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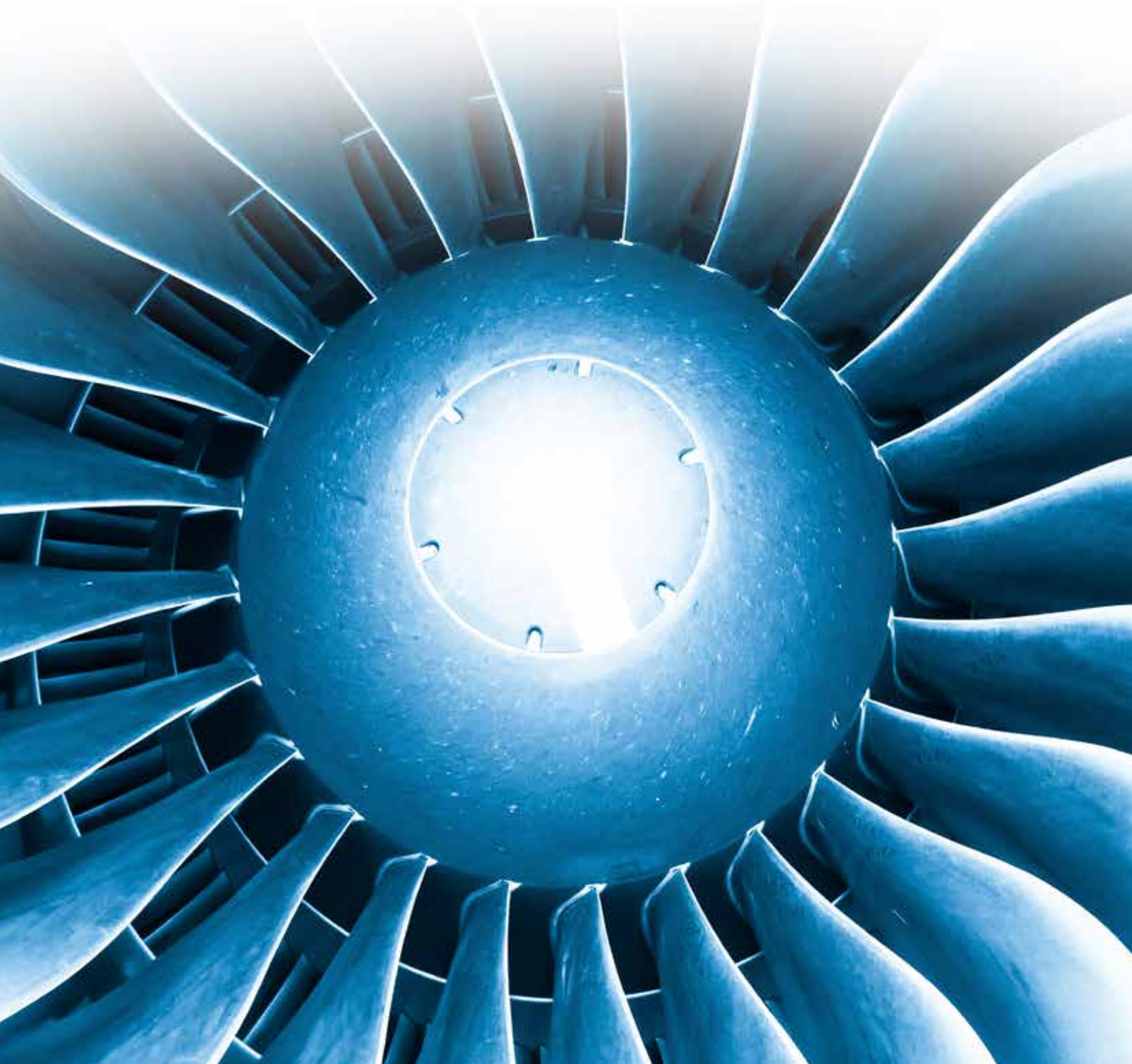
SOLSTICE® PERFORMANCE FLUID

Superior Cleaning for Demanding Military and Aerospace Applications



Solstice® Performance Fluid: Superior Cleaning for Demanding Military and Aerospace Applications

Introduction

Honeywell's Solstice Performance Fluid (PF) is a highly effective non-flammable cleaning solution, with a favorable toxicity profile and low environmental impact. Solstice PF is suitable for electronics, metal and precision cleaning. It can be used in vapor degreasing equipment and may be dispensed from an aerosol can.

Solstice PF has been shown to have desirable environmental properties: negligible ozone depletion, ultra-low MIR and a global warming potential of 1. With these exceptional environmental properties and good solvency, Solstice PF is an excellent choice for a variety of cleaning applications.

Performance

Specifications: There are a wide variety of tests and specifications that a solvent must conform to in order to be acceptable for use in military and aerospace applications. Solstice PF has been tested and found to conform to many of the solvent specifications typically used in military and aerospace applications. *Table 1* lists the specifications, ASTM method and the result in testing Solstice PF. As shown in *Table 1*, Solstice PF conforms to all standards tested with the exception of the stress crazing test on acrylic plastics, similar to other fluorinated solvents.

NAME	ASTM	RESULT	COMMENTS
Effect on Painted Surfaces	ASTM F 502	Conforms	
Residue	ASTM F 485	Conforms	
Sandwich Corrosion	ASTM F 1110	Conforms	2024-T3 Bare/Anodized per MIL-C-5541 2024-T3 Bare/Anodized per MIL-A-8625 2024-T3 Clad/Anodized per MIL-C-5541 2024-T3 Clad/Anodized per MIL-A-8625 7075-T6 Clad/Anodized per MIL-C-5541 7075-T6 Clad/Anodized per MIL-A-8625 7075-T6 Bare/Anodized per BAC 5019
Stress Crazing Test on Acrylic Plastics	ASTM F 484	Does not Conform	
Immersion Corrosion, Aluminum	ASTM F 483	Conforms	Aluminum 7075-T6
Cadmium Removal	ASTM F 483	Conforms	4130 Steel Panels
Hydrogen Embrittlement	ASTM F 519	Conforms	Cadmium Plated per MIL-STD-870
Paint Softening	ASTM F 502	Conforms	Type II and III Primer
Titanium Stress Corrosion	ASTM F 945	Conforms	

Table 1. *Results of Solstice PF Testing*

Cleaning Capabilities: Solstice PF is able to dissolve a number of typical soils that are encountered in military and aerospace cleaning. *Table 2* lists a selection of the soils that have been tested and can be easily dissolved by Solstice PF. The solubility characteristics allow for Solstice PF to be used in a wide variety of military and aerospace cleaning operations.

Compatibility: Solstice PF is compatible with metals commonly used in Aerospace and Military. Metal coupons were fully immersed in a boiling solvent for 2 weeks. The solvent was analyzed by GC and ICP to determine if there was any breakdown during the exposure. Excess water was also introduced into the solvent to ensure that the solvent was hydrolytically stable. In all cases the metals tested in *Table 3* indicated no solvent breakdown or acid formation during the tests.

With best-in-class surface tension, balanced characteristics of boiling point and heat of vaporization, no need for additives and favorable HS&E attributes, Solstice PF has been proven to have the lowest total cost of ownership vs. competing technologies, including aqueous.

Cost Effective

Recycling and Recovery: Solstice® PF can easily be recycled and recovered by simple flash distillation or carbon adsorption. The volatility of Solstice PF allows for easy separation of Solstice PF from a contaminant by simply adding heat. The evaporated Solstice PF can then be recovered by condensing the solvent vapors by means of a chilled brine solution. Activated carbon has also been shown to efficiently adsorb Solstice PF vapor. In this case the Solstice PF can be recovered by simple steam desorption. The hydrolytic stability of Solstice PF allows for it to be adsorbed and desorbed efficiently without any solvent breakdown.

Safety and Sustainability

Non-flammable: Solstice PF does not exhibit any flashpoint or vapor flame limits. It was determined that Solstice PF has no vapor flame limits even at temperatures up to 100°C using an ASTM E 681 apparatus. The non-flammability of Solstice PF allows for use even in harsh conditions.

Oxygen System Cleaning: It is critical that oxygen lines and parts used in oxygen service are completely clean and free of debris. Solstice PF is well suited for oxygen line cleaning in that it is able to effectively remove contamination from the desired lines or parts and then be completely dried. The oxygen-enriched autoignition temperature of Solstice PF was determined to be 210°C (410°F) by ASTM G 72 at 1500psig.

Environmental Properties: It is extremely important to consider the effect on the surrounding area and the safety of those who come in contact with a cleaning solution. A Workplace Environmental Exposure Level (WEEL) of 800 PPM (8-hour weighted time average) has been assigned to Solstice Performance Fluid. The environmental impact of Solstice PF has been studied and is shown to have negligible ozone depletion and a very low global warming potential. It is not a volatile organic compound (VOC), as determined by the U.S. EPA.

Table 4 lists a few of the important environmental and safety properties of Solstice PF.

SOILS THAT CAN BE CLEANED WITH SOLSTICE PF	
Mineral Oils	Aeroshell Grease 5
Silicone Oils	Mobil 28 Grease
Silicone Grease	Lubricating Oils
Cutting Oils	Penetrating Oils

Table 2. *Example of soils that can be readily cleaned with Solstice PF*

METALS TESTED	
Titanium	Aluminum
Magnesium/Aluminum Alloy	Copper
Inconel	Cooled Rolled Steel
Monel	Stainless Steel

Table 3. *Metal compatibility with Solstice PF.*

PROPERTY	SOLSTICE PF
Flash Point	Aeroshell Grease 5
Lower Flame Limit (vol %)	None
OEL (PPM)	800
GWP (100-year)	1
VOC (U.S.)	Exempt

Table 4. *Environmental and Safety Properties of Solstice PF*

With favorable performance, HS&E, and safety characteristics, Solstice PF is well positioned as a long-term viable solvent. It should also be considered as an aqueous replacement technology.

Versatility

The unique solubility characteristics, high performance, non-flammability, stability, low toxicity and excellent environmental properties of Solstice PF allow for use in a wide variety of applications from oxygen line cleaning to degreasing.

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