Coatings Trends & Technologies
September 2021

DIRECT TO METAL
ISOCYANATE FREE INNOVATION

How Sheboygan Paint Company's innovation could displace conventional solvent-borne technology

SHEBOYGAN PAINT COMPANY
Innovative Coating Solutions..... for Generations

Cynthia Baricos – Director of R&D

100-YEARS IN INDUSTRIAL COATINGS

1921 — Knilans-Wheeler Varnish Co.

1923 — Renamed Sheboygan Paint Company

1930 — Move to a New Location in Sheboygan

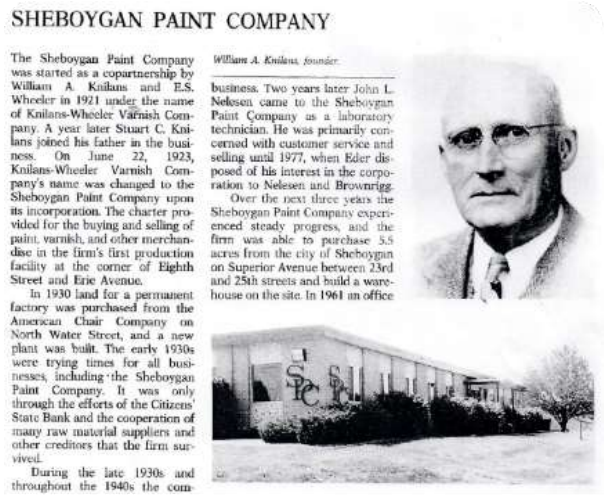
1957 — Warehouse Added

1966 — A New Factory is Built In Sheboygan

1984 — Opens Cedartown GA Facility

2003 — Acquire Sentry Paint

2020 — External CEO & Board



SHEBOYGAN PAINT COMPANY

The Sheboygan Paint Company was started as a copartnership by William A. Knilans and E.S. Wheeler in 1921 under the name of Knilans-Wheeler Varnish Company. A year later Stuart C. Knilans joined his father in the business. On June 22, 1923, Knilans-Wheeler Varnish Company's name was changed to the Sheboygan Paint Company upon its incorporation. The charter provided for the buying and selling of paint, varnish, and other merchandise in the firm's first production facility at the corner of Eighth Street and Erie Avenue.

In 1930 land for a permanent factory was purchased from the American Chair Company on North Water Street, and a new plant was built. The early 1930s were trying times for all businesses, including the Sheboygan Paint Company. It was only through the efforts of the Citizens' State Bank and the cooperation of many raw material suppliers and other creditors that the firm survived.

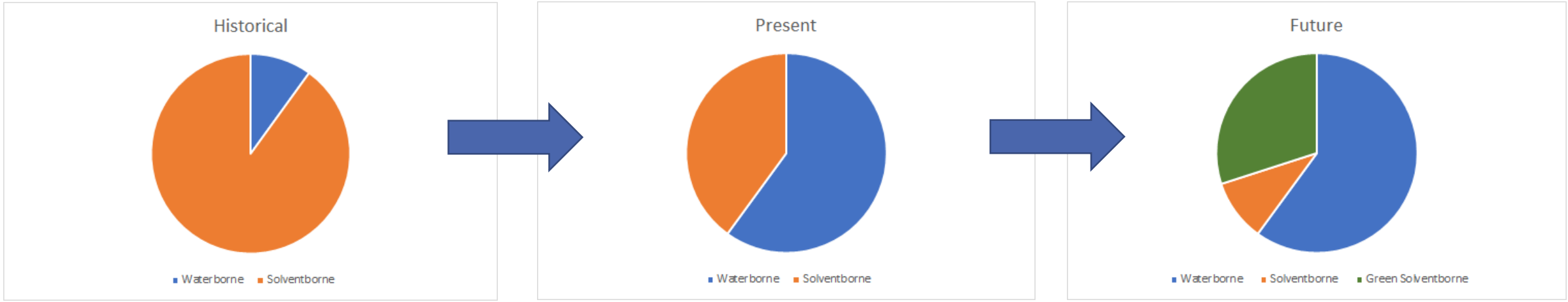
During the late 1930s and throughout the 1940s the com-

William A. Knilans, founder.

business. Two years later John L. Nelesen came to the Sheboygan Paint Company as a laboratory technician. He was primarily concerned with customer service and selling until 1977, when Eder disposed of his interest in the corporation to Nelesen and Brownrigg.

Over the next three years the Sheboygan Paint Company experienced steady progress, and the firm was able to purchase 5.5 acres from the city of Sheboygan on Superior Avenue between 23rd and 25th streets and build a warehouse on the site. In 1961 an office

TECHNOLOGY & INNOVATION



SURVEY OF AVAILABLE CONVENTIONAL SOLUTIONS

Product	Green	Premium Performance	Easy to Use	Direct to Metal	Equip Cost
2K Polyurethane	✗	✗	✓	✓	✓
Bake Enamel	✗	✓	✗	✓	✗
Polyaspartic	✓	✗	✓	✓	✗
New Technology	✓	✓	✓	✗	✓
Market Need	✓	✓	✓	✓	✓

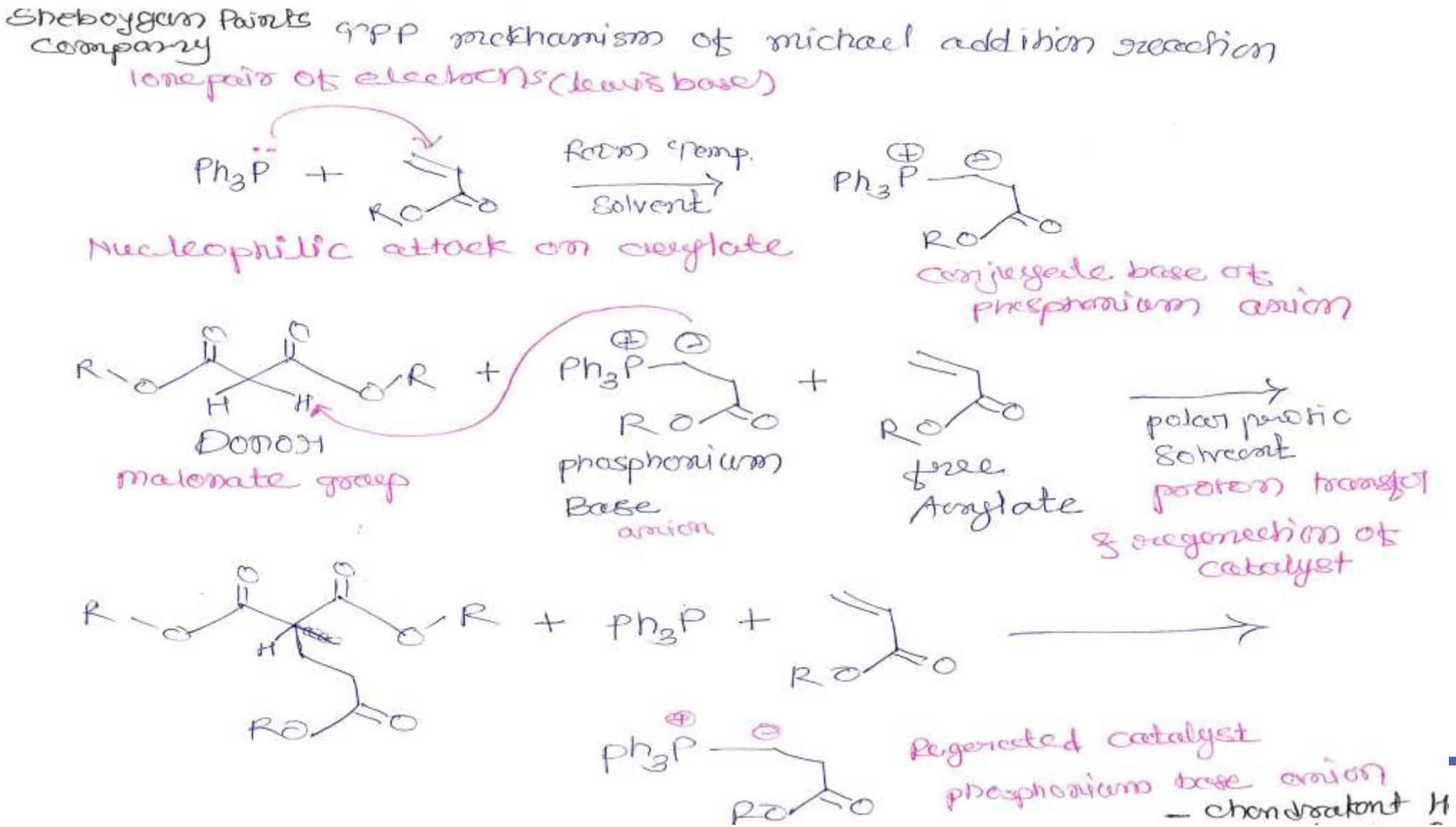
PATENT-PENDING TECHNOLOGY

- Marketplace gap for high-performance, green coating technologies
- Current products are restrictive
- SPC's catalyst makes existing technology more accessible to a wider audience

CATALYST SCREENING

Catalyst Type	Formula Number	Catalyst Level	Observations
Sodium Hydroxide NaOH 25 % solution in Ethanol and Water	1	0.5%	No Reaction, film was wet even after 16 hours
	1	1.3%	Spontaneous exothermic reaction, Gelled in 5 minutes, not possible to spray
	2	0.3%	No Reaction, film was wet even after 16 hours , grit formation
Potassium Hydroxide KOH 25 % solution in Ethanol and Water	1	0.3%	No Reaction, film is wet even after 16 hours
	1	0.5%	No Reaction, film is wet even after 16 hours
	2	0.3%	No Reaction, film was wet even after 16 hours , grit formation
DABCO	1	4.0%	No Reaction, film was wet even after 16 hours
	2	1.0%	No Reaction, film was wet even after 16 hours
	2	4.0%	No Reaction, film was wet even after 16 hours
Tri o-tolylphosphine	1	0.5%	No Reaction, film is wet even after 16 hours
	1	4.0%	No Reaction, film is wet even after 16 hours
	2	0.5%	Spontaneous Grit formation, No reaction and no curing
	2	2.0%	Spontaneous Grit formation, No reaction and no curing
Trioctylphosphine	1	0.5%	Spontaneous reaction, gelled within 8 minutes
	1	2.0%	Spontaneous reaction, gelled within 2 minutes
	2	0.5%	Skin and grit formation, Rapid catalytic reaction, film curing with moderate speed.
	2	2.0%	Skin and grit formation, Spontaneous catalytic reaction, film curing within 20-25 minutes
Tricyclohexylphosphine	1	0.5%	No Reaction, film is wet even after 16 hours
	1	2.0%	No Reaction, film is wet even after 16 hours
	2	0.5%	Skin and grit formation, Partial Spontaneous catalytic reaction, no curing
	2	2.0%	Skin and grit formation, Partial Spontaneous catalytic reaction, no curing
Triphenylphosphine	1	2.0%	Hard cured film
	1	3.5%	Hard cured film
	1	5.0%	Hard cured film
	2	2.0%	Hard cured film
	2	3.5%	Hard cured film
	2	5.0%	Hard cured film
Current Industry Catalyst	1	2.0%	Hard cured film
	1	3.5%	Hard cured film
	1	5.0%	Hard cured film
	2	2.0%	Hard cured film
	2	3.5%	Hard cured film
	2	5.0%	Hard cured film

DISCOVERY PHASE - REACTION MECHANISM IDENTIFIED



FEASIBILITY GATE REVIEW

Solution Discovery

- Researched possible Michael addition catalysts
- Researched high rate of conversion catalysts
- Initial formulation contained 16% Triphenyl Phosphine

First Test Using TPP

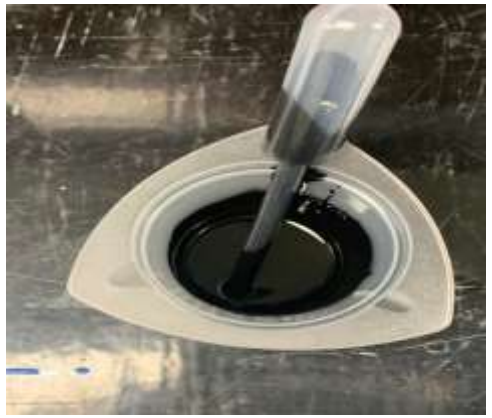
PROTOTYPE EXPERIMENTAL DESIGN

System 1

- Slower cure response
  - Set to Touch 30-45 min
  - Dry to Touch 90 min
- Long pot life
  - Sprayable for 2 hours

System 2

- Fast cure response
  - Set to Touch 15-20 min
  - Dry to Touch 60 min
- Long pot life
  - Sprayable for 30-40 min



PRODUCT DEVELOPMENT

Salt Spray Testing

System 1 Direct to Metal with Triphenylphosphine

- **500 hours salt spray**
- Panels were removed and scraped with a flat blade
- #8 blisters across the panel
- Excellent adhesion over CRS even after scraping

Bare Ground CRS

Primed Ground CRS

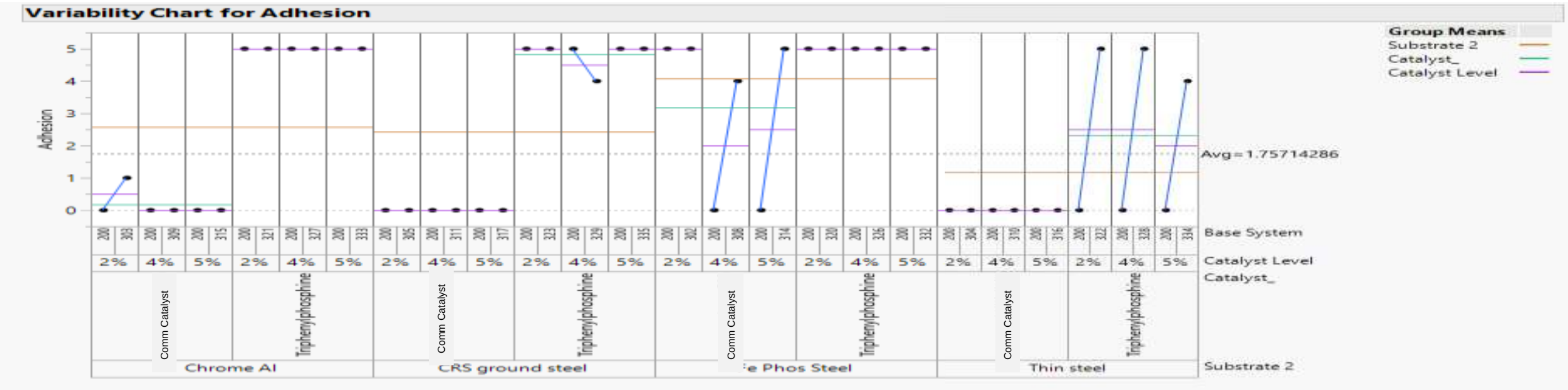
System 1 over Primer with Triphenylphosphine

- **3500 hours salt spray**
- Few #8 and #6 blisters at scribe
- No Blisters or Rust in field

DIRECT TO METAL ADHESION PERFORMANCE

Variance Components

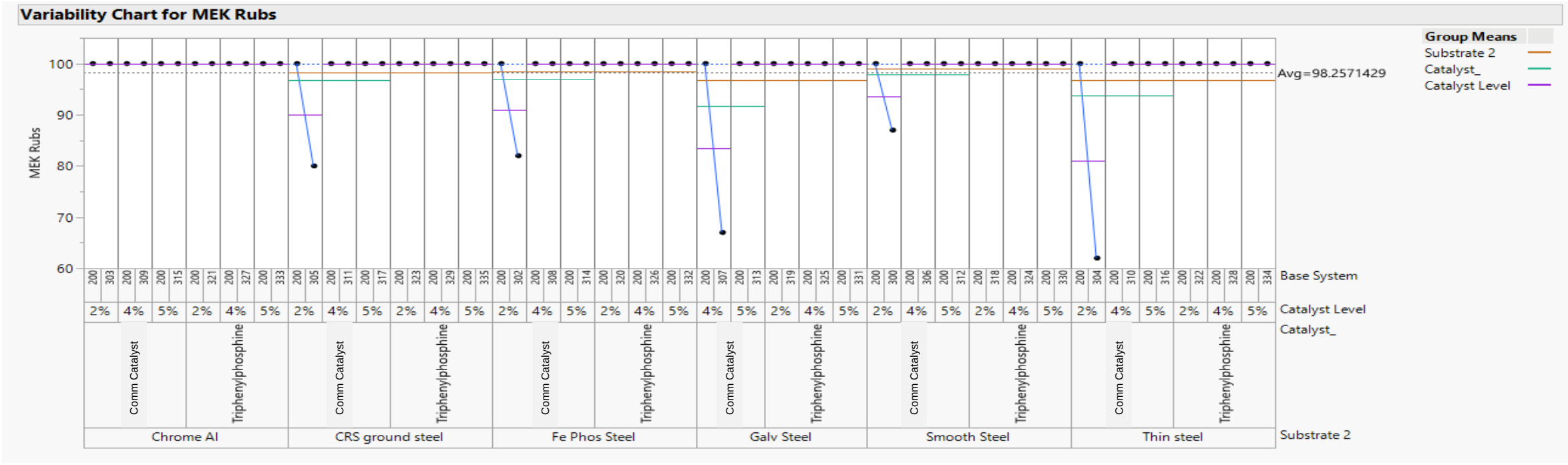
Component	Var Component	% of Total	20 40 60 80	Sqrt(Var Comp)
Substrate 2	1.7285966	36.3		1.3148
Catalyst_	0.9019642	18.9		0.9497
Catalyst Level	0.0442069	0.9271		0.2103
Base System	0.2817796	5.9		0.5308
Within	1.8115564	38.0		1.3459
Total	4.7681038	100.0		2.1836



FILM HARDNESS

Variance Components

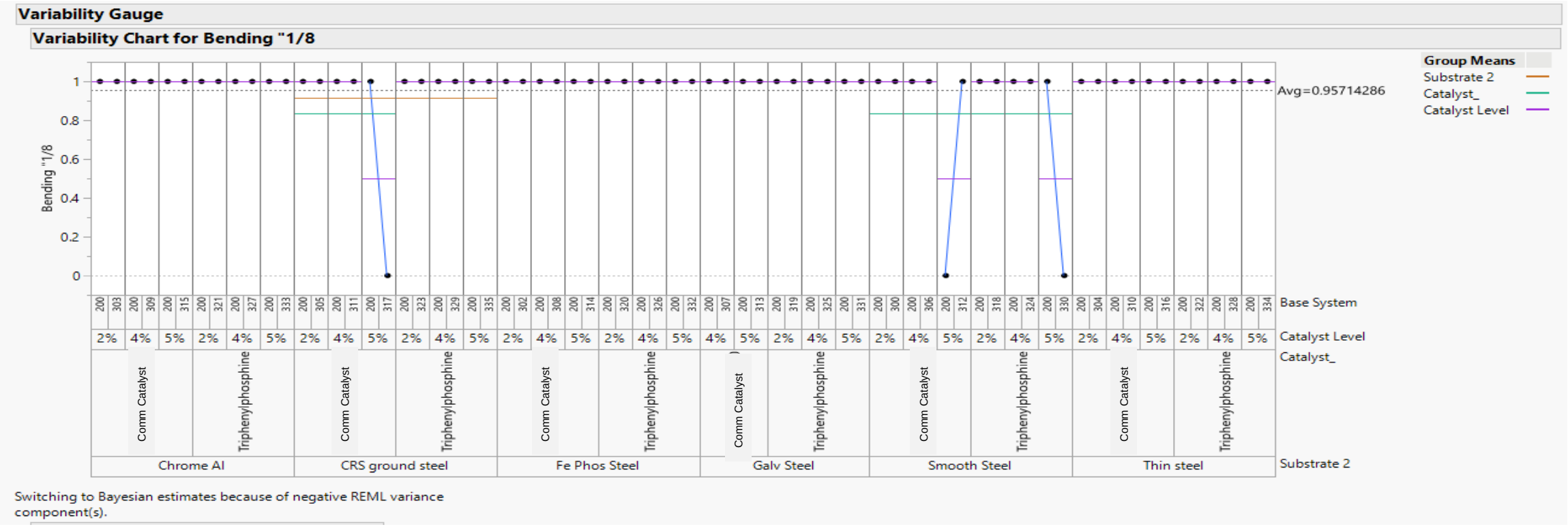
Component	Var Component	% of Total	20 40 60 80	Sqrt(Var Comp)
Substrate 2	9.6791e-10	1.2e-9		3.11e-5
Catalyst_	0.347013	0.4251		0.5891
Catalyst Level	2.10758e-9	2.6e-9		4.59e-5
Base System	81.289503	99.6		9.0161
Within	1.69873e-9	2.1e-9		4.12e-5
Total	81.636516	100.0		9.0353



FLEXIBILITY

Variance Components

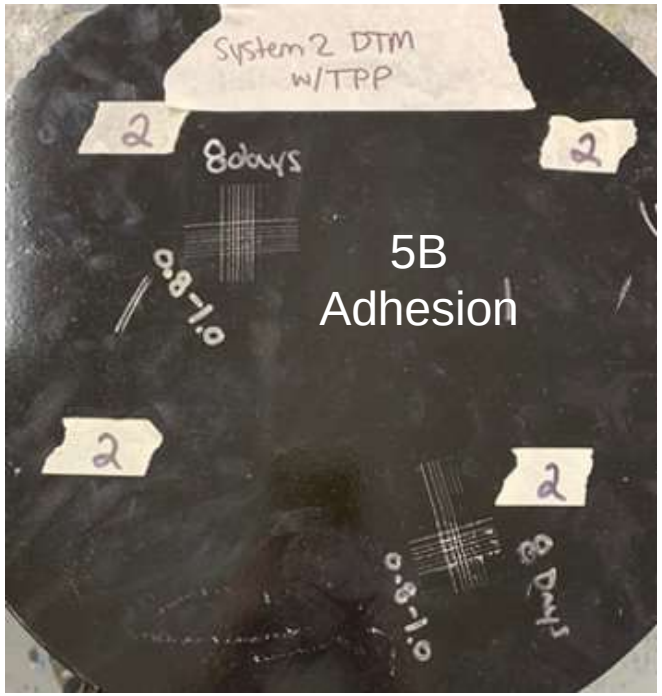
Component	Var Component	% of Total	20 40 60 80	Sqrt(Var Comp)
Substrate 2	0.00032789	0.7944		0.01811
Catalyst_	0.00072068	1.7		0.02685
Catalyst Level	0.00161388	3.9		0.04017
Base System	0.01295869	31.4		0.11384
Within	0.02565571	62.2		0.16017
Total	0.04127685	100.0		0.20317



PRODUCT TRIAL

System 2 DTM with TPP

- Low Dry Film Thickness 0.8-1.0 mils



NOW AVAILABLE SOLUTIONS

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Bake Enamel	✗	✓	✗	✓	✗
Polyaspartic	✓	✗	✓	✓	✗
New Competitive Technology	✓	✓	✓	✗	✓
SPC P	✓	✓	✓	✗	✓
SPC 1	✓	✓	✓	✓	✓

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Innovative Coating Solutions….. for Generations

For a copy of the presentation and the full white paper please contact:

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