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Date: 20-Dec-2023

SMI/REF: 2311-659_R
Report revised to include Biodegradability

Product: **GEN2** (received 20-Nov-2023)

Dilution: As received

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Periodic testing in accordance with
AMS 1435D (Revised 2018-11)
LIQUID RUNWAY DEICING/ANTI-ICING PRODUCT

4.2.2 Periodic Tests

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3.2.6	Effect on Transparent Plastics	
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	MIL-P-83310 (Polycarbonate)	Conforms
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3.2.10	Effect on Runway Pavements	
3.2.10.1	Runway Concrete Scaling Resistance	Conforms
3.2.10.2	Asphalt Concrete Degradation Resistance	*Not performed by SMI
**3.1.1.1	Biodegradability	**Informational

***Testing required for deicer /anti-icer products used in Europe. This test is not performed by SMI.**

****Additional testing requested by client; not a requirement of AMS 1435D Periodic testing**

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***Additional testing requested by client; not a requirement of AMS 1435d Periodic testing**

3.1.1.1 Biodegradability: Product shall be tested in accordance with APHA Standard Methods for Examination of Water and Waste Water. The manufacturer shall provide results of bioassays, which shall contain not less than the following information:

3.1.1.1.1 The percent of product biodegraded in five days at 68°F (20°C)

***BOD = 0.21 kg O₂/kg fluid**

Result Informational

3.1.1.1.2 The 5-day total oxygen demand (TOD) of the product based on theoretical oxygen demand (ThOD), whether calculated computationally or via chemical oxygen demand (COD), expressed in kilograms of oxygen per kilograms of product.

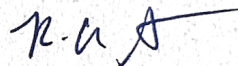
***COD = 0.33 kg O₂/kg fluid**

Result Informational



Jeff Nottebaum, SMI Inc.
Director

Respectfully submitted,



Rae-anne Nottebaum, SMI Inc.
Chemist

4.2.2 Periodic Tests: Freezing point (3.2.4), effect on aircraft metals (3.2.5), effect on transparent plastic (3.2.6), effect on painted surfaces (3.2.7), effect on unpainted surfaces (3.2.8), rinsibility (3.2.9), runway concrete scaling resistance (3.2.10.1) and asphalt concrete degradation resistance (3.2.10.2 Appendix A, valid for deicing/anti-icing products used in Europe) are periodic tests and shall be performed on or just prior to the second anniversary of initial testing and thereafter every four calendar years.

3.2.4 Freezing Point:

3.2.4.1 Freezing point of product diluted 1:1 by weight with ASTM D1193, Type IV, water shall be reported and shall be lower than +6°F (-14.5°C) determined in accordance with ASTM D1177.

Freezing point (1:1 dilution): -15 °C

Result Conforms

3.2.4.2 Shall be reported and shall be within 7°F (4°C) of the preproduction value established in 4.2.3, determined in accordance with ASTM D1177.

Freezing point (1:1 dilution): -15 °C

Result Informational

3.2.5 Effect on Aircraft Metals:

3.2.5.1 Sandwich Corrosion: Specimens, after testing in accordance with ASTM F 1110, shall show a rating not greater (worse) than one.

	2024-T3 Bare Anodized	2024-T3 Alclad	7075-T6 Bare Anodized	7075-T6 Alclad
PRODUCT (AS RECEIVED)	1	1	1	1
CONTROL	1	1	1	1

Result Conforms

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3.2.5.2 Total Immersion Corrosion: The product, tested in accordance with ASTM F483 (except that panels of AMS4376 shall be tested for 24 hours), shall neither show evidence of corrosion of panels, nor cause a weight change of any test panel greater than shown in Table 1.

TEST PANEL	WEIGHT CHANGE (mg/cm ² /24hrs)	
	ALLOWABLE	RESULTS
AMS 4037 aluminum alloy, anodized as in AMS 2470	0.3	+ 0.01
AMS 4041 aluminum alloy	0.3	+ 0.01
AMS 4049 aluminum alloy	0.3	+ 0.02
AMS 4376 magnesium alloy, dichromate treated as in AMS 2475 <i>(tested for 24 hours only)</i>	0.2	+ 0.01
AMS 4911 titanium alloy	0.1	+ 0.02
AMS 5045 Carbon Steel	0.8	+ 0.01

"+" indicates weight gain

Result Conforms

3.2.5.3 Low-Embrittling Cadmium Plate: Test panels, coated with low-embrittling cadmium plate, shall not show a weight change greater than 0.3 mg/cm² per 24hrs, determined in accordance with ASTM F1111.

As received: 0.01 mg/cm²/24hrs

Result Conforms

3.2.5.3.1 The product shall be tested for cyclic immersion corrosion of cadmium plate in accordance with AIR6130 and the results reported as specified in Section 6 of AIR6130A.

Initial pH of solution: 11.1

Final pH of solution: 10.7

PANEL WEIGHTS	REPLICATE #	Weight (g)		
		Initial	Final	Weight change
	1	8.2041	8.2035	0.0006
	2	8.0351	8.0369	+ 0.0018
	3	7.9339	7.9345	+ 0.0006
Average weight change = + 0.0006 g (+ 0.02 mg/cm ²)				
Note: "+" indicates weight gain				

AIR6130A: A runway deicing fluid or solid compound tested in accordance with this document that exhibits a weight loss of more than 0.3 mg/cm² may cause undesirable corrosion effects to airplane equipment and/or airport equipment.

Result: ***Informational**

See separate report for complete data tables

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3.2.5.4 Hydrogen Embrittlement: The product shall be non-embrittling, determined in accordance with ASTM F519, utilizing Type 1a, 1c or 2a specimens cadmium plated in accordance with MIL-STD-870 Class 1 Type I. Type 1a and Type 1c, specimens shall be loaded to 45% of the predetermined notch fracture strength, and Type 2a specimens loaded to 80% of the yield strength. The entire 2a stressed specimen, or just the notched area of the 1a and 1c stressed specimen, shall be immersed continuously in the solution under test for 150 hours at a temperature of 77°F ± 9°F (25°C ± 5°C).

Specimens: Type 1c:

As received: #1: No failures occurred within 150 hours.

#2: No failures occurred within 150 hours.

#3: No failures occurred within 150 hours.

#4: No failures occurred within 150 hours.

Result Conforms

3.2.5.5 Stress-Corrosion Resistance: The product shall not cause cracks in AMS 4911 titanium alloy specimens, determined in accordance with ASTM F945, Method A.

As received: No cracking evident.

Result Conforms

3.2.5.5.1 The product shall be tested in accordance with ASTM F945, Method A using AMS4916 specimens. Report shall detail the effect of the product and the effect of control solution. The results shall be reported for informational purposes only.

As received: Cracking evident.

Result Informational

3.2.6 Effect on Transparent Plastics:

3.2.6.1 The product, at 77°F ± 4°F (25°C ± 2°C), shall not craze, stain, or discolor MIL-PRF-25690 stretched acrylic plastic, determined in accordance with ASTM F484.

Result Conforms

3.2.6.2 The product, at 77°F ± 4°F (25°C ± 2°C), shall not craze, stain, or discolor AMS-P-83310 polycarbonate plastic, determined in accordance with ASTM F484, except that the specimens shall be stressed for 30 minutes ± 2 minutes to an outer fiber stress of 2000 psi (13.8 MPa).

Result Conforms

3.2.7 Effect on Painted Surfaces: The product, at 77°F ± 4°F (25°C ± 2°C), shall neither decrease the paint film hardness by more than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F502.

Result Conforms

3.2.8 Effect on Unpainted Surfaces: The product, tested in accordance with ASTM F485, shall neither produce streaking nor leave any stains requiring polishing to remove.

Result Conforms

3.2.9 Rinsibility: The product shall be completely rinsible in tap water, determined in accordance with 3.2.9.1

3.2.9.1 A 3 x 8 inch (75 x 200 mm) panel of clear glass shall be cleaned to provide a surface free of waterbreak, dried, and coated with the deicer/anti-icer product by pouring the product over the panel while it is held in a horizontal position. The coated panel shall be inclined at an angle of approximately 45 degrees for 10 minutes \pm 0.5 minute, then placed in a horizontal position for 24 hours \pm 0.25 hour at room temperature. After the 24 exposure, the panel shall be rinsed in tap water for 5 to 6 minutes, followed by a rinse with ASTM D1193, Type IV, water, allowed to air dry at ambient temperature, and examined for visible traces of deicer/anti-icer product.

Result Conforms

3.2.10 Effect on Runway Pavements

3.2.10.1 Runway Concrete Surface Scaling Resistance: The condition of the runway concrete surface shall have a rating not greater than one for 50 freeze-thaw cycles, determined in accordance with ASTM C672 except that concrete shall:

- a. Be air-entrained with an air content as specified in ASTM C 672
- b. Have a minimum cement content of 510 lb/yd³ \pm 10 lb/yd³ (302 kg/m³ \pm 6 kg/m³)
- c. Have a slump, 1.5 inches \pm 0.5 inch (38 mm \pm 13 mm).

A 25 % by volume solution of the deicer/anti-icing product, as supplied by the manufacturer in commercial concentration, in tap water shall be substituted for calcium chloride. Performing more than one freeze-thaw cycle per day is acceptable.

Rating: 1

Result Conforms

3.2.10.2 Asphalt Concrete Degradation Resistance (Appendix A, valid for deicer/anti-icer products used in Europe)

Result *Not performed by SMI

***Testing required for deicer /anti-icer products used in Europe. This test is not performed by SMI.**