



NEW POLYESTER RESIN

A Package Solution to Single Edge Coverage

AGENDA

- Current Challenges
- Un-Met Needs / Goal
- Value Proposition
- Performance
- Summary

Market Need: Single layer powder coating with adequate coverage on the sharp edges

One coat system

- Pull-away at the sharp edges
- Corrosion and premature failure
- Requires mechanical grinding or chemical acid treatment of laser smut/carbon to attract powder

Two coat systems

- Proven to yield better result than one-coat
- Requires separate cure cycles
- Expensive and time consuming
- Additional manufacturing overhead

Dry-on-Dry

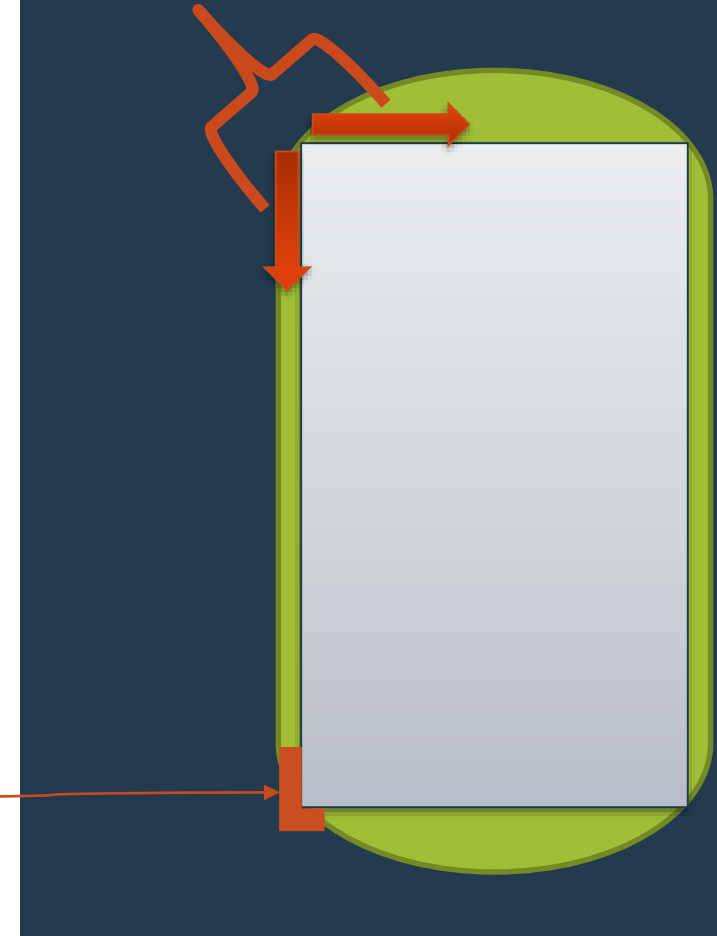
- Performance not proven to match the two coat systems
- Difficulty controlling DFT
- Requires re-designing of the paint line
- Prone to cross-contamination
- Less attractive than single coat

What happens to paint during cure?

- Rheology of the paint changes
- Shrinkage of paint occurs during cure
- The sharp edge causes the paint to flow even further way from the sharp edges
 - Exposing the bare metal at the edge

How do we keep powder on the sharp edge during cure?

Sharp edge causes paint to flow away



Value Proposition

Introducing a novel resins package designed for coating sharp edges and overcome premature paint failures



The choice for ACE, earthmoving, and snowplows applications

Innovation in performance

- Outstanding edge coverage at single coat
- Better alternative to two coats or dry-on-dry
- Excellent weathering resistance
- Robust appearance and gloss – greater than 90 units on a 60° gloss scale

Binder Package Offering

- New polyester resin
- New Additive

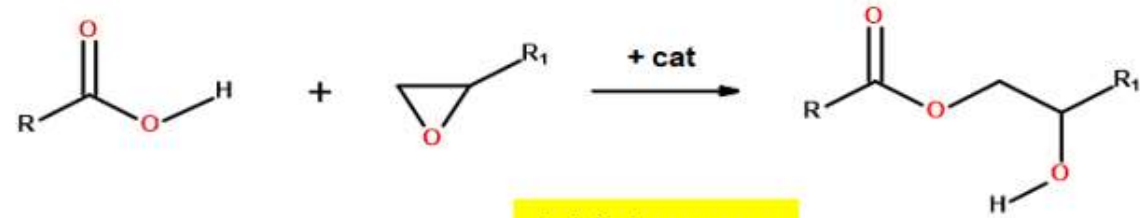
Product Specification	New Resin	New Additive
Brookfield viscosity (mPa.s)	1800 @ 200°C	1072 @ 200°C
Acid value (mg KOH/g)	50	-----
Epoxy Equivalent Weight (EEW)	-----	380
Glass transition (°C)	62	46

Composition	White	Black
New Resin	81	81
Hydroxy Alkylamide (HAA)	2.8	2.8
Flow Modifier	1.8	1.8
Benzoin	1.0	1.0
New Additive	15.5	15.5
Carbon black	-----	2.0
Kronos TR 2160	35	-----

Extrusion Conditions		Application Conditions	
Premixing	Mixaco	Grind / Sieve/Mesh	Strand / Russel/ 200
Extruder/screw	Twin screw - ZSK 30 MM	Spray gun	GEMA Optiflex 2
Temp zones (°C)	90/110/110	Substrate	CRS
Extruder speed (RPM)	350 RPM	Oven type / Cure temp	Electric oven: 15 @ 180°C
Torque (%)	65 - 75	Film thickness (mils)	3.5 – 4.5

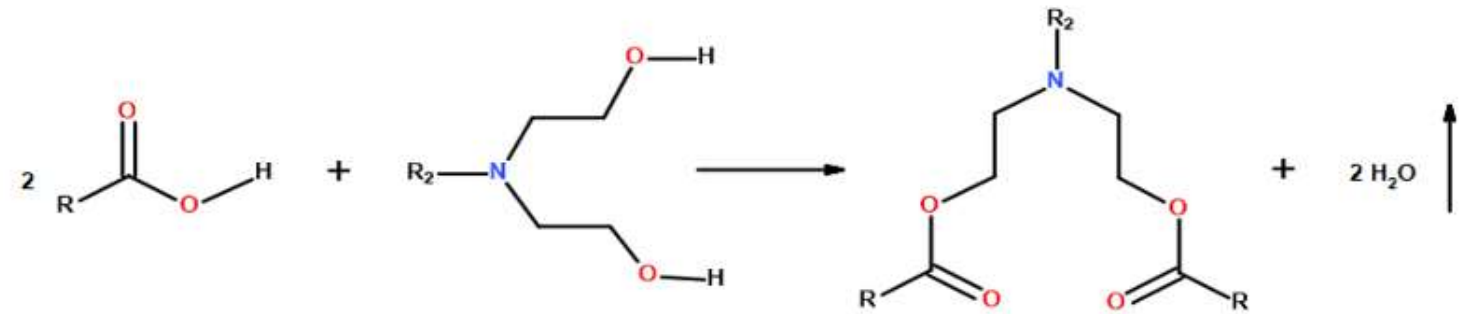
Steps

1. Caboxylated polyester with epoxide functionality



Addition rxns.

2. Caboxylated polyester and Primid XL-552 (B-hydroxy-alkylamide – HAA)



Condensation rxns.

Two-coats in one approach

Substrate: CRS Q-panels
DFT: 3.5 to 4.5 mils

	Black	White
One-Coat: Std SD TGIC	0	0
Two-coats (Hyb. primer/SD TGIC)	0	0
One-coat: New technology	2.5	3.0

Substrate: ¼" Sandblast Steel
DFT: 3.5 to 4.5 mils

	Black	White
One-Coat: Std SD TGIC	0	0
Two-coats (Hyb. primer/SD TGIC)	0	0
One-coat: New technology	2.5	3.0

DeFelsko PosiTest LPD Pinhole Detector












Rating

- 0** No coverage
- 1** Coverage on some bottom or sides
- 2** Complete coverage on bottom, and some sides
- 3** Full coverage, including all three corners

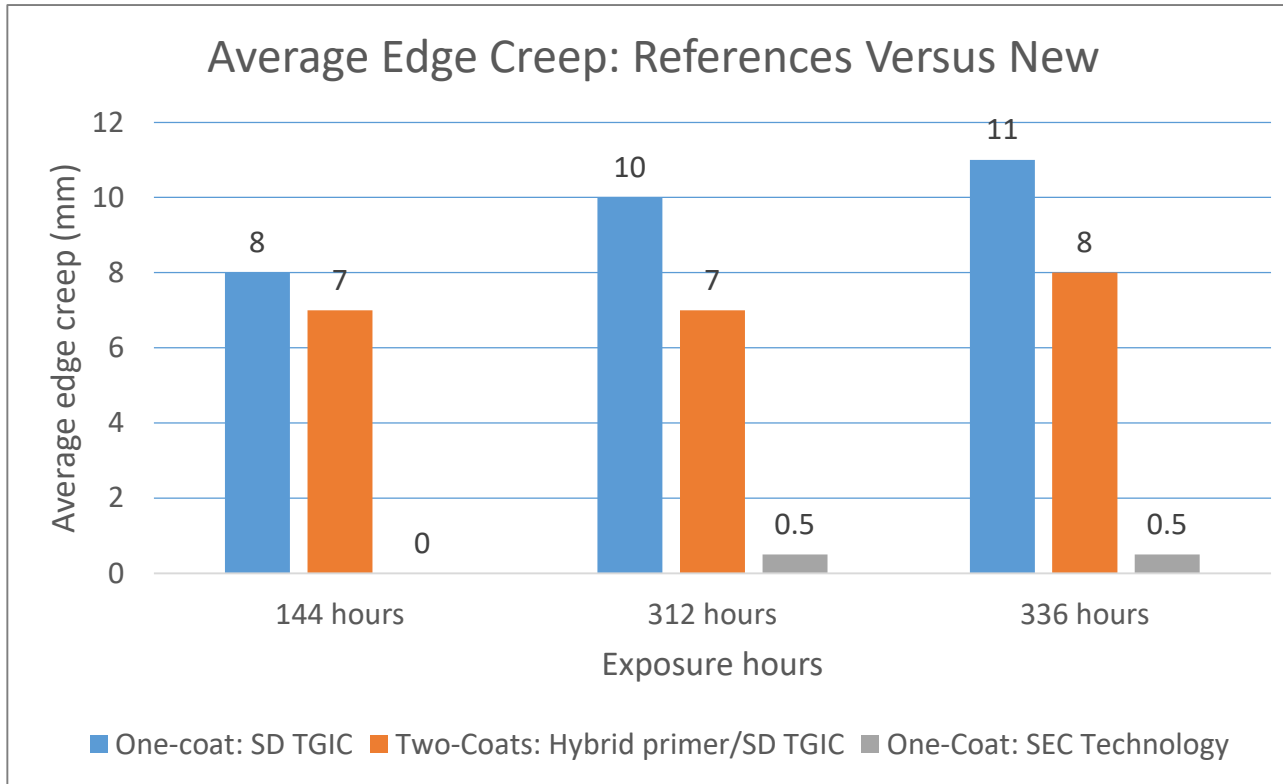


Accelerated Corrosion Screening Test on B1000 P99X

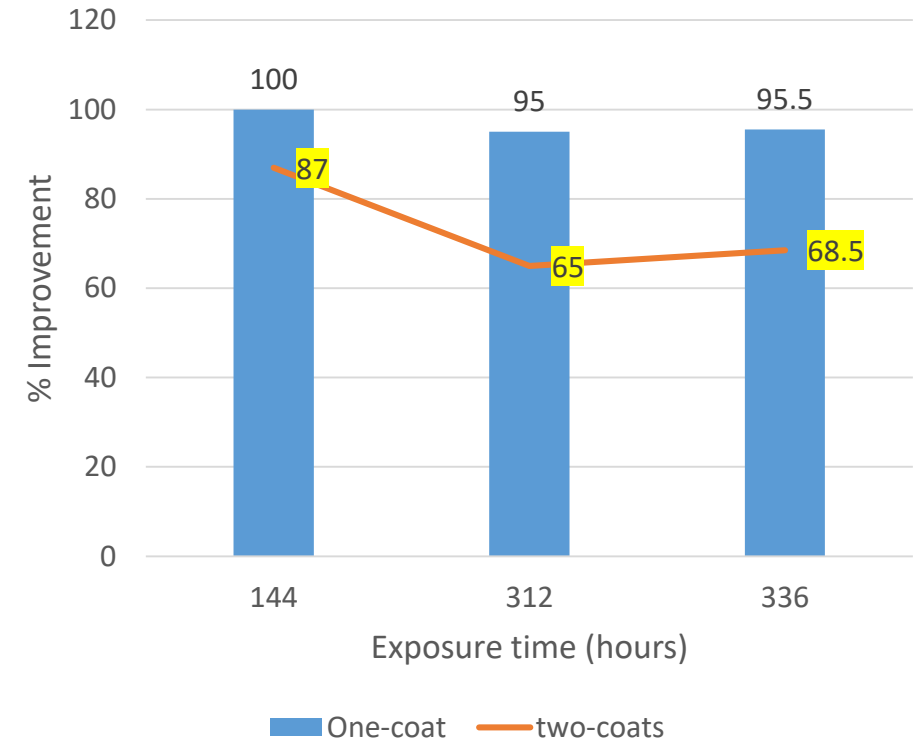
One-coat SD TGIC (DTM)	Two-coats Primer/TC	One-coat New (DTM)
		 336 hours
		 312 hours
		 144 hours

Apparatus: Branson CPX3800H Sonicator
Solution: 7% Morton salt culinox 999 food grade in distilled water
Temperature: 35 – 44°C

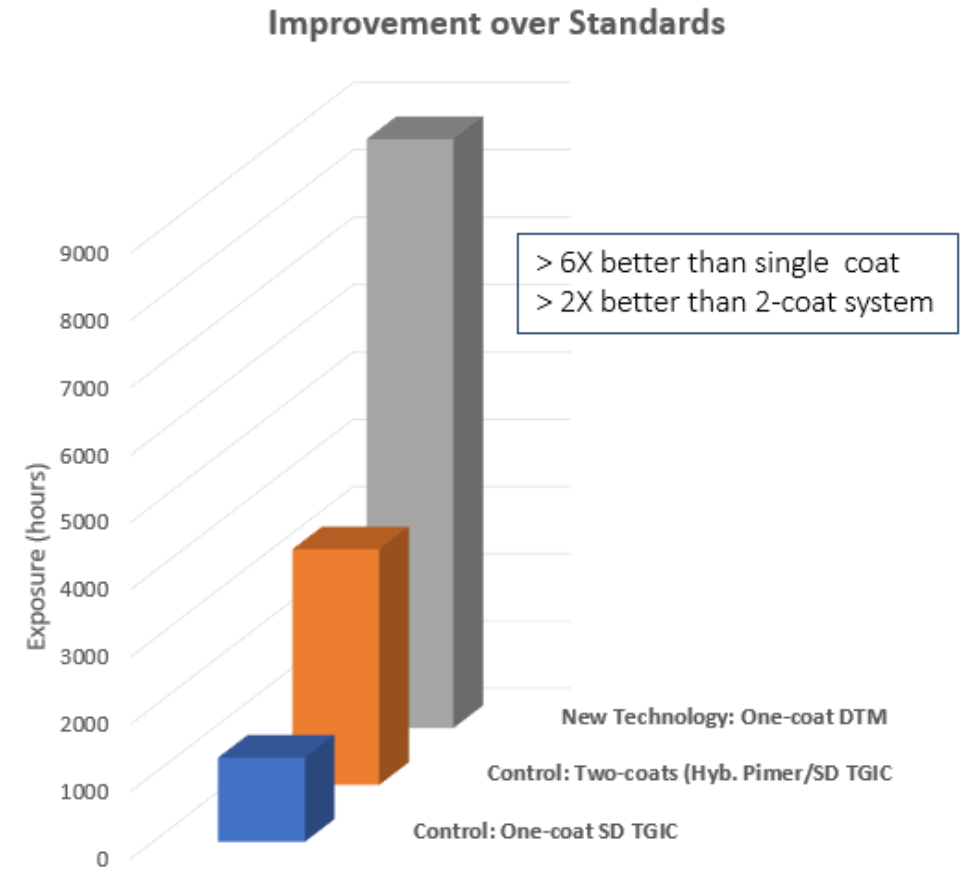
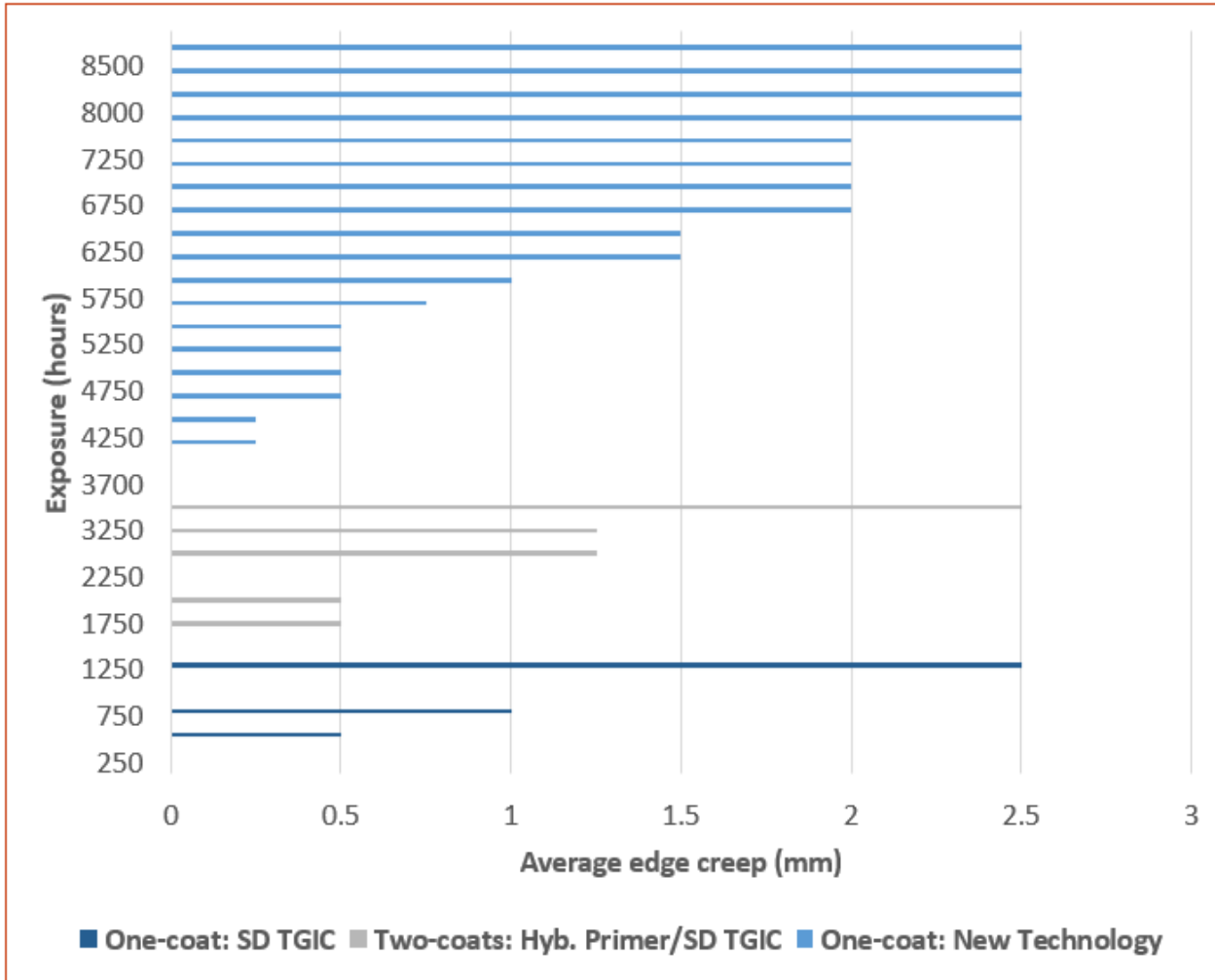
Accelerated Corrosion Screening Test on B1000 P99X



Improvement Over Conventional Systems




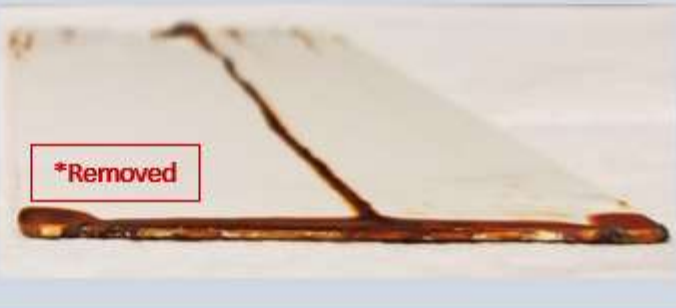
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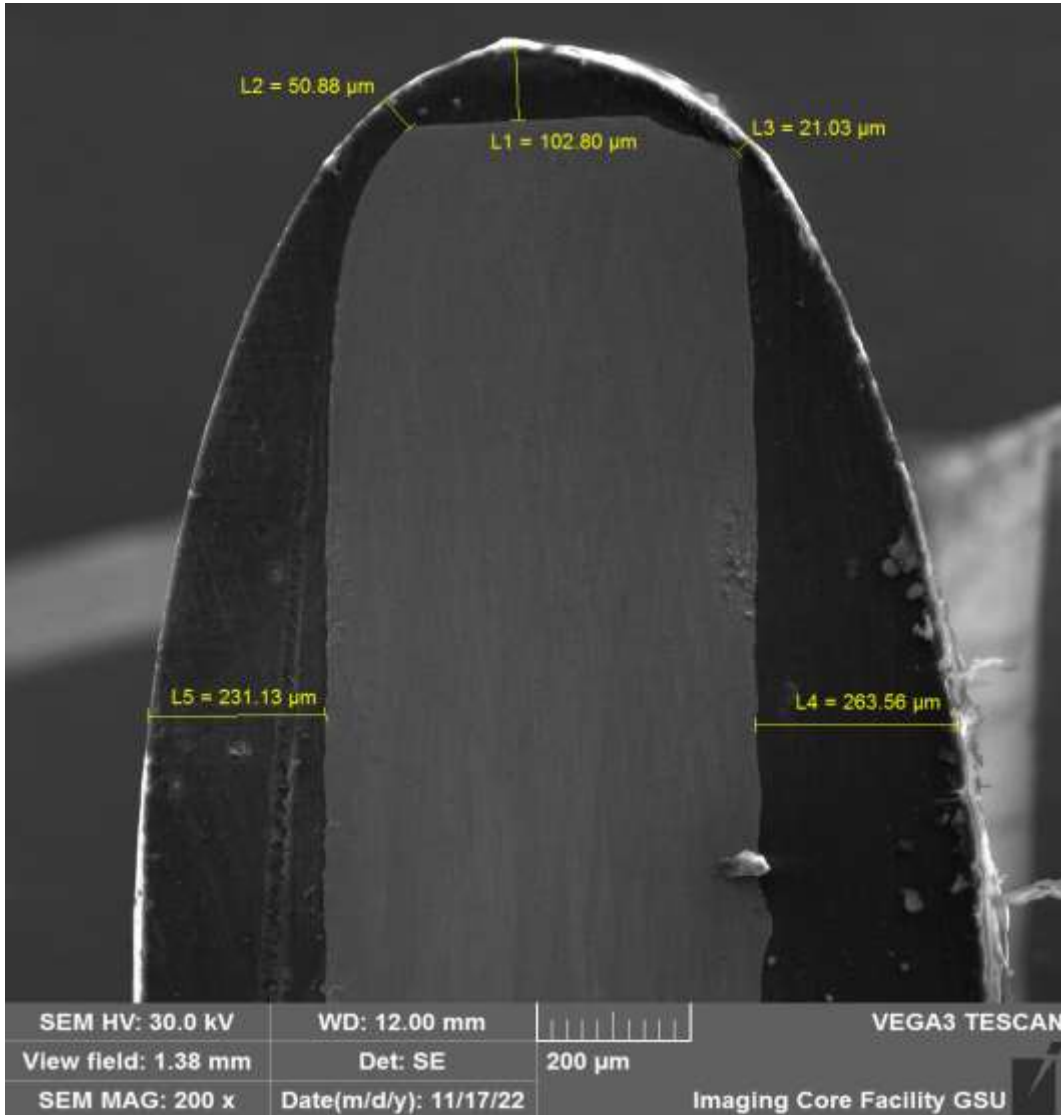
Salt Spray: ASTM B-117 (B1000 P99X) Unscribed

Performance Characteristics – Edge Corrosion

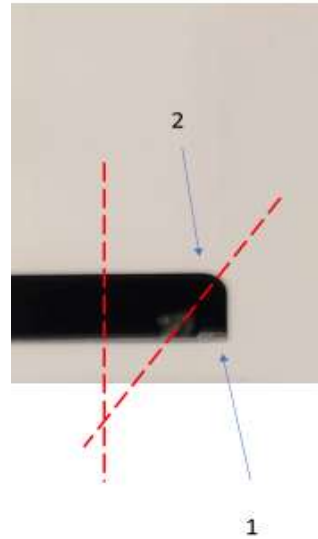
Accelerated Weathering
Salt Spray: ASTM B-117

Exposure	One – Coat: SD TGIC	Two – Coats: Primer / SD TGIC	One – Coat: New Technology
1250 Hours			
3500 Hours			
8500 Hours			

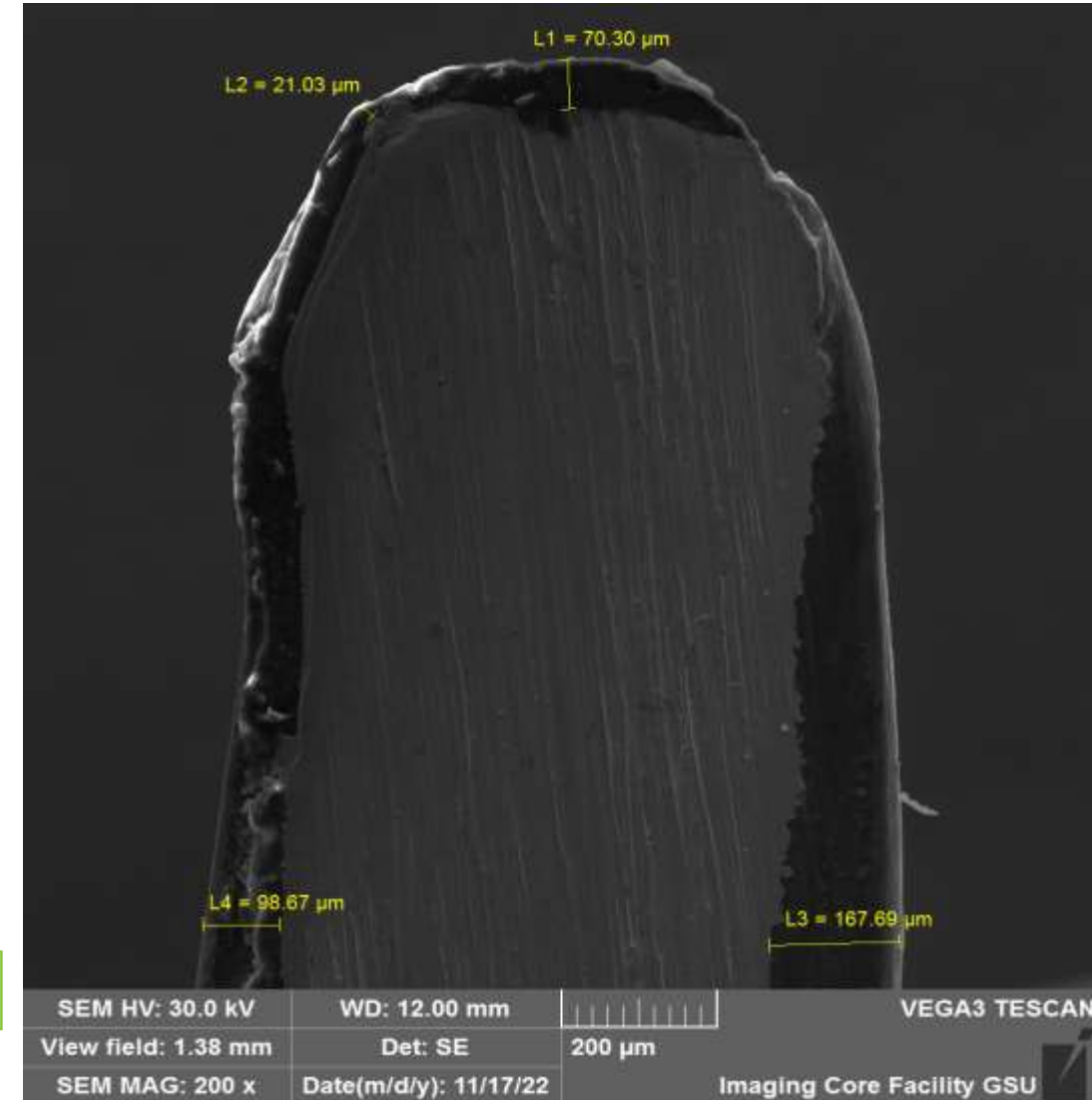
***Removed: average edge creep @ 2.5 mm**

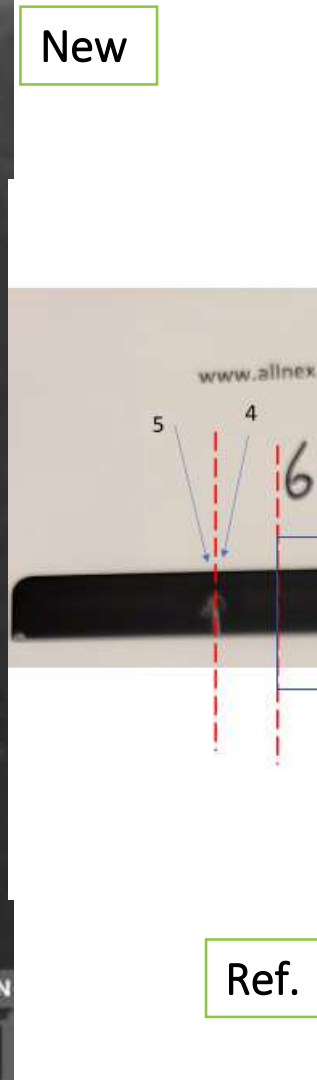
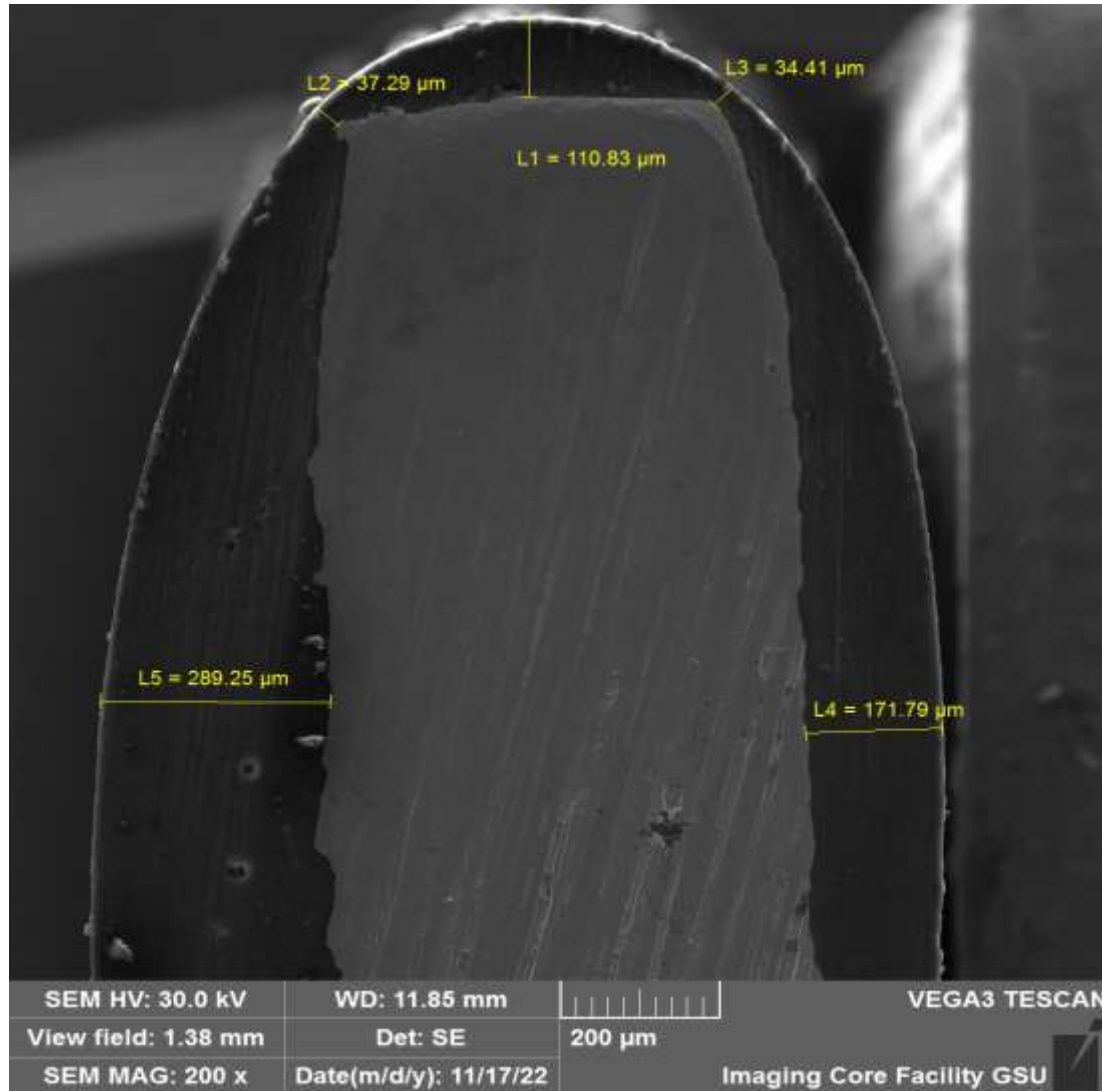


New

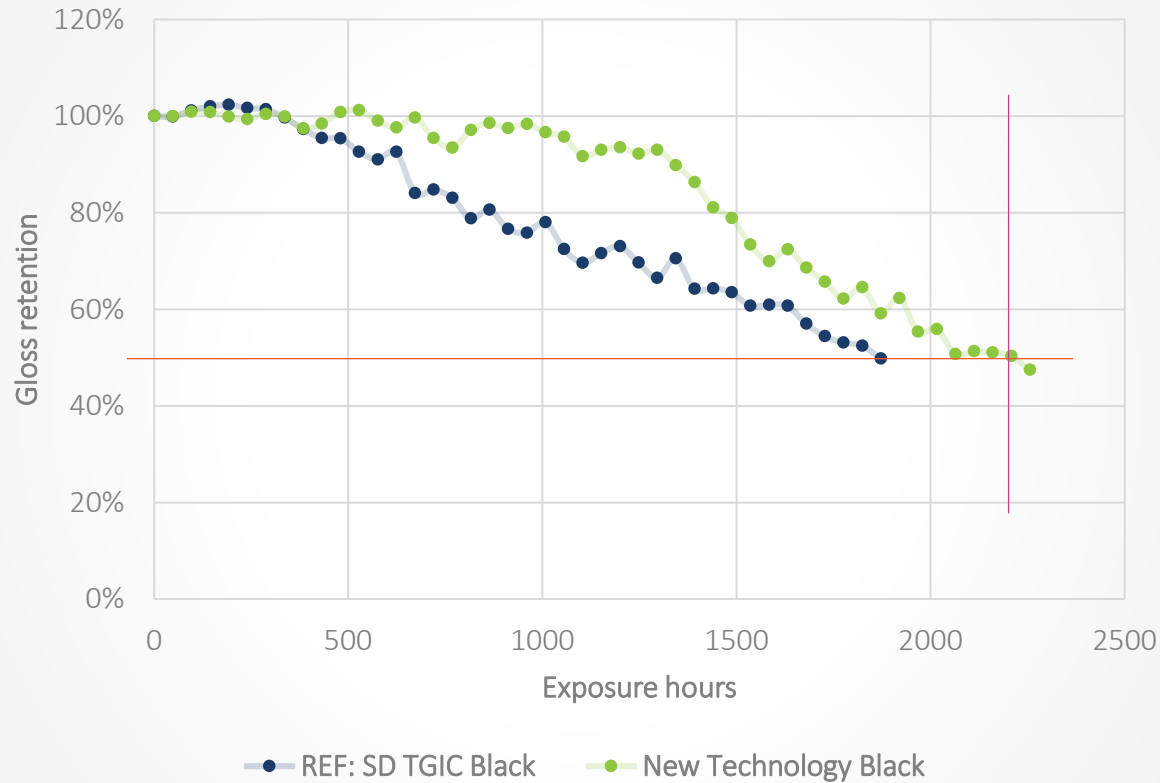


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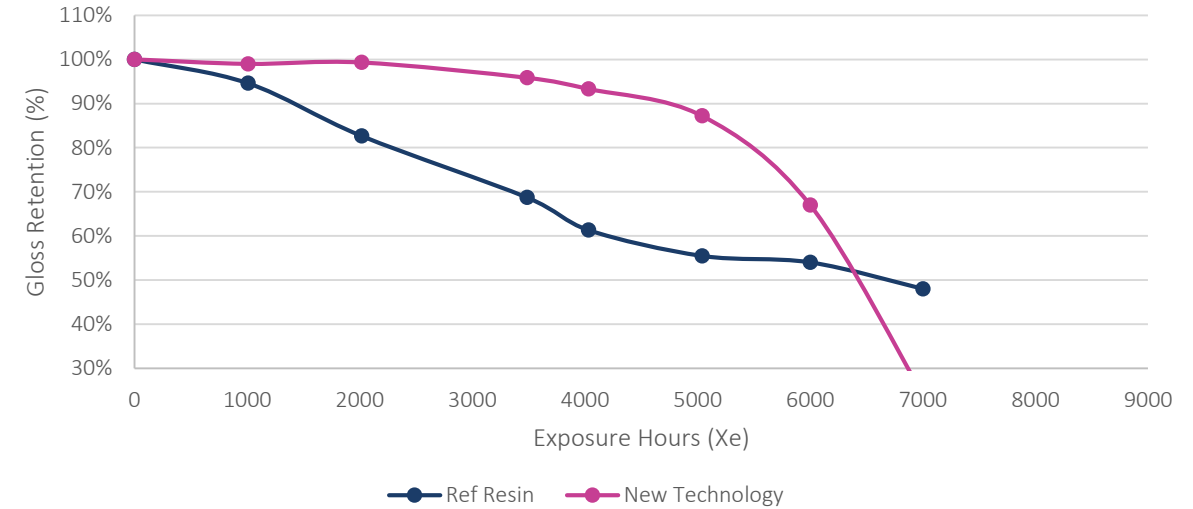


QUV – 313B



Conditions: Irradiance - 0.75 W/m²-nm | UV - 4 hrs. | condensation – 4 hrs.

Xenon Per ASTM D7869-17



ASTM D7869 - 17

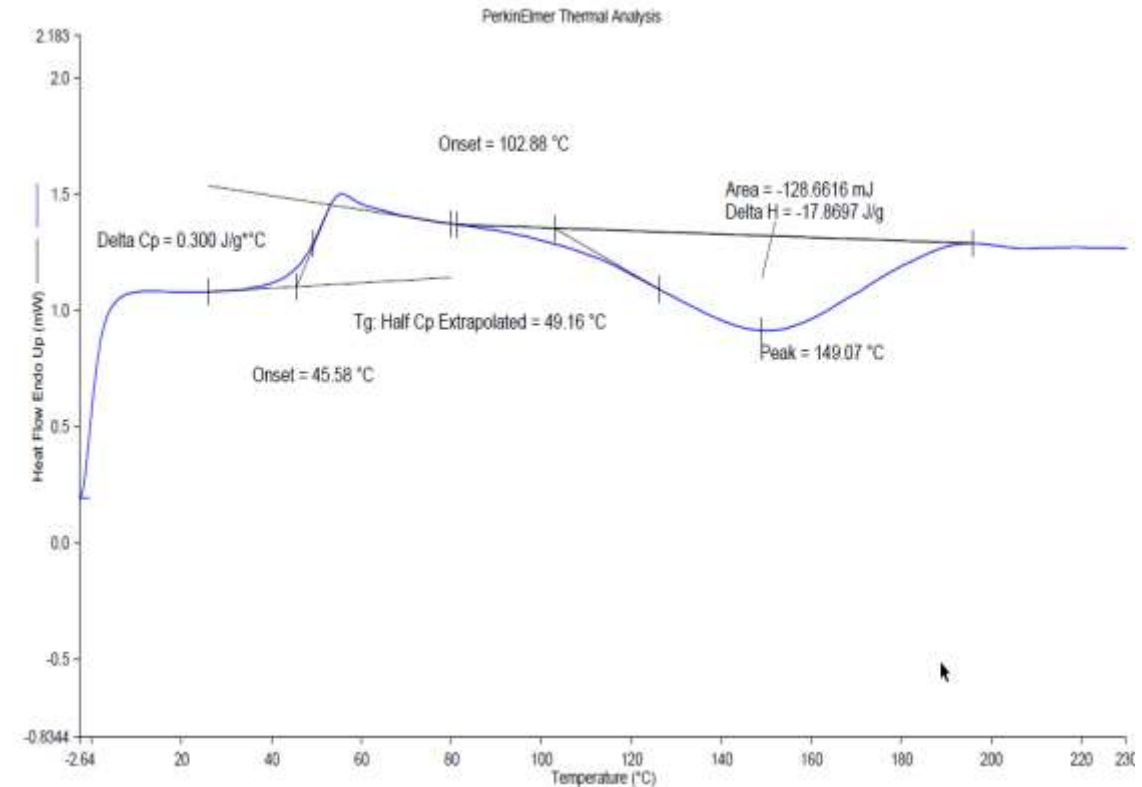
TABLE 1 Exposure Cycle

Step Number	Step Minutes	Function	Irradiance Set Point ^a at 340 nm W/(m ² .nm)	Black Panel Temperature Set Point ^a	Chamber Air Temperature Set Point ^a	Relative Humidity Set Point ^a
1	240	dark + spray	—	—	40°C	95%
2	30	light	0.40	50°C	42°C	50%
3	270	light	0.80	70°C	50°C	50%
4	30	light	0.40	50°C	42°C	50%
5	150	dark + spray	—	—	40°C	95%
6	30	dark + spray	—	—	40°C	95%
7	20	light	0.40	50°C	42°C	50%
8	120	light	0.80	70°C	50°C	50%
9	10	dark	—	—	40°C	50%
10	Repeat subcycle steps 6 to 9 (shown in bold) an additional 3 times (for a total of 24 h = 1 cycle).					

Performance Characteristics

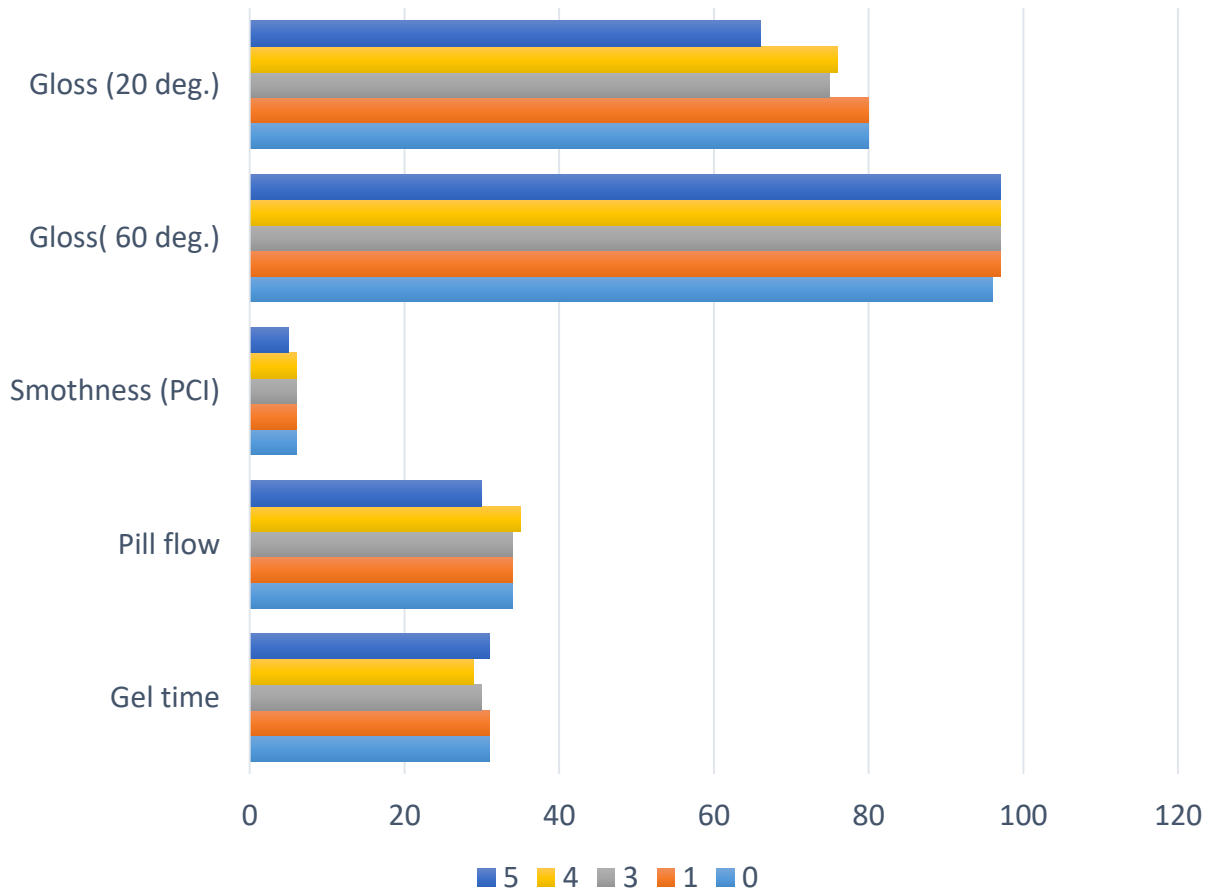
Properties	Test Method	White	Black
Gel time (sec)	PCI #6	31	31
Inclined plate flow (mm)	PCI #7	34	41
Smoothness	PCI #20	5-6	6
Gloss (units): 60° / 20°	ASTM D523	98.5 / 80.1	95 / 81
Impact @ 2mils (in/lb)	ASTM D2794	40/20	40/40
Adhesion	ASTM D3359	5B	5B
Recoat adhesion	ASTM D3359	5B	5B
Chemical resistance	PCI #8	Pass	Pass
Edge coverage		2.5	2.5

Formulated Powder Kinetics: DSC Analysis

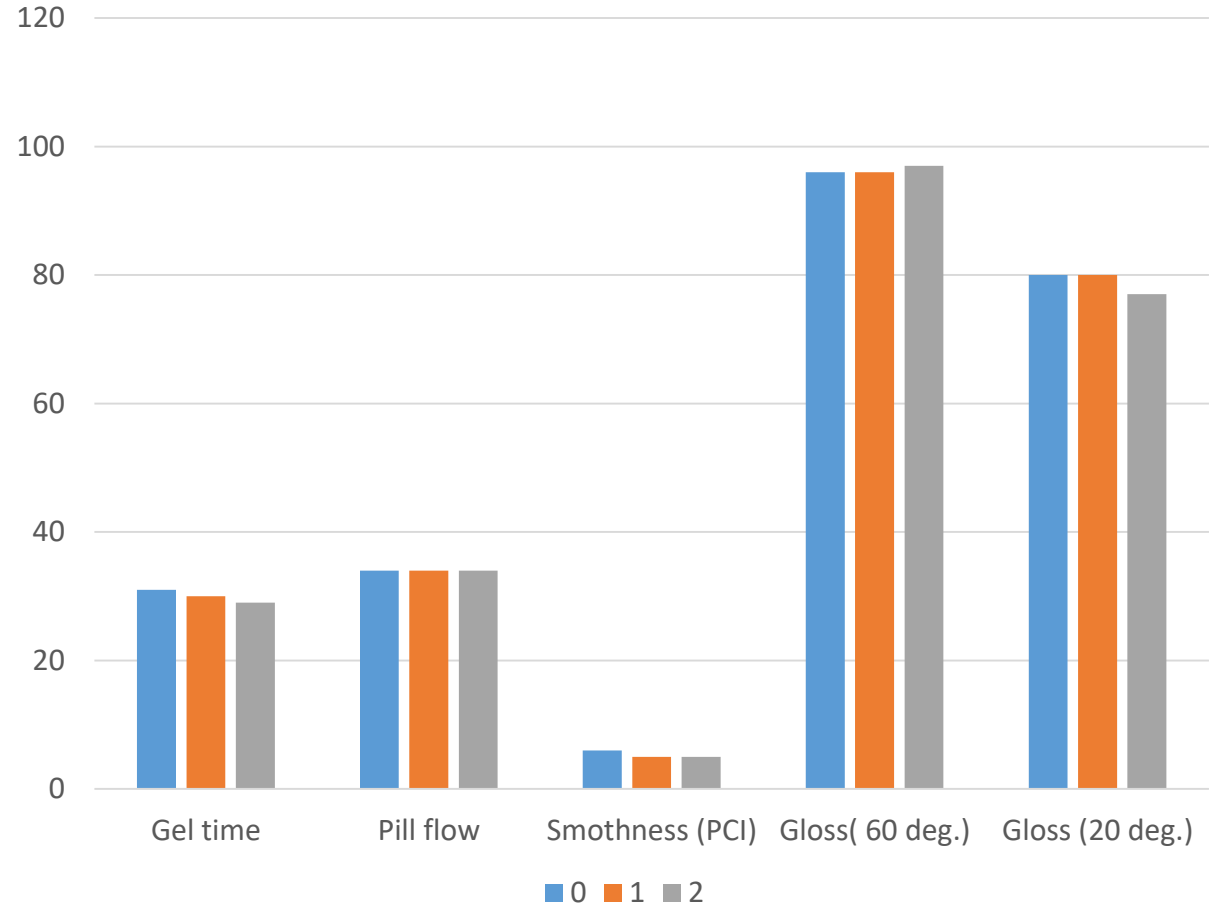


Storage Stability

13 weeks exposure at RT



Two days exposure @ 35 Deg C





THANK YOU FOR YOUR ATTENTION

Questions?