

Honeywell Solstice™ Propellant



**Propelling Aerosol Technology
Forward in Personal Care Products**

Honeywell

Honeywell Solstice™ Propellant for Personal Care Applications

From deodorants to shaving creams and hairsprays, aerosols are used in many personal care products as an efficient, safe, tamper-proof and controlled method of dispensing material. With the advent of global warming-based regulations in many regions around the world, HFC (hydrofluorocarbon) propellants, such as HFC-134a, HFC-152a and HFC-227ea, have come under pressure as potential contributors to global warming. In response to current and possible future restrictions on the use of HFCs, Honeywell has introduced Solstice™ Propellant, which has all the performance benefits of hydrofluorocarbons, but exhibits very favorable environmental properties.

Performance and Cost Effectiveness

Solstice Propellant offers a high degree of versatility to accommodate the wide variety of products sold in the personal care market. It is nonflammable, and has a moderate vapor pressure of 49 PSIG (3.4 bars-gauge) at 70°F (21°C) and 147 PSIG (10 bars-gauge) at 130°F (54°C).

It mixes with other common propellants such as HFC-134a, HFC-152a, DME, butane, isobutane and propane. While it does not mix with water, it is highly miscible and compatible with many commonly-used solvents, including ethanol, acetone, halogenated solvents and hydrocarbons. It has been shown to be compatible with aluminum chlorohydrate and commonly-used hairspray ingredients, and is currently being evaluated in personal care products. Prototype hairspray formulations containing Solstice Propellant, either as the sole propellant or in combination with isobutane, exhibited spray characteristics comparable to those of commercial HFC-152a propelled hairsprays.

Solstice Propellant is thermally and hydrolytically stable and exhibits good compatibility with plastics, elastomers and metals. In particular, Solstice Propellant has been shown to be compatible with unlined tinplate aerosol

cans, as well as with PAM, epoxy and PET-lined aerosol cans. Solstice Propellant has also been tested with aerosol valves from the major valve companies, and found to be compatible with common gasket materials, including grades of butyl rubber, buna and neoprene.

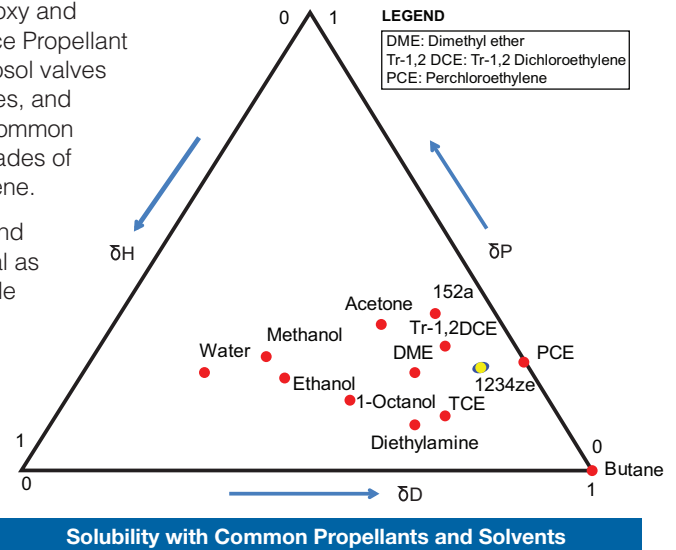
Customers have generally found conversion costs to be minimal as Solstice Propellant requires little or no change to existing filling equipment.

Sustainability

When substituted for HFC-152a in personal care aerosol products, Solstice Propellant can substantially reduce greenhouse gas emissions. It has a global warming potential (GWP) of less than 1¹, compared to 124 for HFC-152a². It also has an MIR value of 0.09g O₃/g VOC, so it does not contribute to ground-level ozone creation and has been excluded from the definition of VOC by the U.S. EPA.

Safety

Solstice Propellant is a UN class 2.2 non-flammable liquefied gas. The results of an extensive set of toxicity tests support the conclusion that Solstice Propellant exhibits a very low order of toxicity. Accordingly, the American Industrial Hygiene Association (AIHA) has assigned a Workplace



Environmental Exposure Limit (WEEL) of 800 PPM (8-hour time-weighted average).

Regulatory Compliance

Solstice Propellant complies with global regulations. The product is registered in Europe under REACH (Regulation 1907/2006) for tonnages of more than 1,000 tonnes/annum. In the U.S., it was added to the SNAP List of Acceptable Substitutes for Aerosol Applications in June 2010 and was added to the TSCA inventory without restrictions in November 2010. It is also registered in Japan, China, Australia, Canada and South Korea.

Key Properties of Solstice Propellant

Molecular Formula	CHF=CHCF ₃
Molecular Weight	114
Boiling Point	-2.2°F (-19°C)
Vapor Pressure	49 psig 3.4 bars 147 psig 10 bars
Liquid Density at 70°F/21°C	1.17 g/cc
Vapor Flame Limits (Vol.% in Air) Measured at 70°F/21°C	None
Solubility of Water in 1234ze at 68°F/20°C	225 ppm
Solubility of 1234ze in Water at 68°F/20°C	373 ppm

References:

- Hodnebrog, O., Etrman, M., Fuglestvedt, J.S., Marston, G., Myhre, G., Nielson, C.J., Shine, K.P., Wallington, T.J.: Global Warming Potentials and Radiative Efficiencies of Halocarbons and Related Compounds: A Comprehensive Review, *Reviews of Geophysics*, 51, 2013.
- IPCC 2007

The information provided herein are believed to be accurate and reliable, but are presented without guarantee or warranty of any kind, express or implied. User assumes all risk and liability for use of the information and results obtained. Statements or suggestions concerning possible use of materials and processes are made without representation or warranty that any such recommendations to infringe any patent. The user should not assume that all safety measures are indicated herein, or that other measures may not be required.

Honeywell Fluorine Products

101 Columbia Road

Morristown, NJ 07962-1053

Phone: 1-800-631-8138

www.honeywell-solstice-propellants.com



Solstice is a trademark of Honeywell International Inc.

September 2013
© 2013 Honeywell International Inc.
All rights reserved.