



Novec™ 1230 Fire Protection Fluid

What you need to know about “Novec 1230 and ECARO-25™”

Introduction: Comments and Perspective

This bulletin provides some of 3M’s comments and objections to a piece of product literature entitled, “Some facts you should know about Novec™ 1230 and ECARO-25™” that is currently being circulated in the marketplace. The piece is published over the Dupont logo and tagline, and refers to an “objective analysis of Novec 1230” conducted by Dupont in October 2004.

Much of the information about Novec 1230 fluid contained in this piece of ECARO-25 product literature is not accurate or is only partially accurate and presented in a manner that is far from an “objective” discussion of Novec 1230 fluid and ECARO-25. 3M believes that this ECARO-25 product literature misrepresents the characteristics and properties of Novec 1230 fluid and has the potential to create confusion and misunderstanding in the marketplace with respect to Novec 1230 fluid and 3M. This ECARO-25 product literature also has the potential to harm the reputation of clean agent fire protection products as a class because of the inaccuracies, misstatements, and possible misrepresentations contained in the piece, particularly with respect to environmental, health, safety, and regulatory characteristics of this class of products.

Clearly the most significant points of differentiation between HFC clean agents and Novec 1230 fluid are the atmospheric properties related to climate impact. Interestingly, these points are not discussed in the ECARO-25 product literature.

Provided below are statements made in the recent ECARO-25 product literature and why 3M believes the statements are inaccurate or misstated:

- *“Novec™ 1230 reacts with moisture to form HFC-227ea and pentafluoropropionic acid (PFPA).”*

Comments:

Although this statement is technically accurate, this information, by itself, does not characterize its relevance to the performance of Novec 1230 fluid in a fire protection system or potential impacts related to human health. Missing from this statement and the ECARO-25 product literature is the fact that Novec 1230 fluid reacts with water only when dissolved in water and that Novec 1230 fluid is only minimally soluble in water. Accordingly, only a very small amount of acid is formed when Novec 1230 fluid contacts liquid water and no acid is formed when Novec 1230 fluid contacts water vapor. This has been verified through numerous laboratory and full-scale tests in which Novec 1230 fluid was discharged into a humid atmosphere and monitored via methods such as FTIR. No formation of pentafluoropropionic acid has been detected.

3M provides guidance to OEM customers about the need to maintain Novec 1230 fluid, as do the suppliers of other extinguishing agents, in a dry condition in order to meet the

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quality requirements of the fire protection industry standards. Users of Novec 1230 fluid have easily managed this issue during the assembly of fire protection systems and handling of Novec 1230 fluid.

- *“PFPA is a very strong acid that is corrosive to a variety of metals including mild steel.”*
- *“When PFPA reacts with mild steel it causes the formation of iron salt solids.”*
- *“These solids have been observed in steel containers containing Novec™ 1230.”*

Introduction of any contaminant, including [liquid] moisture, into a container intended to hold Novec 1230 fluid is contrary to the handling information and guidelines provided by 3M to OEM customers. Procedures are in place at the OEM sites where Novec 1230 fluid is handled to prevent such contamination.

The ECARO-25 product literature does not include any specific information on the containers that were “observed” or the methodology used to determine contamination. However, if one fails to follow a manufacturer’s directions or guidance on how to handle a particular clean extinguishing agent, one certainly can cause corrosion or other undesirable conditions to exist in a metal container with any agent. The OEMs with whom 3M works have material handling information instructing them on the proper use and care in handling Novec 1230 fluid. OEMs take appropriate steps to prevent the introduction of contaminants into any container intended to hold Novec 1230 fluid, whether onsite storage containers or OEM production cylinders.

- *“PFPA (a reactionary by-product of Novec™ 1230 and moisture) is extremely destructive to tissue of the mucous membranes and upper respiratory tract. MSDS’s from manufacturers of PFPA state, “liquid and vapors cause severe burns to skin, eyes and mucous membranes,” and instruct those working with PFPA to wear safety gloves and glasses and use a chemical fume hood.”*

This statement fails to characterize its relevance to the performance of Novec 1230 fluid in a fire protection system or potential impacts related to human health. As reflected in the results of toxicity studies, Novec 1230 fluid is very low in toxicity. The toxicity of the Novec 1230 fluid is, in large part, dictated by the physical properties of the material. Due to a very high vapor pressure and very low solubility in water, i.e., biological media, an exceedingly small amount of inhaled material is absorbed into the body. This understanding is clearly reflected in the toxicity studies conducted on Novec 1230 fluid. Novec 1230 fluid has shown a very low potential for irritation to the eyes, skin, and mucous membranes. The acute and repeat dose toxicity of Novec 1230 fluid is also very low. These results clearly reflect the low rate of formation of acid in biological systems.

- *Under the heading, “Toxicity: Novec™ 1230 Targets the Liver and Has Much Lower Exposure Limits than Fike’s ECARO-25™”*
- *“The Novec™ 1230 MSDS lists the liver as a ‘target organ’ and states that effects may include ‘loss of appetite, weight loss, fatigue, weakness, abdominal tenderness and jaundice.’ The ECARO- 25™ (DuPont FE-25) Material Safety Data Sheet (MSDS) does not list any ‘target organs.’”*
- *“The time-weighted average (TWA) refers to the level of chemical exposure that should not be exceeded in an eight-hour work day. Novec™ 1230 has a TWA of 150 ppm while ECARO-25™ has a TWA of 1000 ppm (a difference of nearly 600%).”*

When one conducts animal toxicity studies on new materials, the studies typically include an assessment of toxicity through a range of doses so that dose response curves can be established and adequate margins of safety associated with handling the material can be determined. When these studies are designed, the range of doses is selected with the intent of establishing concentrations that elicit no effects and concentrations where effects

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can be observed. Therefore, the observation of an effect such as a liver effect at high doses is not uncommon in toxicity testing. This information, along with the concentrations where no effects are observed, is used in establishing concentrations to which workers can be exposed safely. When effects are communicated independent of dose, as is the case in the ECARO-25 product literature, one cannot draw conclusions with regard to risk. It is inappropriate to suggest such a conclusion on this basis.

3M complies with all applicable laws and regulations, including the OSHA Hazard Communication Standard (29 C.F.R. 1910.1200), related to the environmental, health, and safety of its products. The OSHA Hazard Communication Standard requires that manufacturers articulate the results of toxicity studies on products in Material Safety Data Sheets (MSDS), somewhat independent of considerations of risk. Therefore, 3M references the observed liver toxicity at high doses in the MSDS for Novec 1230 fluid.

In general, time-weighted average exposure guidelines are established to protect workers routinely exposed to industrial chemicals. In the case of Novec 1230 fluid such workers include those who manufacture the agent and workers who manufacture fire protection systems and who handle, distribute, transport, store, and use Novec 1230 fluid. Industry practice for setting exposure guidelines includes the application of safety factors to the NOAEL (No Observable Effect Level) of a repeat dose animal toxicity study. 3M used this industry practice in establishing an exposure guideline for Novec 1230 fluid. Our experience in our manufacturing facility suggests that exposures can be adequately managed through use of standard industrial hygiene practices.

- *“The LC50 of Novec™ 1230 is listed as >10% while the LC50 of ECARO-25™ is listed at 70.90%. 'LC50' is another measure of the relative toxicity of a chemical. ECARO-25™'s LC50 is known, it is exact, and it is almost nine times greater than the concentration used to extinguish class A fires. What is the actual LC50 of Novec™ 1230?”*

Safety considerations related to the discharge of a fire protection system have been very thoroughly addressed in industry standards such as NFPA. The exposure guideline is not pertinent to individuals who may be exposed to the discharge of a fire protection system. These industry standards such as NFPA specifically and correctly focus on the hazards associated with acute exposure to an agent, such as cardiac sensitization, which is more pertinent to individuals who may be exposed to the discharge of a fire protection system.

3M has determined that a large margin of safety exists between design concentration in fire protection systems and the NOEL for all end-points of acute toxicity, i.e., 10%. The ECARO-25 product literature clearly omits a consideration of the cardiac sensitization potentials that have been carefully and clearly communicated in industry standards for this product. 3M recognizes that the ECARO-25 product can be used when designed into systems at concentrations reflective of industry standards. It is disappointing, however, that the ECARO-25 product literature omitted any reference to thresholds for cardiac sensitization and does not acknowledge the careful analysis reflected in industry standards such as the NFPA standard's listing of Novec 1230 fluid. We hope that, by omitting the information on cardiac sensitization potential, the ECARO-25 product literature does not mean to suggest that ECARO-25 product could be used at design concentrations related to the LC50 rather than the cardiac sensitization potential of the product.

Questions:

If you have any questions related to this bulletin, or would like more information on Novec 1230 fluid, please visit our website at: www.3M.com/novec1230fluid

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