Material Safety Data Sheet

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: HFE-71IPA 3M (TM) Novec (TM) Engineered Fluid
MANUFACTURER: 3M
DIVISION: Electronics Markets Materials Division

ADDRESS: 3M Center
St. Paul, MN 55144-1000

EMERGENCY PHONE: 1-800-364-3577 or (651) 737-6501 (24 hours)

Issue Date: 06/07/2006
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Product Use:

Intended Use:	FOR INDUSTRIAL USE ONLY. NOT INTENDED FOR USE AS A MEDICAL DEVICE OR DRUG
Specific Use:	Cleaning, drying and rinse agent for co-solvents and degreasers

SECTION 2: INGREDIENTS

Ingredient	C.A.S. No.	% by Wt
METHYL NONAFLUOROISOBUTYL ETHER	163702-08-7	19 - 76
METHYL NONAFLUOROBUTYL ETHER	163702-07-6	19 - 76
ISOPROPYL ALCOHOL	67-63-0	4 - 5

SECTION 3: HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Specific Physical Form: Liquid
Odor, Color, Grade: Clear, colorless, liquid. Slight alcohol odor.
General Physical Form: Liquid
Immediate health, physical, and environmental hazards: May cause target organ effects.

3.2 POTENTIAL HEALTH EFFECTS

Eye Contact:

Mild Eye Irritation: Signs/symptoms may include redness, pain, and tearing.

Skin Contact:
Mild Skin Irritation: Signs/symptoms may include localized redness, swelling, and itching.

Inhalation:
Respiratory Tract Irritation: Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

If thermal decomposition occurs:
May be harmful if inhaled.

May be absorbed following inhalation and cause target organ effects.

Ingestion:
Gastrointestinal Irritation: Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

May be absorbed following ingestion and cause target organ effects.

Target Organ Effects:
Central Nervous System (CNS) Depression: Signs/symptoms may include headache, dizziness, drowsiness, incoordination, nausea, slowed reaction time, slurred speech, giddiness, and unconsciousness.

3.3 POTENTIAL ENVIRONMENTAL EFFECTS

AQUATIC TOXICITY:

Testing results indicate that methyl nonafluoroisobutyl ether and methyl nonafluorobutyl ether have insignificant toxicity to aquatic organisms at their saturation point (Lowest LC50, EC50, or IC50 > substance water solubility). These compounds are highly volatile and have high Henry's Law constants and are thus expected to move rapidly through vaporization from solution in an aquatic compartment or from a soil surface in a terrestrial compartment to the atmosphere.

Isopropyl alcohol has minimal toxicity to aquatic organisms (100 mg/L < Lowest LC50, EC50, or IC50 < 1000 mg/L).

BIOCONCENTRATION:

Methyl nonafluoroisobutylether, and methyl nonafluorobutylether are highly insoluble and very volatile. Bioconcentration is therefore unlikely and not expected as they are not likely to enter aqueous waste streams from typical uses and disposal, or, in the case of a spill, remain in the aquatic or terrestrial compartments. The high potential for these components to move from aquatic or terrestrial environments to the atmosphere indicates bioconcentration is unlikely to occur as they are not expected to be bioavailable. Thus, emphasis has been placed on the atmospheric fate.

Isopropyl alcohol has an octanol/water partition coefficient value <3 indicating it is unlikely to bioconcentrate.

ATMOSPHERIC FATE:

This product has Zero Ozone Depletion Potential (ODP).

Atmospheric Lifetime: approximately 4.7 years and 3.7 years for methyl nonafluoroisobutyl ether and methyl nonafluorobutyl ether, respectively.

Isopropyl alcohol has an atmospheric half-life <2 days.

Global Warming Potential (GWP): 320 (100 year ITH, WMO 1998 method) for methyl nonafluoroisobutyl ether and methyl nonafluorobutyl ether. Essentially zero for isopropyl alcohol.

Methyl nonafluoroisobutylether, and methyl nonafluorobutylether are exempt from the US EPA definition of a volatile organic compound (VOC).

SECTION 4: FIRST AID MEASURES

4.1 FIRST AID PROCEDURES

The following first aid recommendations are based on an assumption that appropriate personal and industrial hygiene practices are followed.

Eye Contact: Flush eyes with large amounts of water. If signs/symptoms persist, get medical attention.

Skin Contact: Wash affected area with soap and water. If signs/symptoms develop, get medical attention.

Inhalation: Remove person to fresh air. If signs/symptoms develop, get medical attention.

If Swallowed: Do not induce vomiting unless instructed to do so by medical personnel. Give victim two glasses of water. Never give anything by mouth to an unconscious person. Get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES

Autoignition temperature	443 ºC [*Details:* ASTM E659 Method]
Flash Point	*Not Applicable*
Flammable Limits - LEL	4.0 % [*Details:* ASTM E681 Method]
Flammable Limits - UEL	16.7 % [*Details:* ASTM E681 Method]

5.2 EXTINGUISHING MEDIA

Material will not burn.

5.3 PROTECTION OF FIRE FIGHTERS

Special Fire Fighting Procedures: Exposure to extreme heat can give rise to thermal decomposition. Wear full protective equipment (Bunker Gear) and a self-contained breathing apparatus (SCBA).

Unusual Fire and Explosion Hazards: No unusual fire or explosion hazards are anticipated. No unusual effects are anticipated during fire extinguishing operations. Avoid breathing the products and substances that may result from the thermal decomposition of the product or the other substances in the fire zone. Keep containers cool with water spray when exposed to fire to avoid rupture. Sustained Burning Test: Does not sustain burning (ASTM D4206)

Note: See STABILITY AND REACTIVITY (SECTION 10) for hazardous combustion and thermal decomposition

information.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Observe precautions from other sections. Call 3M- HELPS line (1-800-364-3577) for more information on handling and managing the spill. Evacuate unprotected and untrained personnel from hazard area. The spill should be cleaned up by qualified personnel. Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice. Warning! A motor could be an ignition source and could cause flammable gases or vapors in the spill area to burn or explode. Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry. Collect as much of the spilled material as possible. Clean up residue with an appropriate solvent selected by a qualified and authorized person. Ventilate the area with fresh air. Read and follow safety precautions on the solvent label and MSDS. Place in a closed container approved for transportation by appropriate authorities. Dispose of collected material as soon as possible.

In the event of a release of this material, the user should determine if the release qualifies as reportable according to local, state, and federal regulations.

SECTION 7: HANDLING AND STORAGE

7.1 HANDLING

Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water. Contents may be under pressure, open carefully. Avoid breathing of vapors, mists or spray. Avoid skin contact with hot material. Avoid eye contact with vapors, mists, or spray. No smoking: Smoking while using this product can result in contamination of the tobacco and/or smoke and lead to the formation of the hazardous decomposition products mentioned in the Reactivity Data section of this MSDS. Store work clothes separately from other clothing, food and tobacco products. Avoid contact with oxidizing agents. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below Occupational Exposure Limits. If ventilation is not adequate, use respiratory protection equipment. Store below the boiling point of 54 C. --- Recovery of material from a co-solvent cleaning process by boil down should only be conducted in equipment designed and approved for handling flammable mixtures since such mixtures could become flammable. Avoid continuous exposure of the material to extreme conditions of heat, i.e., above 150C (welding, open flame, misuse or equipment failure). Avoid exceeding a watt density of 50 watts/inch2 from a heater surface. Continuous exposure to 150C results in a very slight decomposition of htis product and, therefore, is a very conservative use temperature threshold. Applications involving exposure of the fluid to temperatures exceeding 150c should be reviewed with 3M Technical Service.

7.2 STORAGE

Store away from heat. Store out of direct sunlight. Keep container in well-ventilated area. Store away from oxidizing agents. Store away from strong bases. Contents may be under pressure if stored/shipped under elevated temperature. Open closure slowly to vent pressure.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 ENGINEERING CONTROLS

Use with appropriate local exhaust ventilation. Provide appropriate local exhaust ventilation on open containers. For those situations where the fluid might be exposed to extreme overheating due to misuse or equipment failure, use with appropriate local exhaust ventilation sufficient to maintain levels of thermal decomposition products below their exposure guidelines.

8.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

8.2.1 Eye/Face Protection

Avoid eye contact. Avoid eye contact with vapors, mists, or spray.

The following eye protection(s) are recommended: Safety Glasses with side shields.

8.2.2 Skin Protection
Avoid skin contact with hot material. Wear appropriate gloves, such as Nomex, when handling this material to prevent thermal burns. Avoid skin contact.

Select and use gloves and/or protective clothing to prevent skin contact based on the results of an exposure assessment. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible materials.
Gloves made from the following material(s) are recommended: Polyethylene/Ethylene Vinyl Alcohol.

8.2.3 Respiratory Protection
Avoid breathing of vapors, mists or spray. Under normal use conditions, airborne exposures are not expected to be significant enough to require respiratory protection.
Select one of the following NIOSH approved respirators based on airborne concentration of contaminants and in accordance with OSHA regulations: Half facepiece or fullface air-purifying respirator with organic vapor cartridges. Consult the current 3M Respiratory Selection Guide for additional information or call 1-800-243-4630 for 3M technical assistance. If thermal decomposition occurs, wear supplied air respiratory protection.

8.2.4 Prevention of Swallowing
Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water.

8.3 EXPOSURE GUIDELINES

Ingredient	Authority	Type	Limit	Additional Information
ISOPROPYL ALCOHOL	ACGIH	TWA	200 ppm	Table A4
ISOPROPYL ALCOHOL	ACGIH	STEL	400 ppm	Table A4
ISOPROPYL ALCOHOL	OSHA	TWA	400 ppm	Table Z-1A
ISOPROPYL ALCOHOL	OSHA	STEL	500 ppm	Table Z-1A
METHYL NONAFLUOROBUTYL ETHER	AIHA	TWA	750 ppm	
METHYL NONAFLUOROISOBUTYL ETHER	AIHA	TWA	750 ppm	

SOURCE OF EXPOSURE LIMIT DATA:
ACGIH: American Conference of Governmental Industrial Hygienists
CMRG: Chemical Manufacturer Recommended Guideline
OSHA: Occupational Safety and Health Administration
AIHA: American Industrial Hygiene Association Workplace Environmental Exposure Level (WEEL)

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Specific Physical Form:	Liquid
Odor, Color, Grade:	Clear, colorless, liquid. Slight alcohol odor.
General Physical Form:	Liquid
Autoignition temperature	443 ºC [*Details:* ASTM E659 Method]
Flash Point	*Not Applicable*
Flammable Limits - LEL	4.0 % [*Details:* ASTM E681 Method]
Flammable Limits - UEL	16.7 % [*Details:* ASTM E681 Method]
Boiling point	54 ºC
Density	1.48 g/ml
Vapor Density	7.1 [*Ref Std:* AIR=1]
Vapor Pressure	207 mmHg [@ 25 ºC]
Specific Gravity	1.48 [*Ref Std:* WATER=1]

pH	*Not Applicable*
Melting point	*Not Applicable*
Solubility in Water	Slight (less than 10%)
Evaporation rate	58 [*Ref Std:* BUOAC=1]
Volatile Organic Compounds	67 g/l [*Test Method:* South Cost Air Qual Mgmt Dist]
Percent volatile	100 %
VOC Less H2O & Exempt Solvents	67 g/l [*Test Method:* calculated SCAQMD rule 443.1]
Viscosity	<=10 centipoise [@ 23 ºC]

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable.

Materials and Conditions to Avoid: Strong bases; Strong oxidizing agents

Hazardous Polymerization: Hazardous polymerization will not occur.

Hazardous Decomposition or By-Products

Substance	Condition
Carbon monoxide	During Combustion
Carbon dioxide	During Combustion
Hydrogen Fluoride	At Elevated Temperatures - extreme conditions of heat
Perfluoroisobutylene (PFIB)	At Elevated Temperatures - extreme conditions of heat

Hazardous Decomposition: Hydrogen fluoride has an ACGIH Threshold Limit Value of 3 parts per million (as fluoride) as a Ceiling Limit and an OSHA PEL of 3 ppm of fluoride as an eight hour Time-Weighted Average and 6 ppm of fluoride as a Short Term Exposure Limit. The odor threshold for HF is 0.04 ppm, providing good warning properties for exposure.

SECTION 11: TOXICOLOGICAL INFORMATION

Please contact the address listed on the first page of the MSDS for Toxicological Information on this material and/or its components.

SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION

Test Organism	Test Type	Result
,		See 3.3

CHEMICAL FATE INFORMATION

See Section 3.3 - Potential Environmental Effects

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method: Reclaim if feasible. Incinerate in an industrial or commercial facility in the presence of a combustible material. Combustion products will include HF. Facility must be capable of handling halogenated materials.
Consult your HFE distibutor or 3M representative for proper recovery and disposal of used fluid.

EPA Hazardous Waste Number (RCRA): Not regulated

Since regulations vary, consult applicable regulations or authorities before disposal.

SECTION 14:TRANSPORT INFORMATION

ID Number(s):
98-0212-1136-6, 98-0212-1137-4, 98-0212-1138-2, 98-0212-1139-0

Please contact the emergency numbers listed on the first page of the MSDS for Transportation Information for this material.

SECTION 15: REGULATORY INFORMATION

US FEDERAL REGULATIONS
Contact 3M for more information.

311/312 Hazard Categories:
Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No Immediate Hazard - Yes Delayed Hazard - No

STATE REGULATIONS
Contact 3M for more information.

CHEMICAL INVENTORIES
The components of this product are in compliance with the chemical notification requirements of TSCA.

Contact 3M for more information.

Additional Information: The components of this product are in compliance with the chemical notification requirements of ELINCS, METI, AICS, CDSL, PICCS

INTERNATIONAL REGULATIONS

Contact 3M for more information.

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: OTHER INFORMATION

NFPA Hazard Classification

Health: 3 **Flammability:** 1 **Reactivity:** 0 **Special Hazards:** None

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

HMIS Hazard Classification

Health: 2 **Flammability:** 1 **Reactivity:** 0 **Protection:** X - See PPE section.

Hazardous Material Identification System (HMIS(r)) hazard ratings are designed to inform employees of chemical hazards in the workplace. These ratings are based on the inherent properties of the material under expected conditions of normal use and are not intended for use in emergency situations. HMIS(r) ratings are to be used with a fully implemented HMIS(r) program. HMIS(r) is a registered mark of the National Paint and Coatings Association (NPCA).

Revision Changes: Not Applicable

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