MICHELMAN®

High Performance Wood Floor Coatings

Presented by Martha Herzog
for Michelman Inc.

RAMSPEC 2016
Milano, Italy

About Michelman

Established in 1949

- Specialty chemicals
- Customer focused
- Privately held enterprise

Today, Michelman is:

- Global operations
- Advanced materials
- Technology independent
- Professionally managed

Core Competency:

Collaboration with customers to develop coating solutions and manufacture water based emulsions and dispersions of waxes, polymers, binder resins & additives

Applications

Include industrial, maintenance and OEM metal, plastic and wood coatings, including furniture, cabinets & flooring; architectural paints, stains, varnishes; inks & overprints for packaging and consumer goods; fiber sizing; wood, leather & floor care products; composites and construction products

Current Issues

- VOC Regulation and Constraints
  - Lower Maximums
  - Regional & State Requirements
- New & Changing Regulations
  - NMP Hazard Classification
  - NEP Hazard Classification
- Growth in Environmental Sustainability
  - Solvent Free PUD
- Maintaining Expected Performance Requirements

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Binder Resin

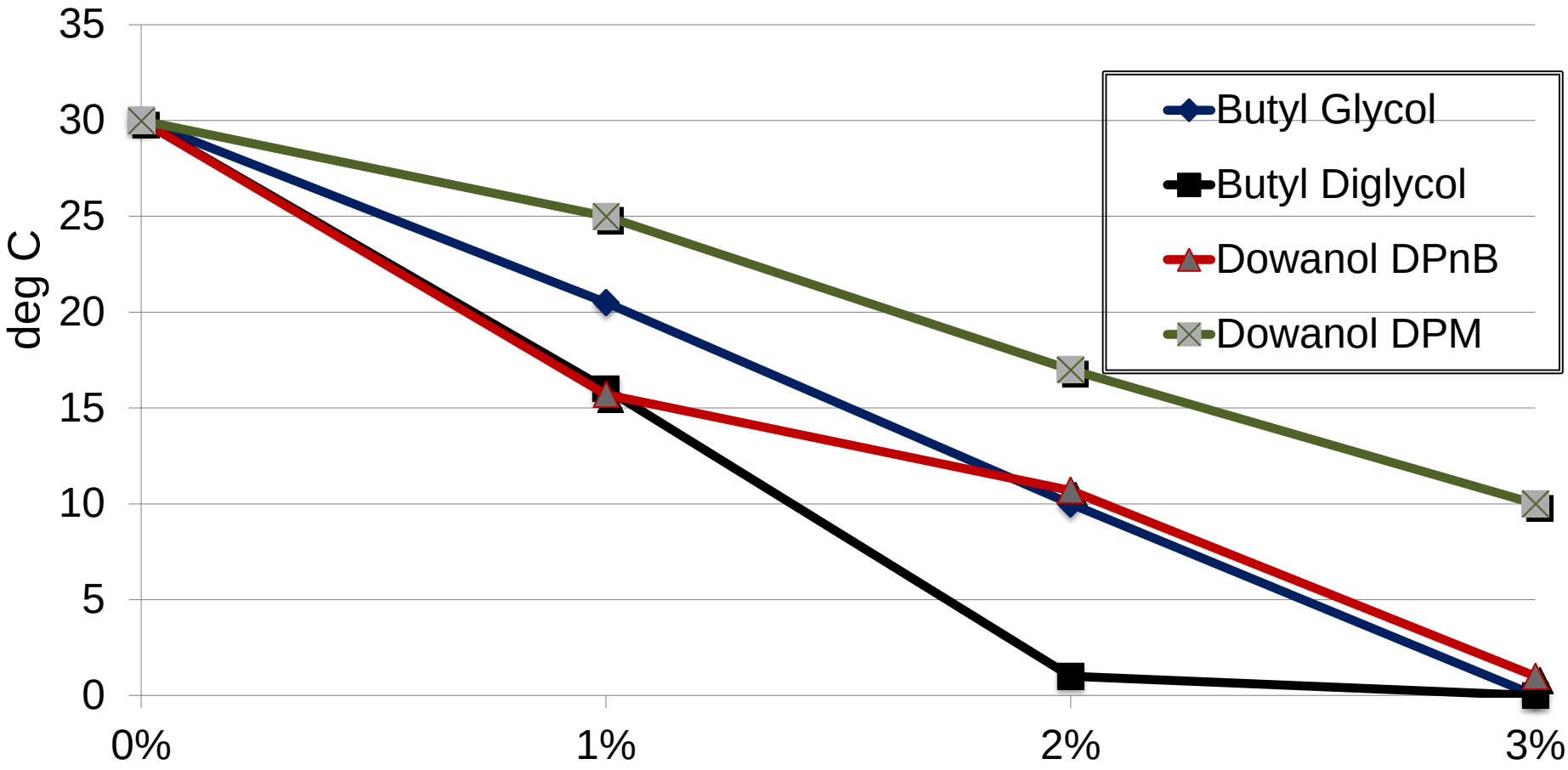
Film Forming Temperature Influence

Solvent free system	Hardness	Elongation %	MFFT ° C	Coalescing agent
PUD Ecrothan® 4075	Soft & scratch-sensitive	~ 350	0	~ 2%
PUD Blended with an Acrylic	Hard & scratch-resistant	not tested	30	~ 6%
PUD / Acrylic Hybrid Ecrothan® 2012	Hard & scratch-resistant	~ 200%	30	~ 3%

MFFT : Minimum Film Forming Temperature

MFFT Reduction in Hybrid System

Based on Ecrothan® 2012



Test Formulations

Formulation & VOC	Binder	Butyl glycol	Water	Defoamer	Wetting agent	Thickener
PUD Ecrothan® 4075 VOC = 19 g/l	90.0	2	7.1	0.2	0.3	0.4
PUD Blended with an Acrylic VOC = 58 g/l	90.0	6	3.1	0.2	0.3	0.4
PUD / Acrylic Hybrid Ecrothan® 2012 VOC = 29 g/l	90.0	3	6.1	0.2	0.3	0.4

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Test Formulation Performance

Requirements of Wood Floor Coatings

- Regulatory compliance
- Abrasion Resistance
- Initial Water Resistance
- Chemical Resistance
- Fast Drying
- Low Dirt Pick-up
- Anti-Slip

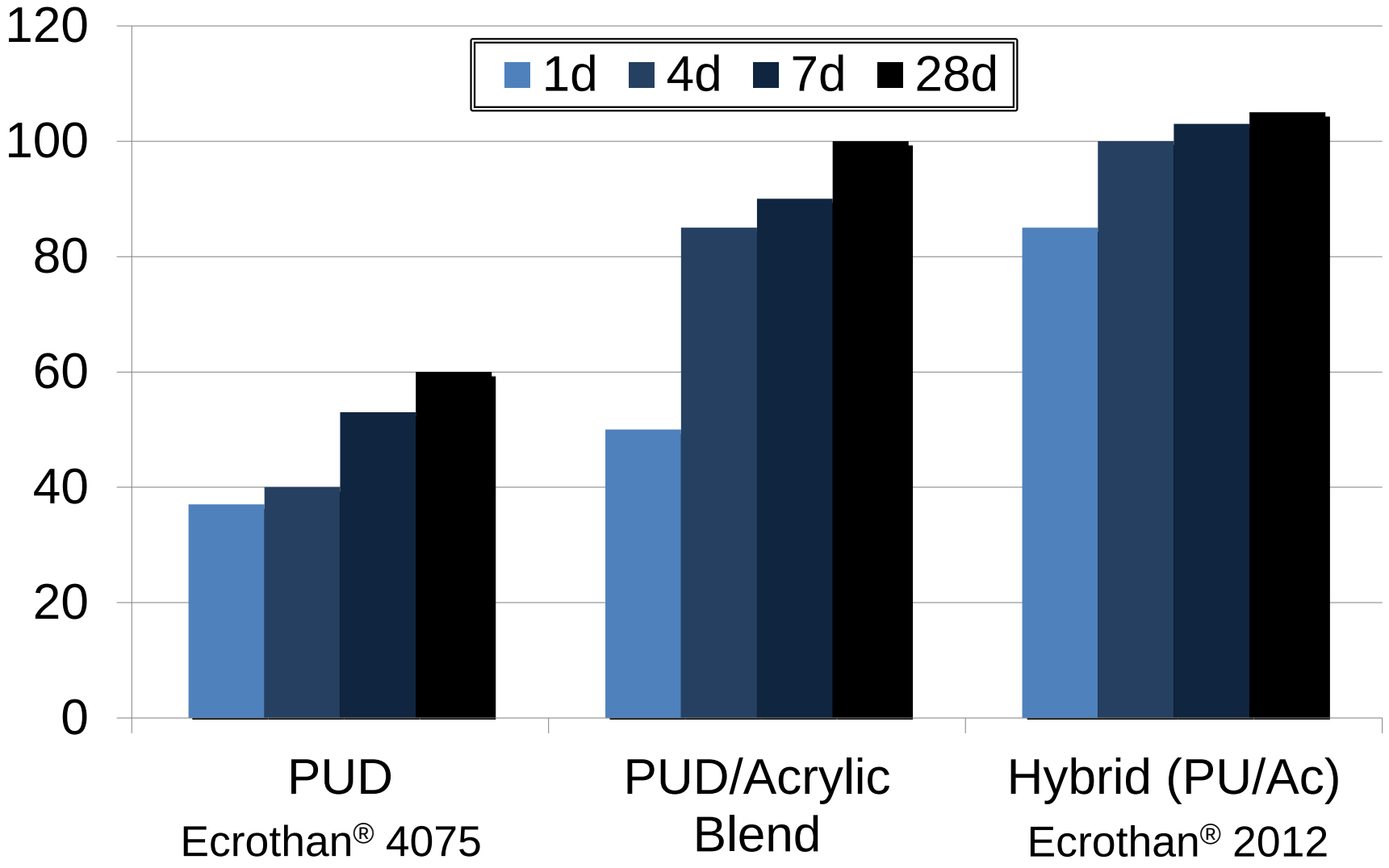
Abrasion Resistance

Formulation	Abrasion [mg]
PUD Ecrothan® 4075	15
PUD/Acrylic Blend	120
Hybrid Ecrothan® 2012	35

Taber abraser (CS 17/ 1000g/1000 rpm)

Hardness Development

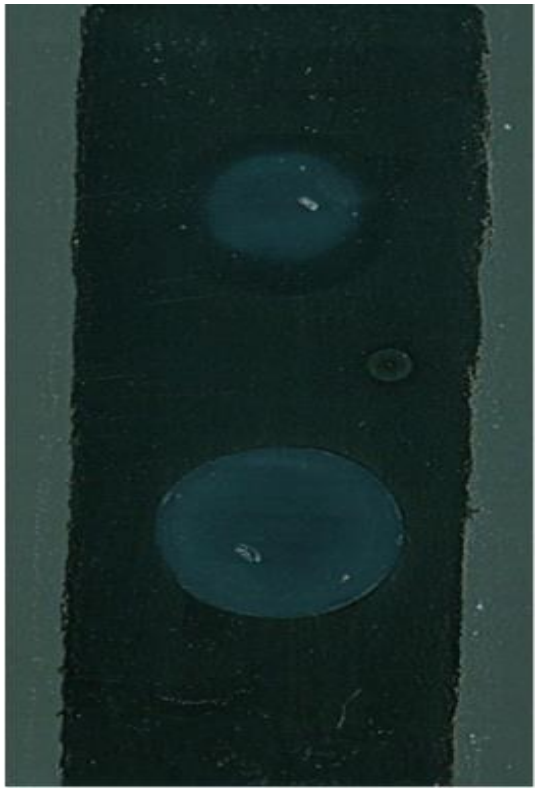
König Pendulum hardness



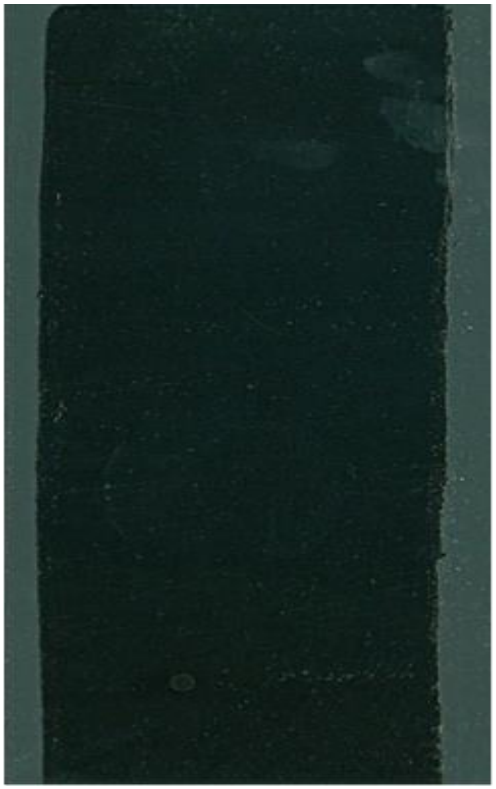
Initial water Resistance

Drying Time: 16 hr@RT; Water Exposure: 4 hr@RT

PUD
Ecrothan®
4075



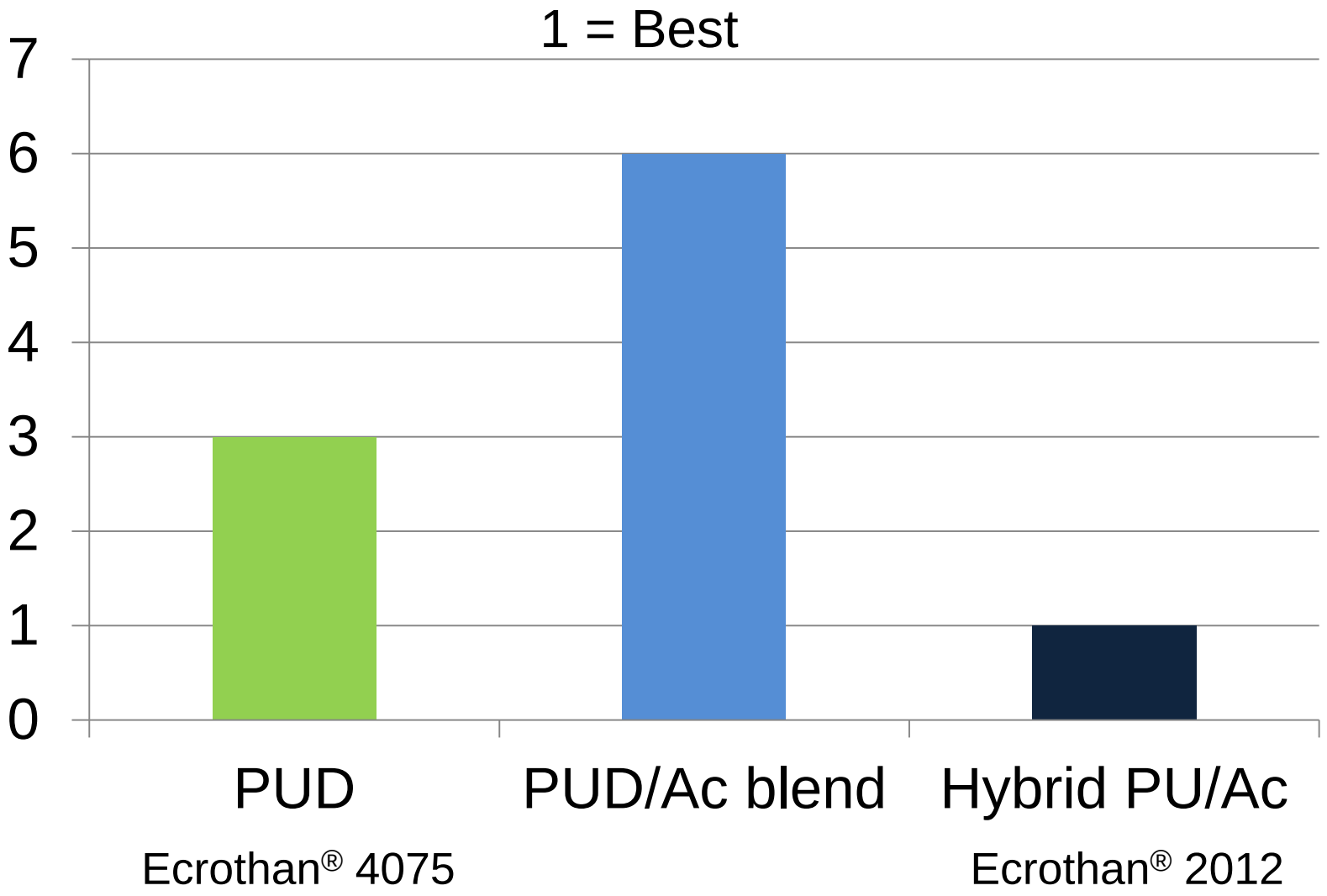
PUD
Blended with
an Acrylic



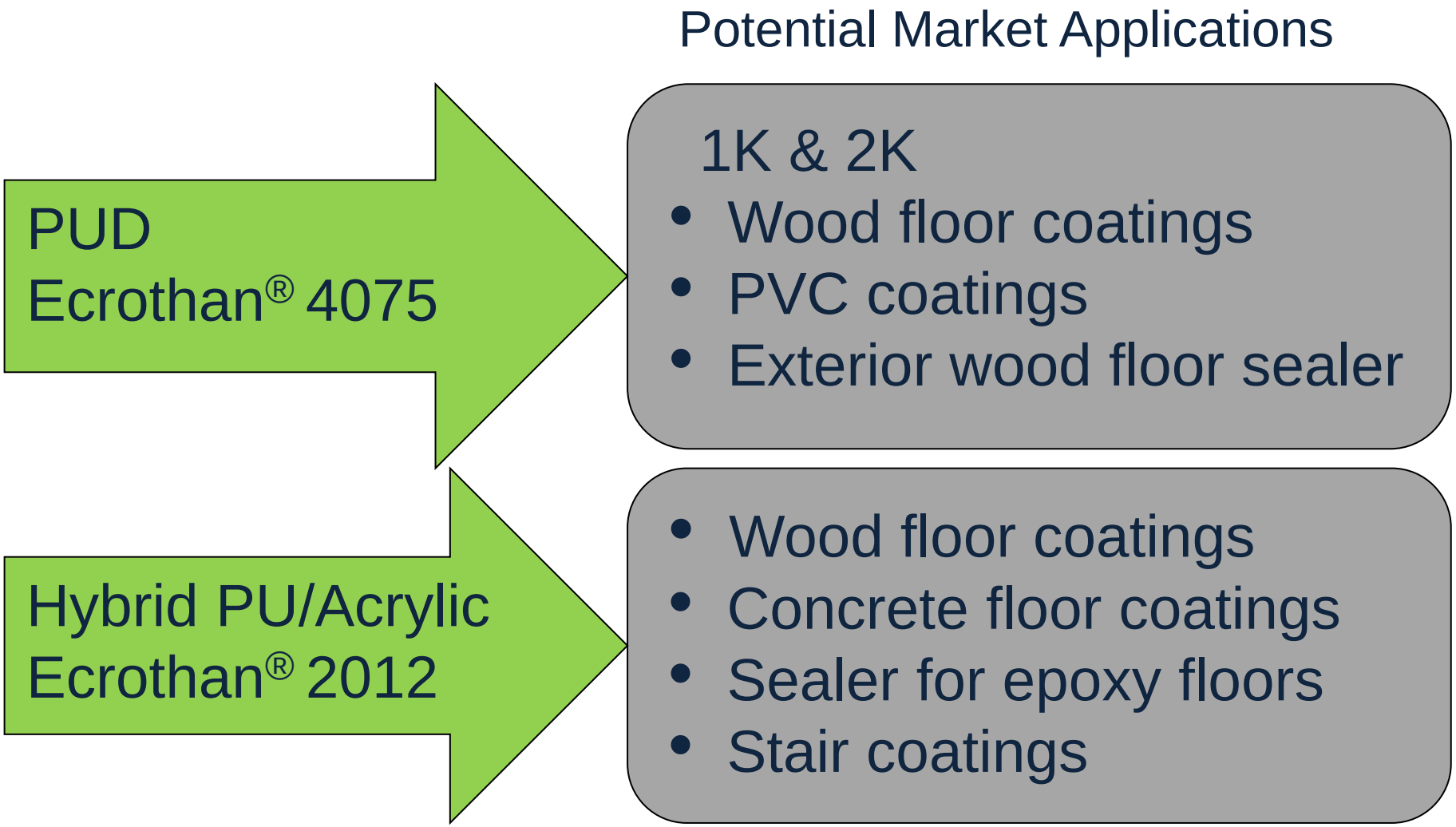
PUD /
Acrylic Hybrid
Ecrothan® 2012

Blocking Resistance

Drying Time: 16 hr@RT; Blocking: 5 hr @ 60°C & 100 Nm



Performance Guides Application



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Wax Emulsion Additives

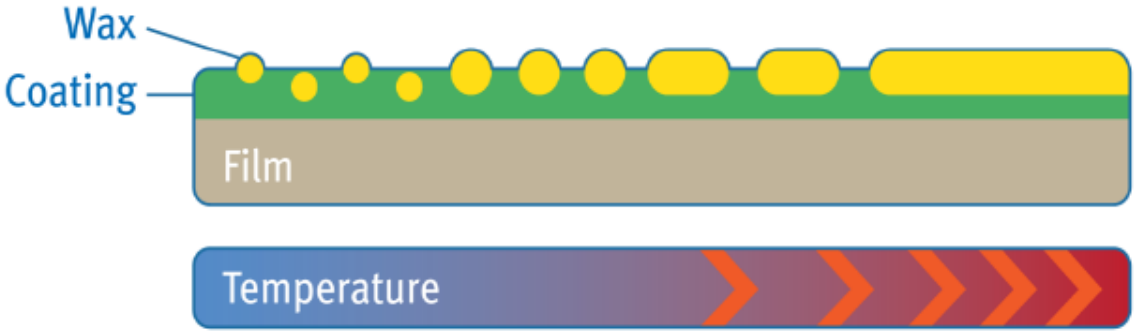
Influence of Wax Additives in Formulated Floor Coatings

- Improvements to the following properties
  - Abrasion Resistance
  - Water Resistance
  - Scratch Resistance
  - Reduced Dirt Pick-Up
  - Anti-Slip

Surface Effect Mechanisms

BLOOMING

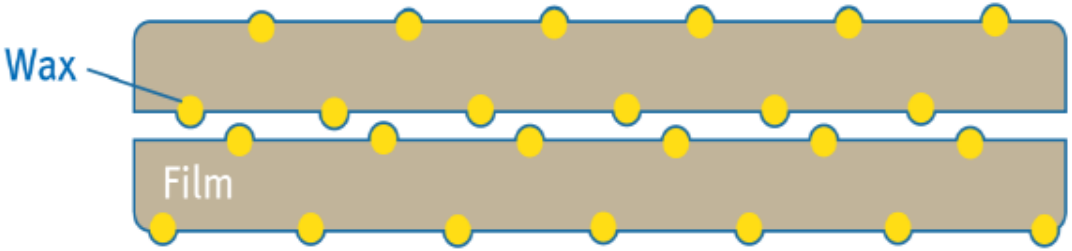
Formation of a thin re-solidified wax layer



- Wax Migration to surface
- Modification of Coefficient of Friction (CoF)

BALL BEARING

Physical and protruding spacer



- Modification of surface properties at 3 – 5% solids on polymer solids:
  - Slip & lubricity
  - Abrasion Resistance
  - Anti-Blocking

Test Formulation

Ingredient	% wt
Ecrothan® 2012	90.0
Butyl glycol	3.0
Water	3.0
Defoamer	0.2
Wetting agent	0.3
Thickener	0.4
Water	3.1
	100.0

Adjustments
None
Michem® Emulsion (various grades)
Silica dioxide

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Test Formulation Performance

Abrasion Resistance

Taber abraser (CS 17 / 1000g/1000 rpm)

Sealer based on Ecrothan® 2012	Abrasion [mg]	Gloss 60°
without wax	30	85
+ 2.0% Michem® Wax 437	18	35
+ 1.5% Silica dioxide	56	35

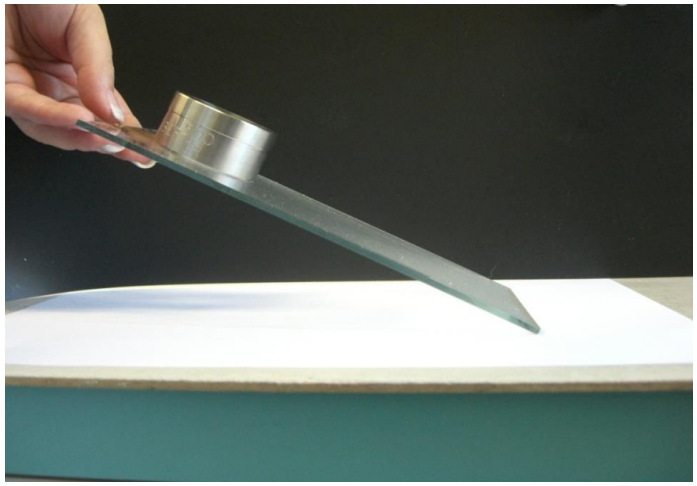
Scratch Resistance

Drying time 7d at rt / 100 strokes with dry Scotch-Brite

Sealer based on Ecrothan® 2012	Gloss before testing	Gloss after testing	Difference
without wax	88	71	17
with 5% Michem® Emulsion 61335	88	76	12
with 5% Michem® Emulsion 93235	88	85	3

Anti-Slip Performance

with 250 gram weight



Sealer based on Ecrothan® 2012	Angle
without wax	20˚
With 5% Michem® Emulsion 94340	26˚
With 5% Michem® Emulsion 61335	17˚
With 5% Michem® Emulsion 93235	20˚

Conclusions

- Solvent-free dispersions are increasing in importance
- Ecrothan® 4075 shows the best abrasion resistance
- Ecrothan® 2012 has a unique rapid-curing ability and excellent initial water resistance
- Michem® Wax additives improve special properties
- Durability & Functionality of those materials enhance floor coatings

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Thank you

Contact Info: Martha Herzog
E-mail: marthaherzog@michelman.com