

3M™ Novec™ 8200 Engineered Fluid

Introduction

3M™ Novec™ 8200 Engineered Fluid is a clear, colorless, low-odor fluid intended to replace 1,1,1-trichloroethane and perchloroethylene in film cleaning applications. Its physical properties are compared with other film cleaning solvents in Tables 1 and 2.

This fluid has zero ozone depletion potential and low global warming potential (GWP); is not a volatile organic compound (VOC)*; and is listed as a Clean Air Solvent by California's South Coast Air Quality Management District. More information on the environmental properties of Novec 8200 fluid can be found in Table 2. It is low in toxicity, with a time-weighted exposure guideline of 200 ppm (eight-hour average).

Novec 8200 fluid has a higher boiling point than most CFCs, HCFCs and HFCs, reducing evaporative losses. The low surface tension and increased solvency of Novec 8200 fluid, coupled with its chemical and thermal stability, nonflammability, and excellent compatibility with film substrates, make it an ideal film cleaning solvent.

*Novec 8200 has been excluded by the U.S. Environmental Protection Agency from the definition of a VOC on the basis that this compound has negligible contribution to tropospheric ozone formation.

Typical Physical Properties

Table 1

Properties	3M™ Novec™ 8200 Engineered Fluid	1,1,1-TCA	Perc
Molecular Weight	264	133	166
Boiling Point (°C)	76	74	121
Freeze Point (°C)	-138	-38	-9
Liquid Density (g/ml)	1.43	1.32	1.62
Surface Tension (dynes/cm)	13.6	25.5	31.8
Solubility of Solvent in Water, ppmw	<20	700	150
Solubility of Water in Solvent, ppmw	92	400	105
Vapor Pressure (mmHg)	109	121	20
Viscosity (cps)	0.61	0.79	0.84
Heat of Vaporization (cal/g @ boiling point)	30	54.4	50

Data compiled from published information.

Not for specification purposes. All values @ 25°C unless otherwise specified.

Environmental and Safety Properties

Table 2

Properties	3M™ Novec™ 8200 Engineered Fluid	1,1,1-TCA	Perc
Ozone Depletion Potential–ODP ¹	0.00	0.1	0.006
Global Warming Potential ²	55	140	N/A ³
Atmospheric Lifetime (years)	0.8	4.8	N/A ³
Flash Point	None	None	None
Flammability Range in Air	2.4-12.4%	7.5-15%	None
Exposure Guidelines (ppm) 8 hr. time-weighted average	200	350	25 ⁴
Hazardous Air Pollutant	No	Yes	Yes
VOC Designation ⁵	No	No	Yes
Annual Reporting (EPCRA 313) (SARA)	No	Yes	Yes
OSHA List of toxins/carcinogens	No	No	Yes
CA SCAQMD Clean Air Solvent	Yes	No	No

¹ CFC-11=1.0

² GWP–100 year ITH, CO₂ = 1.0

³ N/A: Not Available

⁴ 100 ppm STEL

⁵ Novec 8200 fluid has been excluded by the

U.S. EPA from the definition of a VOC

Recommended Equipment

Lipsner-Smith has designed their newest film cleaning machine, the CF-9200, to optimize system performance with 3M™ Novec™ 8200 Engineered Fluid. The increased ultrasonics and high-speed buffers result in excellent cleaning performance without leaching plasticizer from the film. The improved vapor recovery leads to greater efficiency.

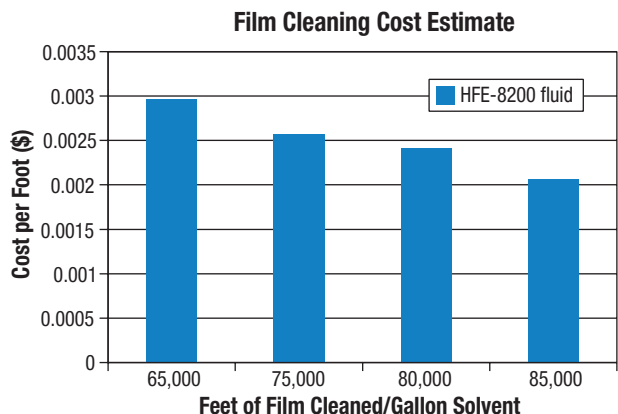
Lipsner-Smith has designed retrofit packages for models CF-3000 Mark VI and higher. It is recommended that Novec 8200 fluid be used only in Lipsner-Smith's CF-9200 or upgraded Lipsner-Smith film cleaning equipment. See your local Lipsner-Smith representative for details.

Data compiled from published information.

Not for specification purposes.

Performance Results

When used in Lipsner-Smith CF-9200 and retrofitted equipment, cleaning results comparable to perchlorethylene and 1,1,1-trichloroethane can be achieved. This equipment will typically allow for running speeds in excess of 220 feet per minute and can achieve cleaning efficiency in the range of 75,000 to 85,000 feet per gallon, making costs competitive with those seen with 1,1,1-trichloroethane, as seen in the table at right.



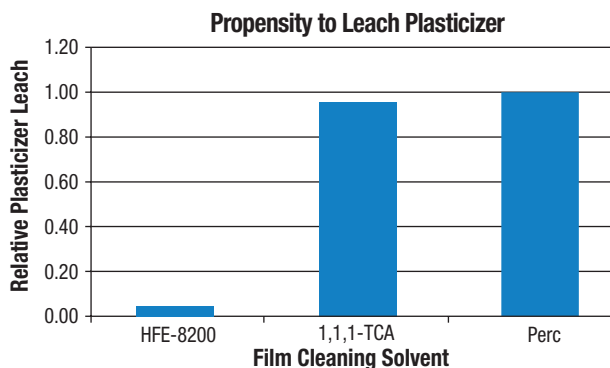
Environmental Policy

3M will continue to recognize and exercise its responsibility to prevent pollution at the source wherever and whenever possible; develop products that will have a minimal effect on the environment; conserve natural resources through the use of reclamation and other appropriate methods; assure that its facilities and products meet and sustain the regulations of all federal, state and local environmental agencies; assist, wherever possible, governmental agencies and other official organizations engaged in environmental activities.

Materials Compatibility

Novec 8200 fluid demonstrates compatibility with a wide range of metals, plastics and elastomers. As with most fluorinated liquids, Novec 8200 fluid will absorb into fluorinated plastics and elastomers over longer exposures. Data compatibility with specific substrates is available upon request.

In addition, Novec 8200 fluid exhibits excellent compatibility with acetate and Estar™ film substrates. Kodak tested the relative propensity of film cleaning solvents to leach plasticizer from Eastman Color Negative (ECN) and Eastman Color Intermediate (ECI) film. This data is for comparison purposes only. Results are shown below with the amount leached by perchloroethylene equal to 1.00.



Packaging and Availability

3M™ Novec™ 8200 Engineered Fluid packaging can be quickly connected to Lipsner-Smith equipment. Novec 8200 fluid may be ordered in the following container sizes:

- 5-gallon pail
- 30-gallon drum

Safety and Handling

Novec 8200 fluid is nonflammable and does not exhibit flammability characteristics under normal operating and storage conditions. This fluid is highly resistant to thermal breakdown and hydrolysis in storage and during use. Recommended handling procedures are provided in the Material Safety Data Sheet.

Before using this product, please read the current product Material Safety Data Sheet (available through your 3M sales or technical service representative) and the precautionary statement on the product package. Follow all applicable precautions and directions.

Regulatory Status

3M™ Novec™ 8200 Engineered Fluid has been accepted for commercial use by regulatory agencies in the United States, Canada (less than 10,000 lbs./yr.), Japan, Philippines (less than 2,000 lbs./yr.), and Europe. The components of Novec 8200 fluid have been nominated to China's draft chemical inventory.

Novec 8200 fluid has been approved under the Significant New Alternatives Policy (SNAP) of the U.S. EPA. Novec 8200 fluid has been excluded by the U.S. EPA from the definition of a VOC on the basis that this compound has negligible contribution to tropospheric ozone formation. In addition, the South Coast Air Quality Management District (SCAQMD) has certified Novec 8200 fluid as a Clean Air Solvent.

Contact your local 3M representative regarding the regulatory status of Novec 8200 fluid in other countries.

Toxicity Profile

The toxicological testing completed on Novec 8200 fluid shows the overall toxicity is low. The material is practically non-irritating to the eyes, minimally irritating to the skin and is not a mutagen. This material is rated "practically non-toxic" through inhalation. Twenty-eight day inhalation studies have helped establish a recommended exposure guideline of 200 ppm for eight-hour average worker exposure per day.

Table 4 Toxicological Test Results

Properties	3M™ Novec™ 8200 Engineered Fluid
Acute Lethal Inhalation Concentration	>92,000 ppm (4 hour)
Oral	Practically non-toxic (>5g/kg)
Eye Irritation	Minimally irritating
Skin Irritation	Non-irritating
Skin Sensitization	Not a skin sensitizer
Inhalation (28 day study)	200 ppm exposure guideline ¹ Detailed results are available
Developmental Toxicity	Detailed results are available
Mutagenicity	Not a mutagen
Cardiac Sensitization	No signs at exposure up to 20,000 ppm
Ecotoxicity Testing	Complete—low aquatic toxicity

¹Exposure Guideline set by the 3M Medical Department

Recycle and Disposal Options

Used Fluid Return Program

3M offers a program for free pickup and return of used 3M specialty fluids in the U.S. A pre-negotiated handling agreement between users and our authorized service provider offers users broad protection against future liability for used 3M product. The fluid return program is covered by independent third-party financial and environmental audits of treatment, storage and disposal facilities. Necessary documentation is provided. A minimum of 30 gallons of used 3M specialty fluid is required for participation in this free program.

For additional information on the 3M Used Fluid Return Program, contact your local 3M representative or call 3M Customer Service at 800.810.8513.

Resources

3M™ Novec™ Engineered Fluids are supported by global sales, technical and customer service resources, with technical service laboratories in the U.S., Europe, Japan, Latin America and Southeast Asia. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues. For additional technical information on 3M™ Novec™ 8200 Engineered Fluid in the United States or for the name of a local authorized distributor, call 3M Electronics Markets Materials Division: **800 810 8513**.

The 3M™ Novec™ Brand Family

The Novec brand is the hallmark for a variety of patented 3M products. 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

United States	China	Europe	Japan	Korea	Singapore	Taiwan
3M Electronics Markets Materials Division 800 810 8513	3M China Ltd. 86 21 6275 3535	3M Belgium N.V. 32 3 250 7521	Sumitomo 3M Limited 813 3709 8250	3M Korea Limited 82 2 3771 4114	3M Singapore Pte. Ltd. 65 64508888	3M Taiwan Limited 886 2 2704 9011

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