



# Metal Coatings for the Future

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1. Synthomer Introduction
2. What are Metal Coatings?
3. Changes Needed to Succeed
4. Latex A
5. Latex B
6. Latex C



# Introducing Synthomer

## An Innovative Specialty Chemicals Company



**1920**

Founded as Yule Catto & Co Ltd

**2006-2011**

Transformation from diversified chemical company to aqueous polymer, speciality chemicals company. Acquisition of PolymerLatex

**2016**

Acquisition of Hexion PAC

**2018**

Acquisition of BASF Pischelsdorf, Austria SBR Business

**2022**

Acquisition of Eastman Adhesive Resin business

**1971**

Listed on London Stock Exchange

**2012**

Renamed as Synthomer plc

**2017**

Acquisition of Perstorp Oxo Belgium

**2020**

Acquisition of OMNOVA Solutions



# Introducing Synthomer Divisional Structure



**\$3.4bn**

(1)

<span style="color: orange;">●</span>	33.3%
<span style="color: green;">●</span>	23.3%
<span style="color: purple;">●</span>	26.4%
<span style="color: blue;">●</span>	17.1%

No. of sites **>5,000**

June 2022:	Adj. EBITDA
<b>\$1.2bn</b>	June 2022:
No. of sites	<b>\$172m</b>

June 2022:	Adj. EBITDA
<b>\$839m</b>	June 2022:
No. of sites	<b>\$120m</b>

Health & Protection	
June 2022:	Adj. EBITDA
<b>\$701m</b>	June 2022:
No. of sites	<b>\$136m</b>
June 2022:	Adj. EBITDA
<b>\$664m</b>	June 2022:
No. of sites	<b>\$88m</b>

1. LTM June 2022 EBITDA

## What are Metal Coatings?

- **Diverse application use:** Infrastructure, industrial manufacturing, transportation, equipment, and consumer goods. *e.g., bridges, cars, trucks, ships, heavy-duty appliances, pipes, furniture, toys*
- **Types**
  - *Anti-corrosion coatings*: a protective coating used to prevent corrosion and increase service life
  - *Topcoats for metal*: used to maintain aesthetics and promote value of expensive goods
  - *Direct-to-Metal coatings*: dual-purpose: anti-corrosive properties and top-coat in one layer



## **Changes are needed to succeed in the future**

**As VOC limits continue to decrease, the use of coalescing solvents must also decrease.**

- Coalescing solvents contribute Volatile Organic Compounds.
- Film formation at VOC's less than 100 g/l becomes more difficult for high Tg polymers as they need higher amount of coalescing solvent.
- Zero VOC coalescing aids can soften the film.
- Low Tg polymers are easier to coalesce but may not give adequate resistance properties.

## Latex A

### *Hydrophobic Dispersion Technology*

1. Polymer Design
2. Benchmarking
3. Performance Results



# 1. Polymer Design



# Synthomer Latexes – Type A

## Hydrophobic Dispersion Technology



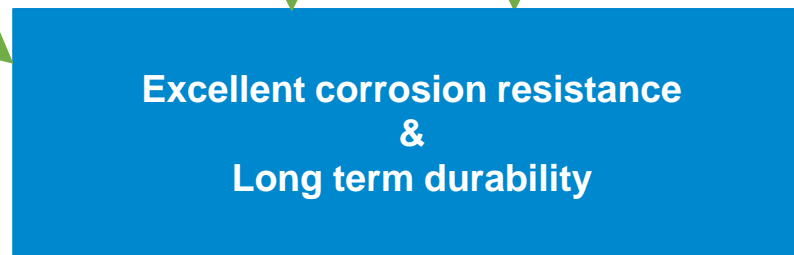
TOOL BOX



KEY PROPERTIES



ACHIEVEMENTS



# Synthomer Latexes – Type A

## Characteristics & Typical Properties



### Typical Properties

- **Modified acrylic dispersion**
- **Solid content** 50 %
- **pH** 8.0
- **APEO free**
- **No added formaldehyde** (amount <10ppm)

### Range of Tg's

- **To suit different applications and DTM requirements, a range of Tg's are available**

Latex A20		Latex A52	
<b>Tg (Midpoint)</b> 28° C	<b>MFFT</b> 20° C	<b>Tg (Midpoint)</b> 52° C	<b>MFFT</b> 52° C

### Very Low VOC

- A paint sample “WB DTM 01” based on Latex A20 was submitted to an independent laboratory in order to carry out emission testing according to the ISO 16 000 Standard
- After 28 days of testing, the emission level corresponds to the best class (A+) of the French regulation relating to Indoor Air Quality



## 2. Benchmarking

# High Gloss Direct-to-Metal Paints – Type A

## Starting formulation based on Synthomer latexes (brush/roller applications)



Raw materials	WB DTM 01 %	WB DTM 03 %
Water	14.40	11.10
Associative thickener	0.50	0.50
Amine	0.20	0.20
Dispersing agent	0.40	0.40
Wetting agent	0.40	0.40
Anti-foam agent	0.20	0.20
Titanium dioxide	15.00	15.00
<b>Latex A20</b>	<b>64.50</b>	<b>/</b>
<b>Latex A52</b>	<b>/</b>	<b>64.50</b>
Open time improver	1.00	1.00
Coalescing agent 1	0.80	1.50
Coalescing agent 2	1.20	3.50
Plasticizer	0.50	0.70
Associative Thickener	0.20	0.30
Anti-flash rust additive	0.70	0.70

### WB DTM 01 (Based on A20 Latex) Paint characteristics

PVC (%)	9.7
Volume solids (%)	42.1
Weight solids (%)	48.8
Specific gravity	1.13
VOC (US calculation)	88 g/L
Gloss 60°	84.0

### WB DTM 03, (Based on A52 Latex) Paint characteristics

PVC (%)	9.7
Volume solids (%)	42.7
Weight solids (%)	49.1
Specific gravity	1.13
VOC (US calculation)	169 g/L
Gloss 60°	84.9



# High Gloss Direct-to-Metal Paints – Type A

## Benchmarking Study – Paint Features



Paint Reference	Market	Destination	VOC	Binder
# 1	DIY	Interior/exterior	<110 g/l	Alkyd emulsion
# 2	Trade / DIY	Interior/exterior	<140 g/l	Modified acrylic
# 3	Trade / Light Industrial	Interior/exterior	191 g/l (US calc.)	Acrylic
# 4	DIY	Interior/exterior	<140 g/l	Alkyd emulsion
# 5	Trade / Light Industrial	Interior/exterior	<140 g/l	Not disclosed
# 6	DIY	Interior/exterior	7 g/l	Alkyd emulsion
# 7	Trade	Interior/exterior	<200 g/l (US calc.)	Styrene-acrylate
# 8	Trade / DIY	Interior/exterior	<140 g/L	Styrene-acrylate
# 9	Trade	Interior/exterior	<140 g/l	Not disclosed
# 10	Trade / Light industrial	Interior/exterior	<140 g/L	Acrylic

- Products sold for light industrial market are recommended mainly for application on metal substrates
- For products sold for Trade (Contractor) or DIY market, multi-surface adhesion is often claimed

# High Gloss Direct-to-Metal Paints – Type A

## Benchmarking Study – Paint Features



Paint reference	ICI viscosity Cone-Plate (Pa.s)	Brookfield viscosity 50 rpm (mPa.s)	pH	Gloss at 20°	Gloss at 60°
# 1	0.29	2 268	8.5	66	86
# 2	0.15	7 420	8.1	42	74
# 3	0.14	1 832	9.0	59	85
# 4	0.39	7 720	7.4	27	65
# 5	0.29	1 964	8.5	42	75
# 6	0.25	3 192	7.9	45	79
# 7	0.17	2 488	9.4	85	96
# 8	0.20	1 640	8.9	37	76
# 9	0.21	1 690	8.6	54	79
# 10	0.09	1972	8.4	40	82
WB DTM 01 (A20)	0.11	3 100	8.5	60	84
WB DTM 03 (A52)	0.12	2 552	8.7	67	85

→ Newtonian rheology profile for most of the products



## 3. Performance Results

1. Impact Resistance
2. Flexibility
3. Adhesion
4. QUV Resistance
5. Salt Spray Resistance

# High Gloss Direct-to-Metal Paints – Type A

## Overall Results



Paint Reference	Impact Resistance (kg.cm) ASTM D2794		Mandrel Bend Test ASTM D522	Adhesion ASTM D 3359 Rated 0B-5B, 5B = Best			Gloss Retention at 60° (% remaining after 6w QUV)	Color Retention (Delta E / 6w QUV)
	Direct	Indirect		Cold Rolled Steel	Aluminum	Galvanized Steel		
# 1	100	100	1/4"	3B	2B	0B	20%	1.01
# 2	100	100	1/4"	4B	1B	2B	68%	0.62
# 3	100	100	1/4"	3B	4B	0B	59%	0.25
# 4	25	10	1/4"	5B	5B	4B	10%	1.10
# 5	100	100	1/4"	5B	5B	4B	11%	0.87
# 6	50	50	1/4"	5B	5B	3B	15%	0.84
# 7	100	100	1/4"	2B	0B	0B	66%	0.44
# 8	100	100	1/4"	4B	4B	0B	95%	0.80
# 9	80	80	1/4"	5B	4B	3B	75%	0.60
# 10	100	100	1/4"	5B	5B	4B	67%	0.39
WB DTM 01 (A20)	100	100	1/4"	5B	5B	4B	93%	0.48
WB DTM 03 (A52)	100	100	1/4"	5B	5B	4B	86%	0.51

- Paints #4 and #6 show failure in the impact resistance test
- Paint #7 (highest initial gloss) has poor adhesion properties. Adhesion to galvanized steel is difficult to achieve.
- Gloss retention of products based on alkyd emulsion is low (Paints #1, #4, #6)



### Test method

- According to ASTM B-117
- Paints applied on cold rolled steel and galvanized steel at 2.5 mils DFT
- 7 days of drying
- 500 hours of exposure
- Degree of rusting evaluated according to ASTM D610
- Degree of blistering evaluated according to ASTM D714
- Following color code is used in this presentation

	Rating according to D610-95	0% to 0.3%	0.3% to 3%	3% to 16%	16% to 50%
<b>Rusting</b>	<b>Color Code</b>	●	●	●	●
<b>Blistering</b>	<b>Rating according to ASTM D 714</b>	Few	Medium	Medium Dense	Dense
	<b>Color Code</b>	●	●	●	●

# High Gloss Direct-to-Metal Paints – Type A

## Salt Spray – Results (Blistering and Rusting)



Paint reference	Cold Rolled Steel				Galvanized steel	
	Blisters		Rust		Blisters	
# 1	N°0 Dense	●	Medium	●	N°6 Dense	●
# 2	N°2 Dense	●	Dense	●	N°4 Dense	●
# 3	N°6 Dense	●	Dense	●	N°8 Dense	●
# 4	N°4/6 Dense	●	Dense	●	N°6 Dense	●
# 5	N°4/6 Dense	●	Dense	●	N°8 Medium	●
# 6	N°8 Medium	●	Few	●	N°8 Medium	●
# 7	N°8 Medium	●	Medium	●	N°6 Medium	●
# 8	N°8 Few	●	Few	●	N°8 Few	●
# 9	N°8 Medium	●	Medium	●	N°8 Medium	●
# 10	N°8 Few	●	Very Few	●	N°6 Medium	●
WB DTM 01 (A20)	N°8 Few	●	Very Few	●	N°8 Few	●
WB DTM 03 (A52)	N°8 Few	●	Very Few	●	N°8 Few	●

→ Blister size is rated N°0-N°10, N°10 means no blisters. N°0 represents very large blisters.



# High Gloss Direct-to-Metal Paints – Type A

## Salt Spray Results (Panels after 500 Hours)



*Paint #1*



*Paint #2*



*Paint #3*



*Paint #4*



*Paint #5*



*Paint #6*

# High Gloss Direct-to-Metal Paints – Type A

## Salt Spray Results (Panels after 500 Hours)



*Paint #7*



*Paint #8*



*Paint #9*



*Paint #10*



**WB DTM 01 (A20)**



**WB DTM 03 (A52)**



## Balancing Act

- Do not affect corrosion resistance
- Maintain early water resistance
- Cannot be tacky
- Maintain adhesion

## Lower VOC Formulations

- <50 g/L formula available for Latex A20
- Very good corrosion resistance
- Very good early water resistance
- Excellent adhesion to multiple substrates, including galvanized steel

## Latex B

*Tests of binders on multiple metal substrates*

1. Polymer Design
2. Performance Results



# 1. Polymer Design

## Tests of binders on multiple metal substrates



### Technical approach

- Hydrophobic hard polymer
- Excellent adhesion to multiple metal substrates
- Polymerized surfactants
- Excellent early water resistance
- Very good salt spray resistance

### Characteristics & Typical Properties

- Styrene Acrylic
- Weight <solids> 50.0%
- MFFT 32 °C
- Tg 38°C
- pH 8.0



# Crosshatch – Adhesion Results on Multiple Metal Substrates



Dispersions	SA-D1			Latex B SA-D2			SA-D3			SA-D4		
	Dry		Wet	Dry		Wet	Dry		Wet	Dry		Wet
	A	B		A	B		A	B		A	B	
Cold rolled steel	4B	4B	5B	5B	5B	5B	5B	5B	3B	5B	5B	3B
Hot-melt galvanized	5B	5B	1B	5B	5B	4B	5B	5B	5B	5B	5B	5B
Electro-galvanized	5B	5B	4B	5B	5B	5B	5B	5B	5B	5B	5B	5B
AL 5754 (AlMg3)	0B	0B	4B	5B	5B	5B	1B	4B	5B	1B	4B	5B
AL 5083 (AlMg4,5Mn)	0B	1B	2B	5B	5B	5B	0B	5B	4B	0B	5B	4B
AL 7020 (AlZn4,5Mg1)	5B	4B	4B	5B	5B	5B	5B	5B	5B	5B	5B	5B
AL 5005 (Eloxal AlMg1)	5B	5B	5B	5B	5B	5B	5B	5B	4B	5B	5B	4B

A = Drying 1d RT      B = Drying 7d RT + 1d 50°C      Wet = 1 h after 500 hr Condensation

Comment

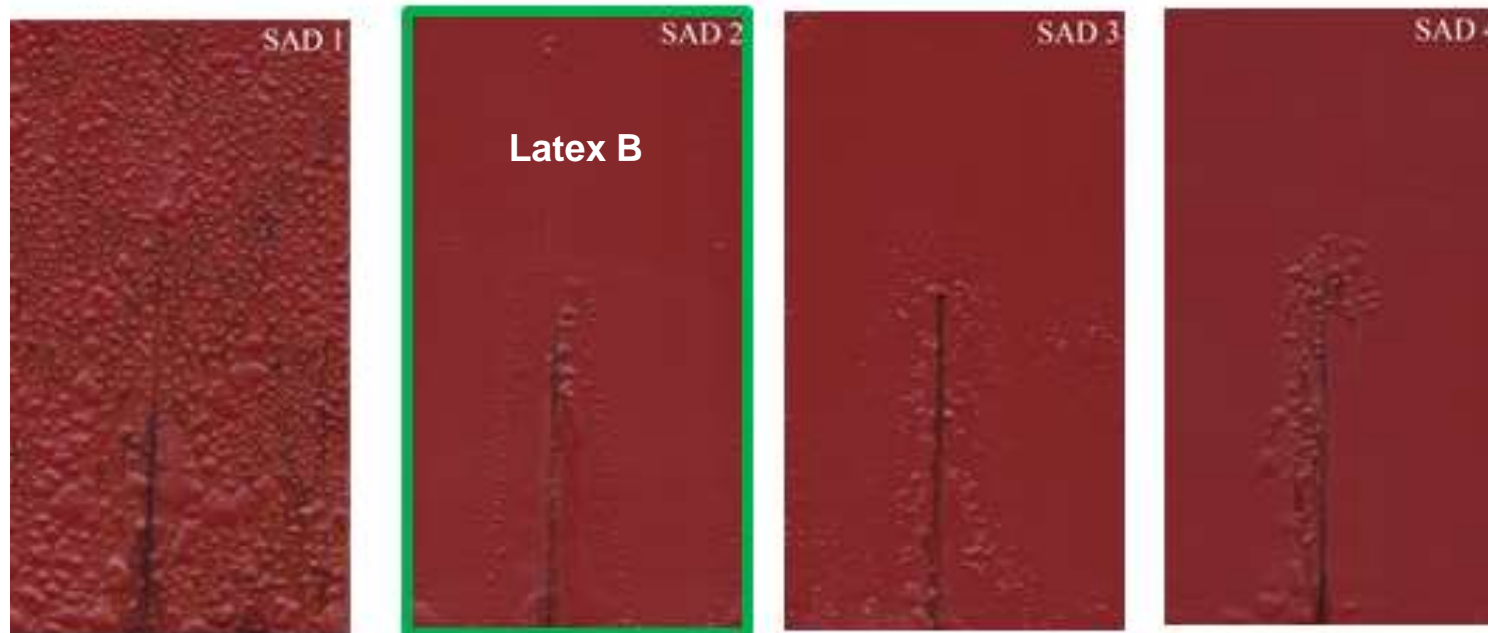
→ Latex B- excellent dry and wet adhesion on multiple metal substrates



Tested per ISO 6270-1, 500 hours

Comment

→ **Latex B** (SA-D2) good water-resistance, no blisters and little blushing



Tested per ASTM B-117, 720 hours

Comment

→ Latex B (SA-D2) has good anti-corrosive performance

## Latex C

*XSBR Latex for automotive underbody protection and anti-corrosion primers*

1. Polymer Design
2. Performance Results



# 1. Polymer Design

Technical  
approach

- Hydrophobic, elastic polymer
- Excellent adhesion on bare metal
- Excellent stone, chip, and impact resistance
- Crosslinkable via C=C double-bonds
- Very good salt spray resistance

Characteristics &  
Typical Properties

- Carboxylated SB Latex (XSBR)
- Weight solids 50.0%
- MFFT 0 °C
- Tg -5°C
- pH 8.5

Designated  
end-use

- Underbody-Coatings for automotive OEM
- Anti-Corrosion primers
- Flexibilizing component for WB 2K Epoxy Primers
- Monocoats for automotive OEM-parts in non-visible area

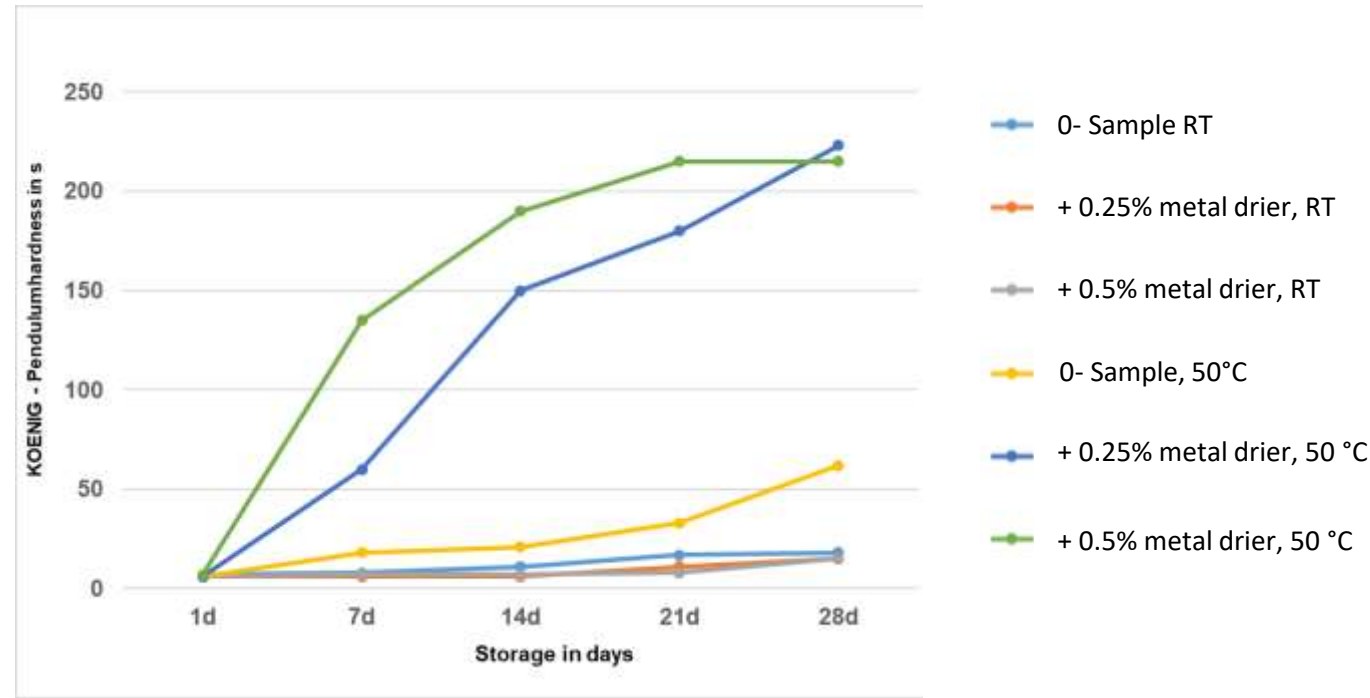


## 2. Performance Results



# Synthomer Latexes – Type C

## Hardness development with metal driers



Comments

- **Latex C** contains C=C double-bonds which can be cross-linked via oxidative curing
- Hardness development can be effectively controlled by metal driers including cobalt-free grades
- **Latex C** can be blended with oxidative curing water-based binders, such as **wb alkyds and epoxy esters**  
**Typical ratio (by solids): 70% Latex C / 30% other resin**

# Metal Coatings for the Future Summary



	Topcoat	Primers	Elastomeric Coatings
	Direct-to-Metal	Anti-corrosion	Underbody Coatings
Latex A20	X	X	
Latex A52	X		
Latex B	X	X	
Latex C		X	X

## Questions?



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Thank you for your attention!