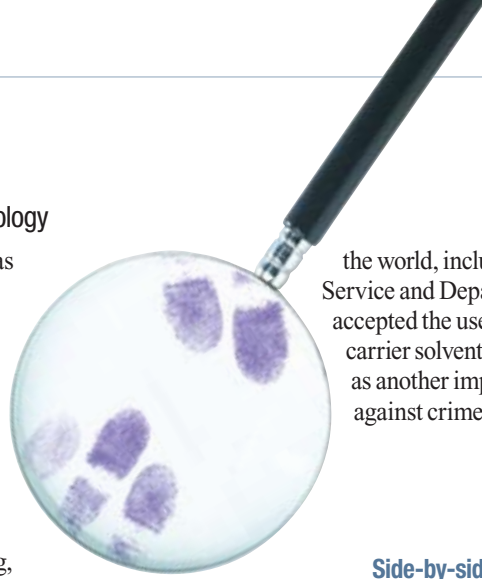
Ten years ago, forensic scientists began experimenting with 3M™ Novec™ 7100 Engineered Fluid – a solvent offering performance equal to or better than CFC-113, but with an excellent environmental profile, and without the health and safety concerns associated with many conventional CFC alternatives.

Novec 7100 fluid was found to offer a number of unique advantages for developing latent fingerprints. From a health, safety and environmental standpoint, it is non ozone-depleting, non flammable, low in global warming potential and low in acute toxicity. From a performance standpoint, Novec 7100 fluid is compatible with a wide range of materials, including paper and ink; it dries quickly; and it allows the development of fingerprints with detail and ridge crispness as good as or better than CFC-113, in both ninhydrin and DFO formulations.

There are a number of reasons behind this outstanding performance. First, Novec 7100 fluid is a selective solvent, and as a result, does not dissolve the amino acids of the fingerprint and is inert to inks. In addition, the surface tension of Novec 7100 fluid is much lower than hydrocarbon solvents, allowing it to carry dissolved ninhydrin or DFO to the edges of fingerprint ridges more efficiently, resulting in sharper detail of the developed print. The combination of low surface tension, low viscosity and high fluid density also gives Novec 7100 fluid the ability to penetrate porous surfaces more completely, making it easier to develop older prints whose amino acid signatures have gone deeper into the porous surface. And, because Novec 7100 fluid does not absorb moisture, ridge diffusion on the print is minimized.

Based on their own independent studies, a number of law enforcement agencies around

the world, including the U. S. Secret Service and Department of Justice, have now accepted the use of Novec 7100 fluid as a carrier solvent for fingerprint development as another important tool in the fight against crime.



Side-by-side comparisons show the outstanding performance of 3M™ Novec™ 7100 Engineered Fluid

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Novec 7100 fluid on the left, petroleum ether on the right.

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Novec 7100 fluid on the left, CFC-113 on the right.

Introducing: www.3M.com/Novec

3M is pleased to announce the launch of the new Novec Brand Products website. In creating this website, the goal was to offer one website for customers to locate specific product information as well as have the ability to learn about all available Novec products for a particular industry or application. Within the website we have brought all of the various Novec products together into one, easy to navigate website – from Novec Engineered Fluids, to Electronic Coatings

and Surfactants, Aerosol Cleaners and Novec 1230 Fire Protection Fluid. The site is divided into categories including Product Information, Applications and Industry Solutions. We hope this allows users to have a clear view of the breadth of the Novec product line and the variety of offerings presented for a particular industry or application. As with every website, this is a live working document. We welcome your ideas to add to and improve the site.





Crowd Pleaser

3M™ Novec™ 1230 Fire Protection Fluid draws a diverse crowd at major industry conferences

Because of its unique capabilities, 3M™ Novec™ 1230 Fire Protection Fluid is proving a popular attraction at industry expos, no matter what the market!

In recent months, Novec 1230 fluid has been exhibited at three separate expositions geared toward three different industries. However, the multiple applications of Novec 1230 fluid proved to be attractive to visitors at all three of these important events.

The first stop was the prestigious National Archives Preservation Conference presented by the U.S. National Archives and Records Administration (NARA) and held at the U.S. National Archives Building in Washington, D.C. The conference focused on “Modern Fire Suppression in Cultural Institutions.”

“Because of 3M’s existing relationships with organizations such as the Smithsonian Institution, this show was an ideal way for us to introduce Novec 1230 fluid to personnel involved in the protection of invaluable

collections housed in cultural facilities,” notes Tom Brodbeck, Key Account Manager for the 3M Electronics Markets Materials Division. Attendees at the conference were from such diverse organizations as the Smithsonian Institution, Harvard University, the National Archives, the Library of Congress, and the National Gallery of Art.

Various speakers discussed current fire suppression options, including Novec 1230 fluid. In particular, J. Andrew Wilson, Associate Director for Fire Protection and Safety at the Smithsonian Institution and Cornelius Rusnov of the State Library of Pennsylvania outlined examples of where Novec 1230 fluid was selected for certain applications within their facilities.

Novec 1230 fluid was also part of the 3M booth at the 2008 Offshore Technology Conference (OTC) in Houston, Texas. This show attracted over 75,000 attendees from 110 countries in the offshore oil and natural gas resources

industries. OTC is the world’s largest offshore conference. Novec 1230 fluid is becoming increasingly popular on offshore oil rigs not only because of its exceptional environmental footprint, but also because of its ease of delivery and refilling. In addition, many attendees were interested in seeking a replacement for CO₂ fire suppression, which is discouraged in occupied spaces.

Dale Kent, Senior Account Manager for Novec 1230 fluid states that “OTC was an extremely busy show for us. The attendees were impressed that the same product that protects an office can also be used to protect an engine room or a paint room.”

Finally, Novec 1230 fluid took center stage at the annual conference of the National Fire Protection Association (NFPA) in Las Vegas where over 5,000 fire protection professionals were in attendance.

While Novec 1230 fluid was the feature attraction in the 3M booth, it was also displayed by many of our OEM partners such as Ansul, Kidde, and SEVO. As the future needs of clean agent fire suppression applications become more defined, Novec 1230 fluid continues to be the preferred choice of end-users seeking the solution to providing optimum fire protection while also protecting the environment with a sustainable product.



Working with 3M gives you access to world class technical service and sales specialists to help make sure you get the performance you need from 3M Novec products. Our experts can help you with equipment conversion; process development/optimization; environmental, health and safety support; and much, much more. In North America, our team of technical service and sales specialists can be reached at 3M.com/novec or at the following numbers.

3M US: Customer Service: 800-810-8513
Technical Service: 800-833-5045

3M Canada: Customer and Technical Service: 800-364-3577

For North America contacts please see Spring 2008, Issue 1. Next issue will feature 3M Asia Pacific sales and technical contacts.

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