



# Novel High Performance Waterborne Oil-modified Urethane for Wood Flooring and Furniture Applications

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**37** plants in the world

**2,390** mrd € turnover in 2023

**3.036** employees

**786** kton volume sale in 2023

we are a specialty  
polymers & intermediates  
company  
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COMPOSITES



INTERMEDIATES

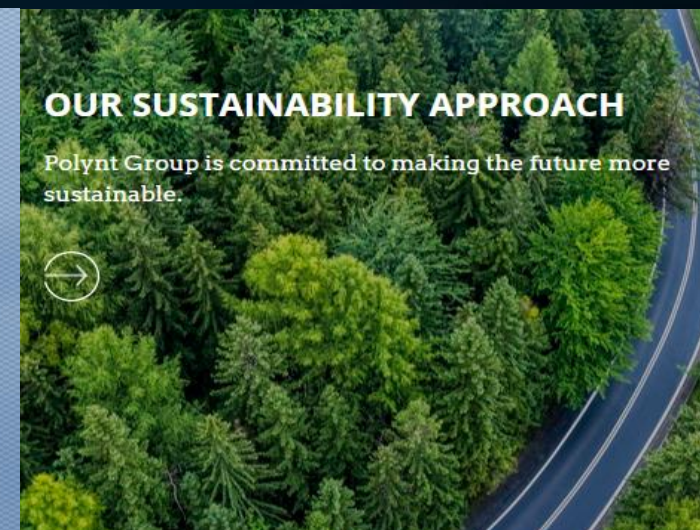


COATINGS



## OUR SUSTAINABILITY APPROACH

Polynt Group is committed to making the future more sustainable.



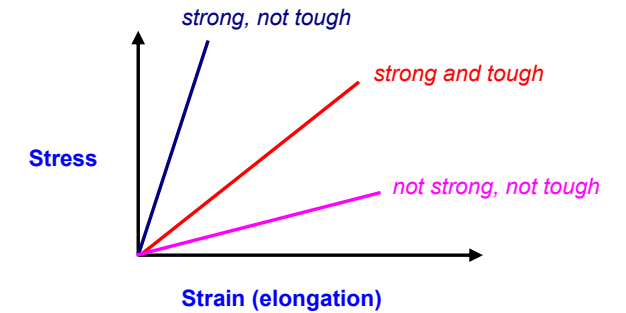
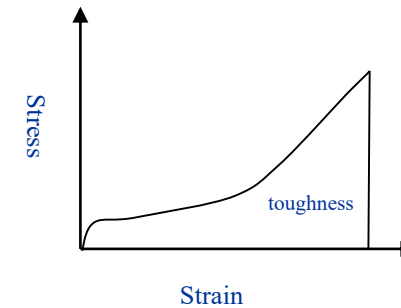
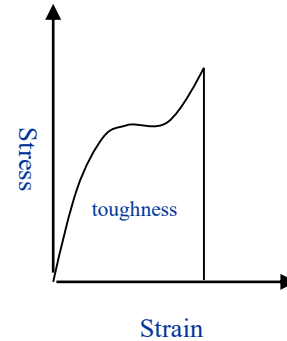
# Benefit of Urethanes

Structural Element	Chemical	Weathering	Flexibility	Hardness	Abrasion	Heat	Water
Aliphatic hydrocarbon chains	Good	Excellent	Good	Good	Good	Good	V. Good
Aromatic hydrocarbon chains	Excellent	Poor	Fair	Excellent	Excellent	V. Good	Excellent
Alkoxy groups	Fair	Good	Excellent	Poor	Good	Poor	Poor
Ester linkages	Poor	Good	Excellent	Fair	Good	Poor	Good
Urea linkages	Good	Poor	Poor	Excellent	Fair	Good	Good
<b>Urethane linkages</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Excellent</b>	<b>Good</b>	<b>Good</b>
Allophanate groups	Fair	Excellent	Fair	Good	Good	Fair	Good
Amide linkages	Fair	Poor	Good	Good	Good	Fair	Fair
Linearity	Good	V. Good	Excellent	Fair	Fair	Poor	Depends
Low molecular weight	Poor	Poor	Fair	Fair	Good	Poor	Poor
High molecular weight	Good	Good	Good	Good	Good	Fair	V. Good
High crosslink density	Excellent	Fair	Poor	Excellent	V. Good	V. Good	Good



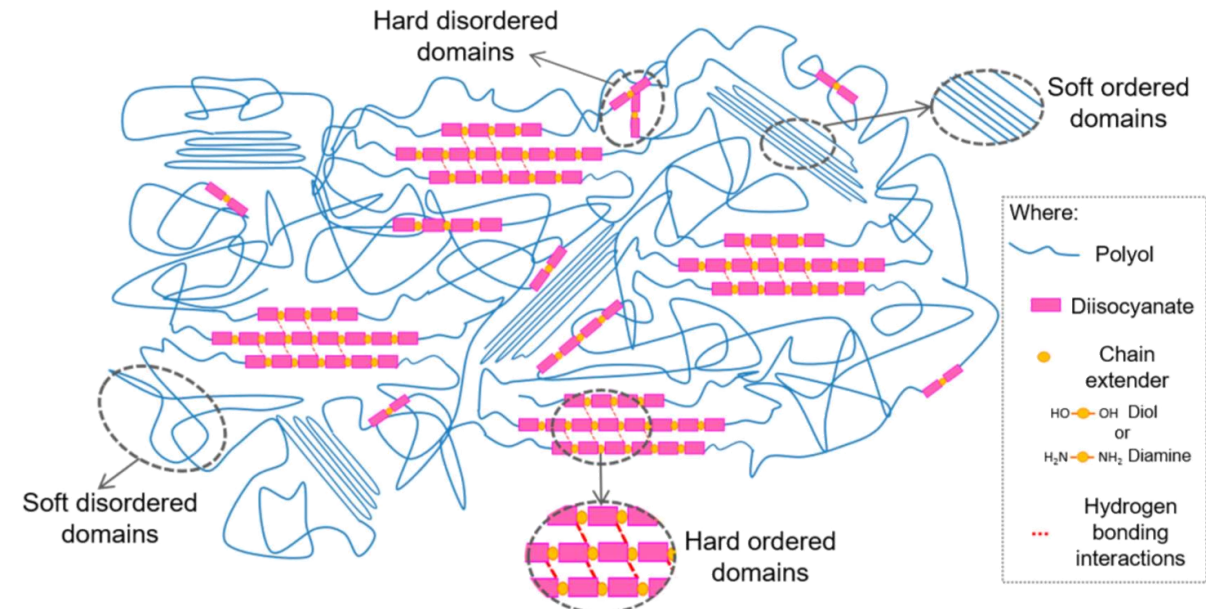
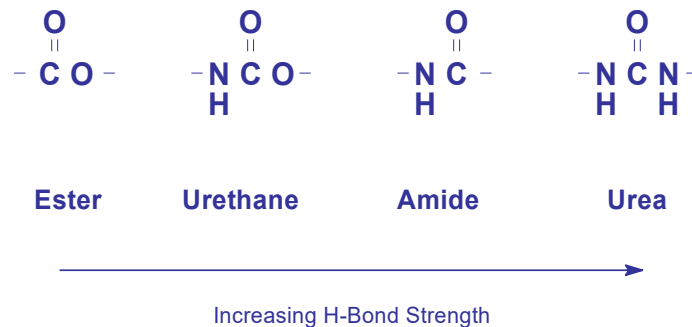
## ■ Toughness

- Soft but not tacky
- Hard but not brittle
  - Mechanical properties
  - Abrasion resistance



## ■ Segmentation

## ■ Moderate Hydrogen Bonding

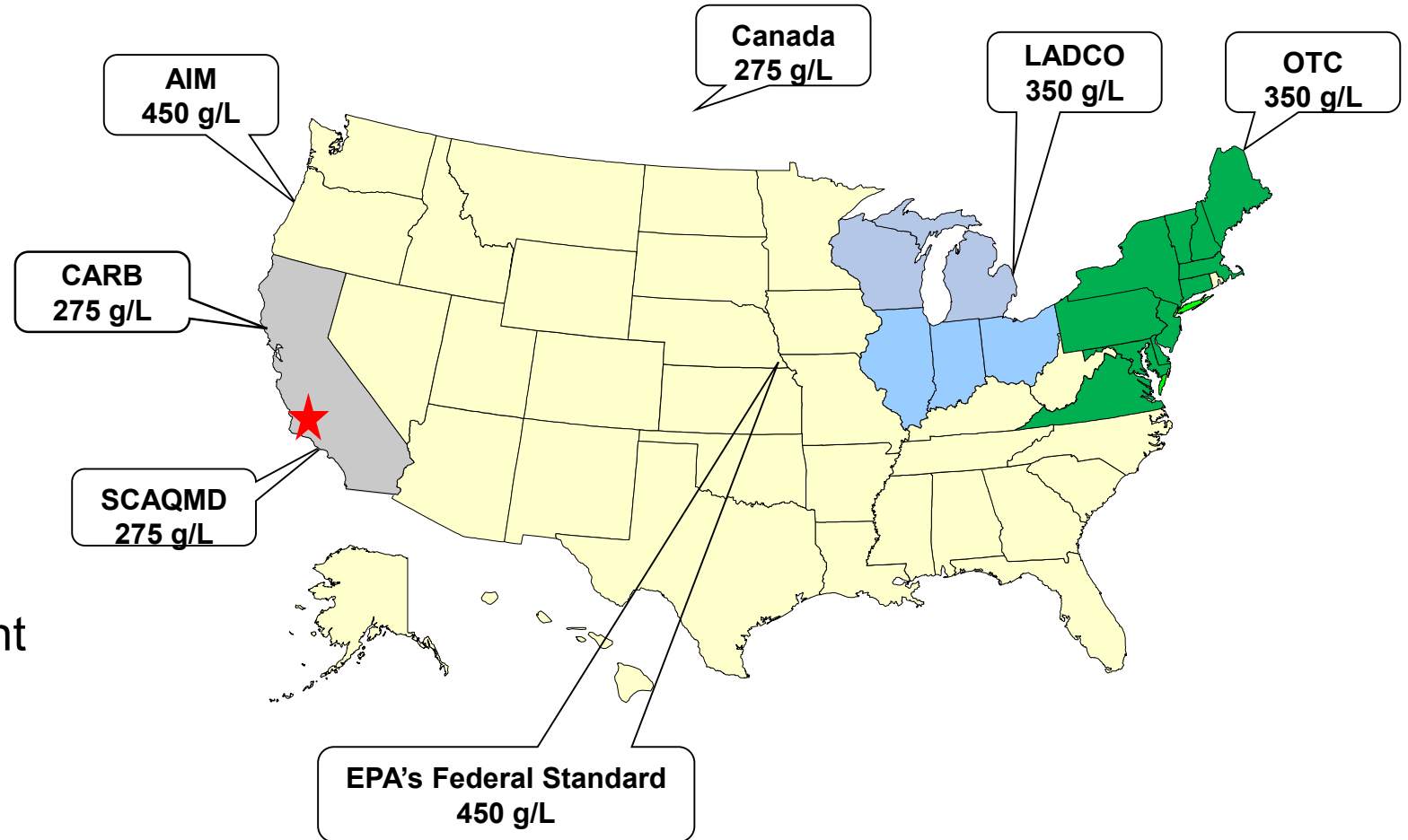


## ■ Solvent-borne systems

- High VOC >275 g/L
- Cost effective
- High hydrolytic stability
- Fewer coats needed
- High gloss values

## ■ Waterborne systems

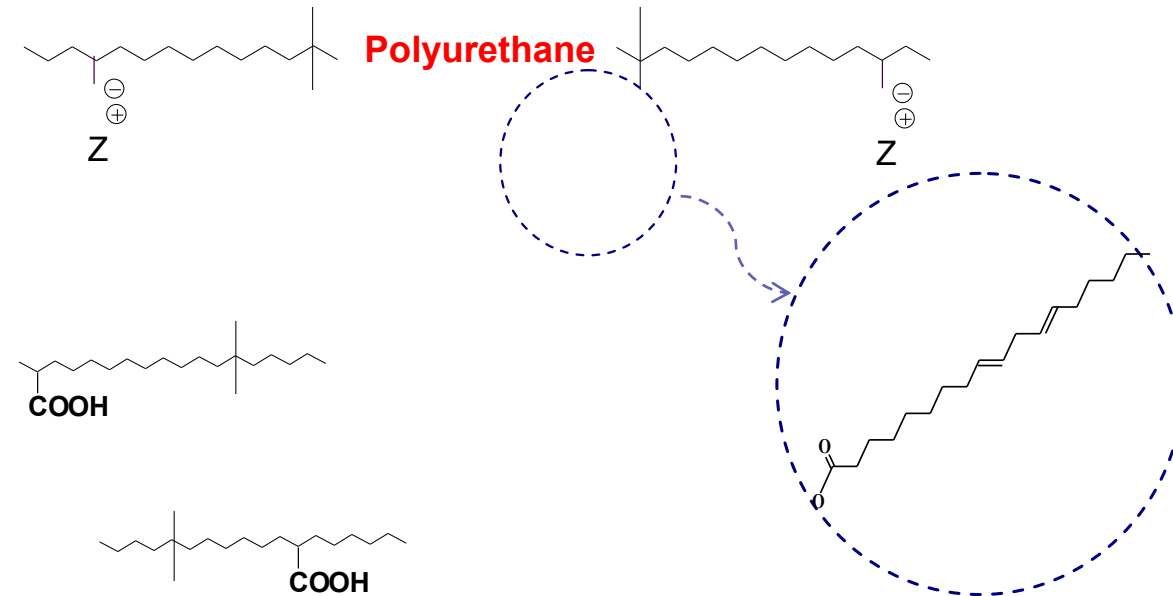
- Low VOC <275 g/L
- Fast-property development
- High molecular weight
- Excellent wear resistance
- Little to no odor
- Easy clean-up with water



VOC Regulation Map, Clear Varnish, North America 2024

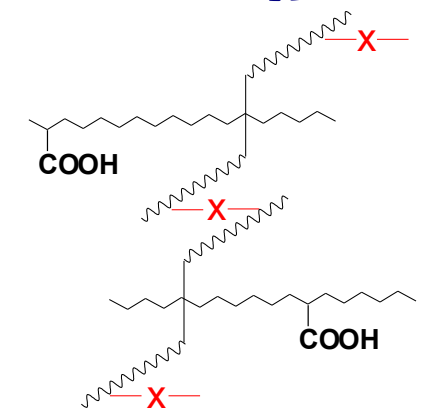
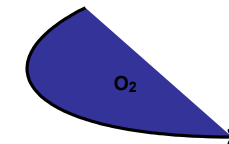
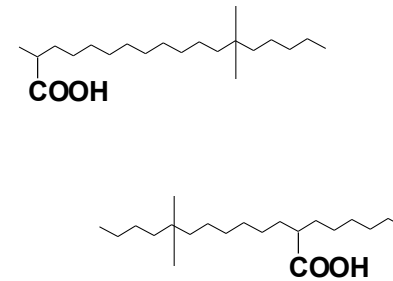
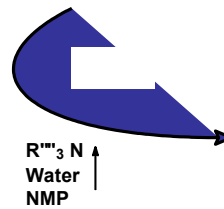
## ■ Conventional PUDs:

- Thermoplastic
- Crosslinkable with external crosslinkers
- Water-white finish
- Excellent abrasion resistance



## ■ Oil-modified PUDs:

- Thermoset
- Oxidative cure (self-crosslinking)
- Yellow to amber finish
- Inherent black heel mark (Mar) resistance
- Excellent chemical resistance
- Bio-renewable



$\sim\sim\sim$  = unsaturated fatty acid residue  
 Metal<sup>++</sup> = cobalt, manganese carboxylates  
 X = carbon-oxygen, carbon-carbon bond





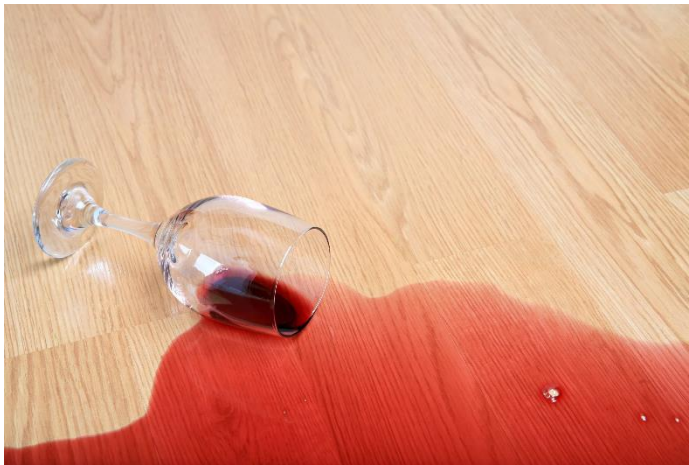
Return to Service



Contraction & Expansion



Scratch Marks



Exposure to Chemicals



Indentation



Abrasion and Wear

# Aromatic vs Aliphatic OMUs

	Dry Times	Property Development	Film Hardness	Chemical Resistance	Mechanical Properties	Wear Resistance
Aromatic OMUs	✓	✓	✓	✗	✗	✗
Aliphatic OMUs	✗	✗	✗	✓	✓	✓
Target	✓	✓	✓	✓	✓	✓



**NMP Free**



**Bio-based**



**250 g/L VOC Compliant**

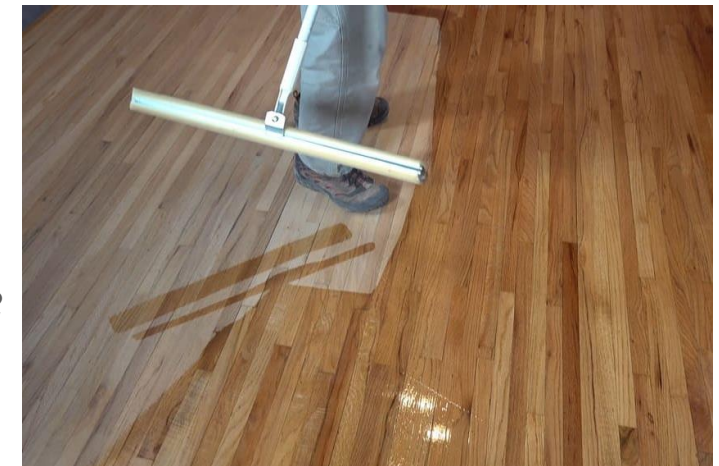
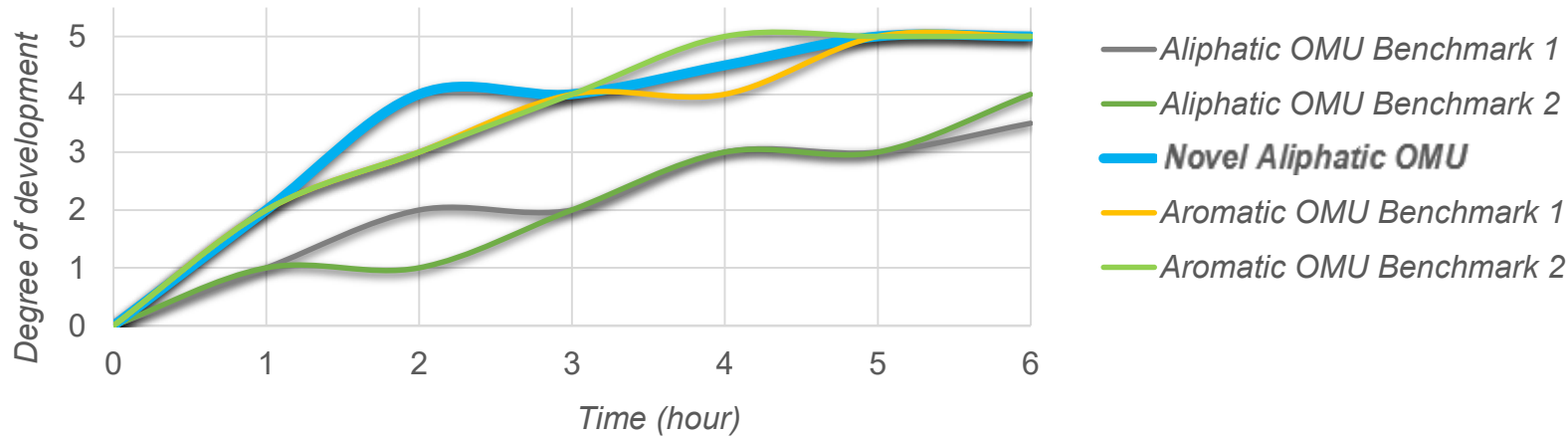


**Water Clean-up**



Tack Free	Aliphatic OMU Benchmark 1	Aliphatic OMU Benchmark 2	Novel Aliphatic OMU	Aromatic OMU Benchmark 1	Aromatic OMU Benchmark 2
200 g (Hr:Min)	1:37	1:15	<b>0:51</b>	0:48	0:49
500 g (Hr:Min)	2:16	1:35	<b>0:55</b>	0:54	0:58

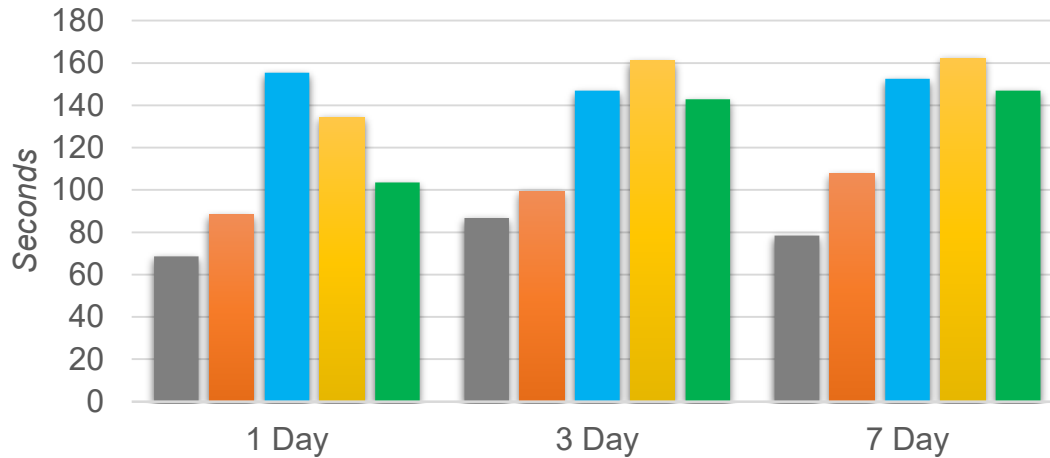
## Physical Property Development



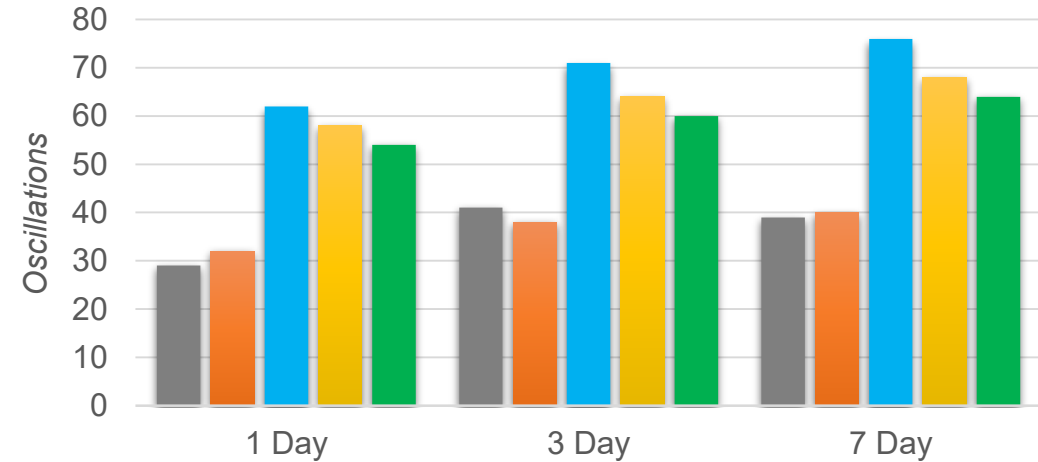
Thumbnail Gouge Test, 0-5, 5 = full development

**Novel Aliphatic OMU matches the fast property development of aromatic OMUs**

## König Hardness



## Sward Hardness



■ Aliphatic OMU Benchmark 1  
 ■ Aliphatic OMU Benchmark 2  
 ■ Novel Aliphatic OMU  
 ■ Aromatic OMU Benchmark 1  
 ■ Aromatic OMU Benchmark 2

	Aliphatic OMU Benchmark 1	Aliphatic OMU Benchmark 2	Novel Aliphatic OMU	Aromatic OMU Benchmark 1	Aromatic OMU Benchmark 2
<b>Mandrel Bend, 1/8"</b>	Pass	Pass	<b>Pass</b>	Fail	Pass
<b>Impact Resistance (lb*inch): Forward/Reverse</b>	160/160	160/160	<b>160/160</b>	15/0	15/0

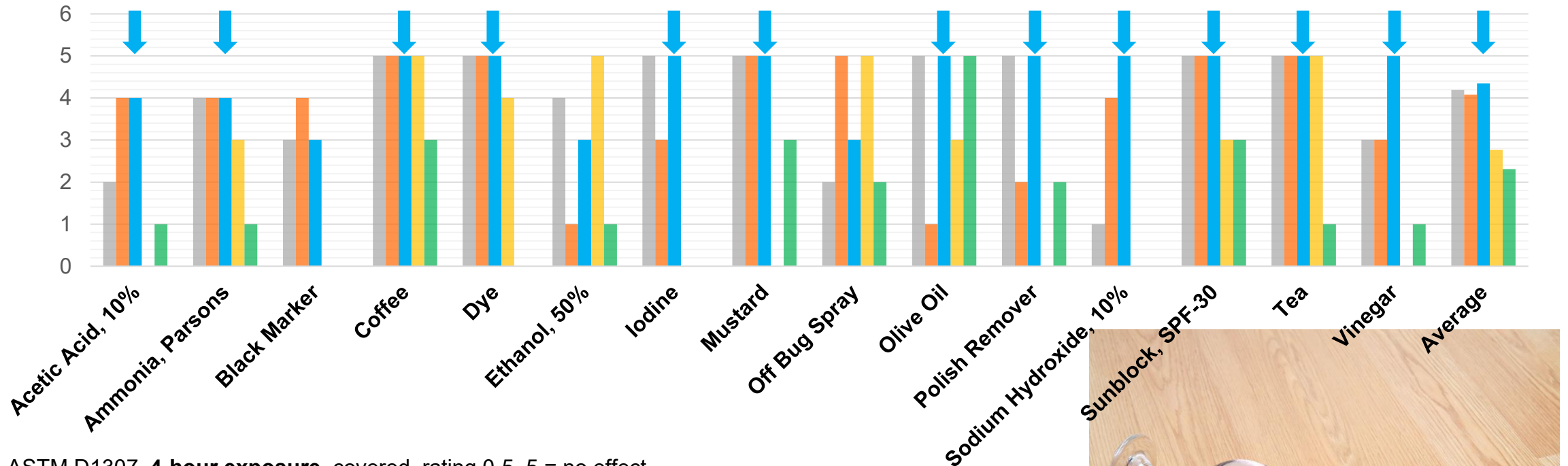


**Novel Aliphatic OMU achieves perfect balance between hardness and flexibility**



## Chemical Resistance (26 Household Chemicals tested)

■ Aliphatic OMU Benchmark 1   
 ■ Aliphatic OMU Benchmark 2   
 ■ Novel Aliphatic OMU   
 ■ Aromatic OMU Benchmark 1   
 ■ Aromatic OMU Benchmark 2



ASTM D1307, 4-hour exposure, covered, rating 0-5, 5 = no effect  
 Chemicals that receive high rating across the board are omitted from the graph



**Novel Aliphatic OMU scores the best chemical resistance**

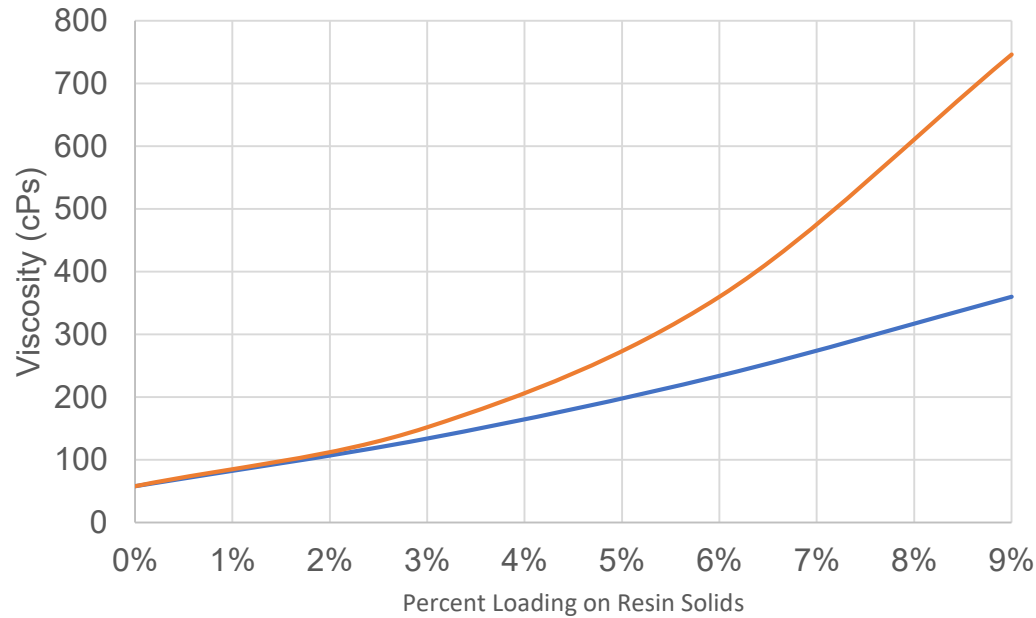
	Taber Abrasion Resistance (mg loss/1000 cycle)	Mar Resistance Development (hours)
Aliphatic OMU Benchmark 1	63	24
Aliphatic OMU Benchmark 2	70	24
<b>Novel Aliphatic OMU</b>	<b>56</b>	<b>24</b>
Aromatic OMU Benchmark 1	147	72
Aromatic OMU Benchmark 2	113	24



**Novel Aliphatic OMU exhibits superior wear and mar resistance**

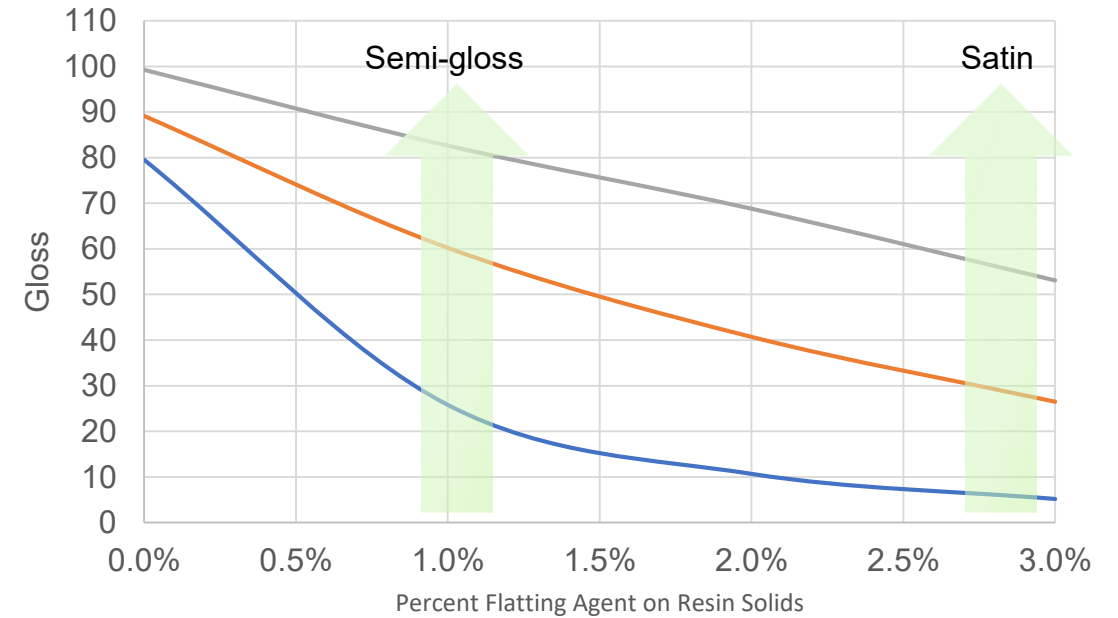


## Rheology Modifier Study

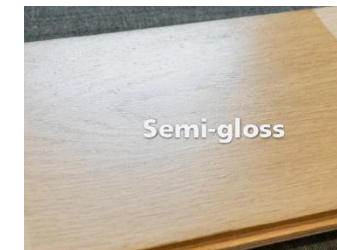


— Rheology Modifier 1    — Rheology Modifier 2

## Flatting Agent Study



— 20°    — 60°    — 85°

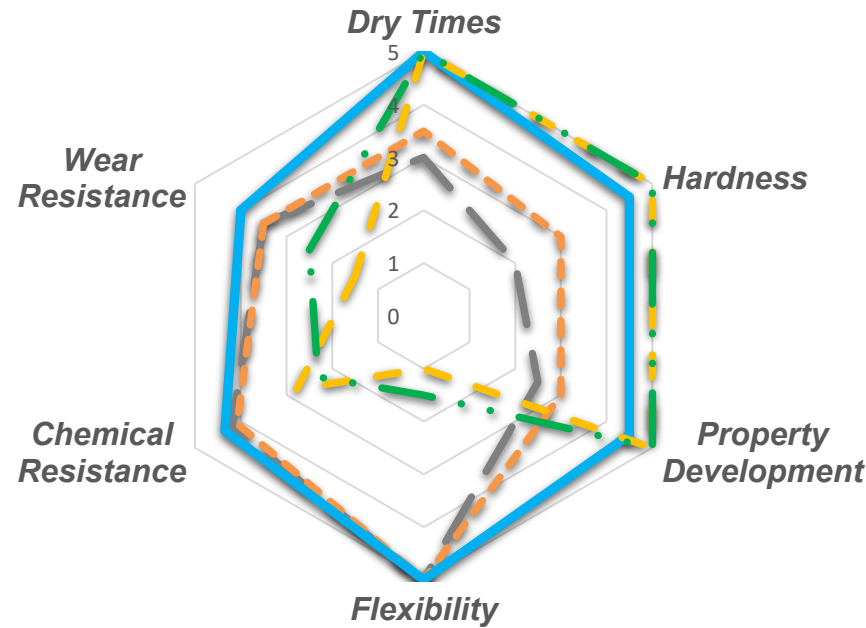


**Novel Aliphatic OMU can be easily formulated**

Sustainability

Superior Performance

Primary Applications



- Aliphatic OMU Benchmark 1
- Aliphatic OMU Benchmark 2
- Novel Aliphatic OMU
- Aromatic OMU Benchmark 1
- Aromatic OMU Benchmark 2





□ The innovative minds behind today's scene

Obrigado!

- Scott Cooley

- Dawei Qiu

- Mahesh Chaudhari

Danke! Merci!

شُكْرًا

□ Thank you for today's opportunity

Gracias!

धन्यवाद !

- Coatings Trends & Technologies Committee

Takk!

谢谢!

Grazie!

Děkujeme!

Dank!