

**PCI VueGuard[®] 932
Anti-Fog Coating for
Tritan[™]**

Introduction

- VueGuard[®] 932 coatings from PCI Labs were selected as candidates to impart anti-fogging properties to Tritan[™].
- Links to VueGuard[®] coatings product specs:
 - [VueGuard[®] 932](#)
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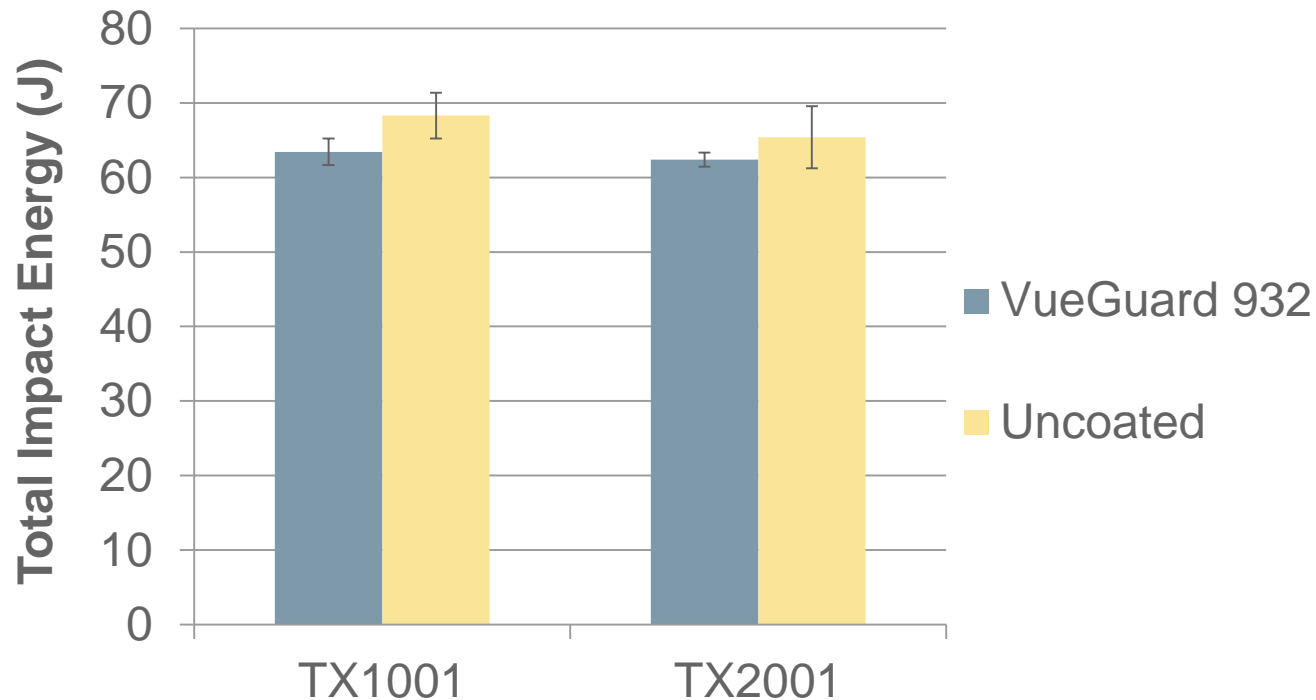
Dip-coating Application Details

- Tritan™ TX1001 and TX2001 1/8” thick 4”x4” plaques were dip-coated on both sides with VueGuard® 932 AF Coating with the following procedure:
 - The Tritan samples for anti-fog were first dip-primed with UV curable primer PST 1200.
 - The cured primed Tritan™ was then over-coated with the dip-coating.
 - Standard thickness for anti-fog Vueguard® 932 was 8-10 μm
- Coated plaques passed breath fogging¹ and hot water fogging² tests.
- Coated plaques were tested for:
 - Instrumented drop impact resistance
 - Taber abrasion resistance
 - Pencil hardness

¹ No fog formation after direct breathing on the coated surface

² A glass beaker (300 ml) is filled with 250 ml of water. The beaker is placed on a hot plate and the water heated to 60°C. The water temperature should be maintained 60±3 °C during the entire test. Place a chip coated with anti-fog coating on top of the beaker, with coated side facing the water bath, covering completely the beaker opening. Sample should not fog for at least one minute.

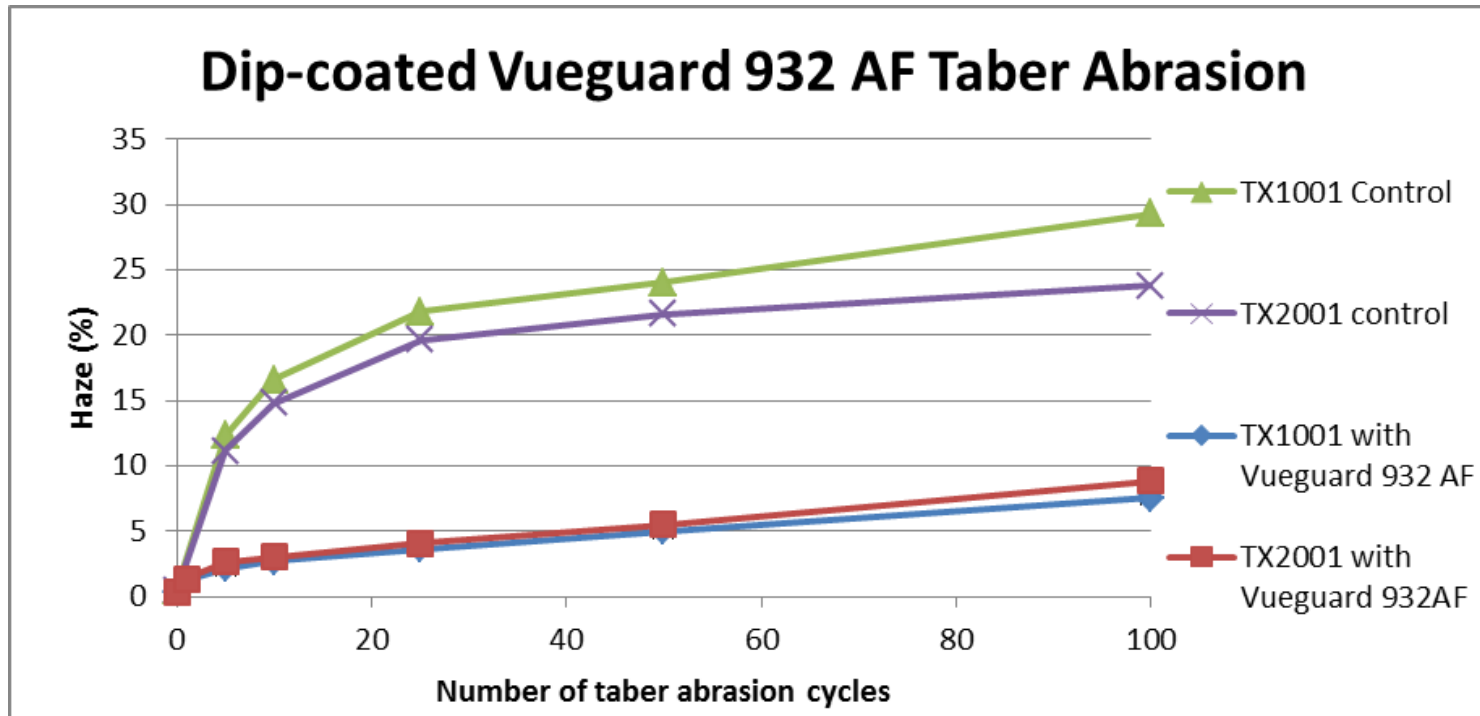
Instrumented Drop Impact Resistance



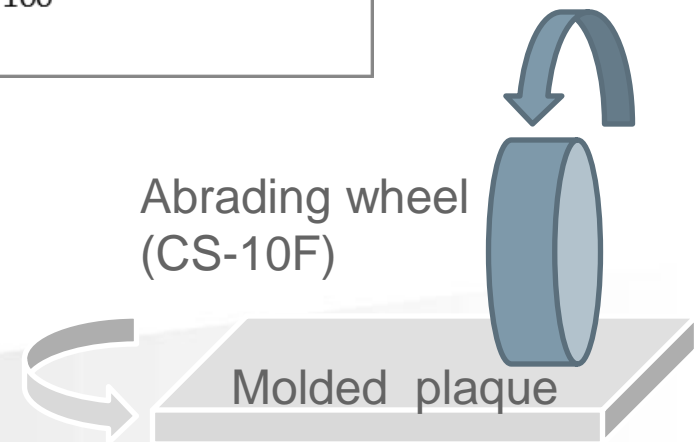
A 28 kg load was dropped from 0.5 m at a temperature of 23°C.

- No significant reduction in impact energy was recorded for Tritan™ plaques coated with VueGuard® 932, and the mode of impact failure of all tested Tritan plaques coated with VueGuard® 932 was ductile.

Taber Abrasion Resistance



- The VueGuard[®] 932AF coating significantly improved the abrasion resistance of Tritan[™].



Pencil Hardness

- Pencil hardness of coated plaques was tested according to ASTM D-3363. Molded plaques were tested with Mitsubishi Hi-Uni graphite pencils at 750 g load and 45 degree angle. Hardness of the lead that just fails to scratch the surface was reported.

Pencil Hardness Scale

6B 5B 4B 3B 2B B HB F H 2H 3H 4h 5H 6H 7H 8H 9H
 Softer ←—————→ Harder

Material	Dip - Coated	Pencil Hardness
Tritan® TX1001	Uncoated	B
Tritan® TX1001	VueGuard® 932 AF	B
Tritan® TX2001	Uncoated	B
Tritan® TX2001	VueGuard® 932 AF	B



Wolf Wilburn Pencil Hardness Tester

- No changes in pencil hardness of Tritan™ were recorded with the application of VueGuard® 932 AF coating

Conclusions

- VueGuard[®] 932 AF coating, when applied over PST 1200 primer, was effective in imparting anti-fogging properties to both Tritan[™] TX1001 and TX2001 molded parts.
- All tested Tritan[™] plaques coated with VueGuard[®] 932 AF retained their ductility, and did not exhibit any significant reduction in impact energy
- VueGuard[®] 932 AF improved the taber abrasion resistance of neat Tritan[™] molded plaques, while it did not influence their pencil hardness.

Technical Disclaimer

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Appendix:

Solution Properties of Primer PST 1200

The following solution properties are typical values for PST 1200, as supplied:

Solids:	11.9%
Viscosity @ 25°C:	8 cP
Appearance:	Clear liquid
Density @ 25°C:	7.6 lb/gal
% Solvents:	88.1%

The solids content of PST 1200 needs to be controlled in the operating range of 11-13 %, by weight. A mixture of DAA, Butyl Acetate, MIAK and n-Propanol (1 : 2.4 : 0.9 : 2.4) can be used to maintain the solids content. 15 min of mixing is recommended prior to use (Cowls blade, or equivalent, high shear blade – moderate agitation), followed by filtration of the coating with 1.0 µm double open end cartridge, bag (or equivalent) filtering systems.

Appendix: Recommended Operating Ranges for Primer PST 1200 as supplied by PCI

The following operating ranges were provided by PCI as recommendations for consistent processing of this primer.

% Solids	11-13%
Viscosity @ 25°C	8 cP
% Solvents	87-89%
Addition Solvents	DAA, Butyl Acetate, MIAK and n-Propanol (1 : 2.4 : 0.9 : 2.4)
Process % Relative Humidity	~ 50% RH
Process Air Temperature	20 - 26°C
Process Air Flow	HEPA Filtered Laminar Air
Spray Gun	HVLP or Air-Assist
Oven Flush-off (with Air movement)	1-2 min @ 40°C
UV - Cure Conditions	Dosage energy: 450-650 mJ/cm ² with medium pressure, Hg lamps @ 300 Watts/in
Dry Coating Film Thickness	2-3 micrometers
Quality Control	Run min. three coated plaques and measure: Coating Thickness; 2-3 um Adhesion: 100% (ASTM 3002 / 3359)

Appendix: Solution Properties of VueGuard 931 AF as supplied by PCI

The following solution properties are typical values for PST 1200, as supplied:

Solids:	24.1 %
Viscosity @ 25°C:	8 cP
Appearance:	Clear liquid
Density @ 25°C:	7.9 lb/gal
% Solvents:	75.9 %

The solids content of VueGuard 931 AF needs to be controlled in the operating range of 23-26%, by weight. A mixture of PM Solvent and n-Propanol (15.5 : 1) can be used to maintain the solids content. 15 min of mixing is recommended prior to use (Cowls blade, or equivalent, high shear blade – moderate agitation), followed by filtration of the coating with 1.0 µm double open end cartridge, bag (or equivalent) filtering systems.

Appendix: Recommended Operating Ranges for VueGuard 931 AF as supplied by PCI

The following operating ranges were provided by PCI as recommendations for consistent processing of this coating.

% Solids	23-26%
Viscosity @ 25°C	8 cP
% Solvents	74-77%
Addition Solvents	PM solvent: n-Propanol (15.5 : 1)
Process % Relative Humidity	~ 50% RH
Process Air Temperature	20 - 26°C
Process Air Flow	HEPA Filtered Laminar Air
Spray Gun	HVLP or Air-Assist
Oven Flush-off (with Air movement)	5-6 min @ 50°C
UV - Cure Conditions	Dosage energy: 1200 mJ/cm ² with H+ lamp @ 480 Watts/in
Dry Coating Film Thickness	8-10 micrometers
Quality Control	Run min. three coated plaques and measure: ¹ Breath Fogging Test: No fogging ² Hot Water Fogging Test: No fogging for 1 min Adhesion: 100% (ASTM 3002 / 3359) Scratch Resistance: No scratches, 2 psi @ 5 rev with 0000 steel wool.

¹ No fog formation after direct breathing on the coated surface

² A glass beaker (300 ml) is filled with 250 ml of water. The beaker is placed on a hot plate and the water heated to 60°C. The water temperature should be maintained 60±3 °C during the entire test. Place a chip coated with anti-fog coating on top of the beaker, with coated side facing the water bath, covering completely the beaker opening. Sample should not fog for at least one minute.