

Novel Pre-Treatments for Aluminum

by Paul Lewis

Technical Manager

CASE Laboratory, Houston, TX

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Bringing together the best of the best for customers and suppliers.

**Adding valuable
services**

**Broadening our
capabilities**

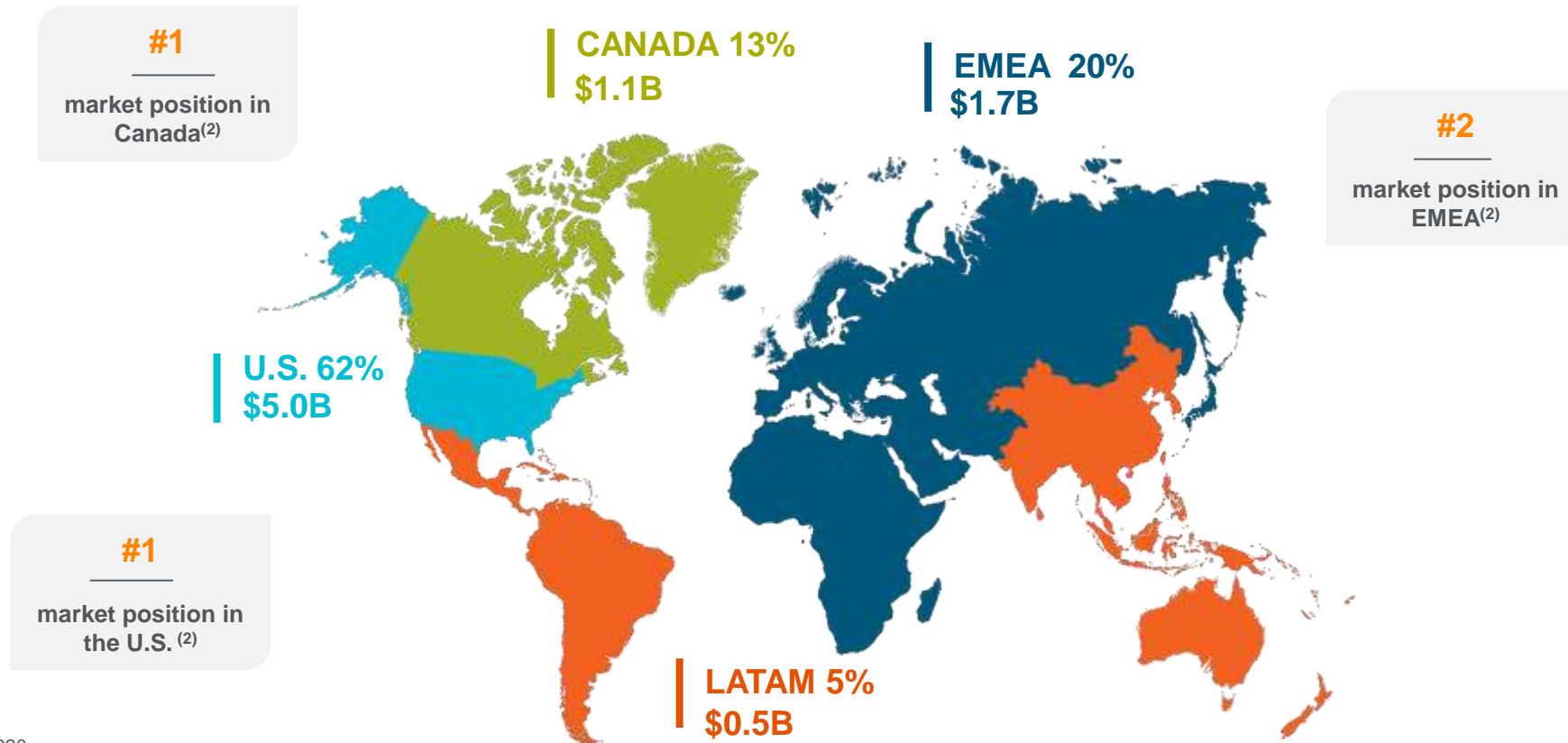
**Expanding on our
know-how and
experience**

Our Footprint

We are a leading global chemical and ingredient distributor and provider of specialty services

Purchase chemicals and ingredients from thousands of producers and warehouse, repackage, blend, dilute, transport and sell worldwide

Net Sales by Region⁽¹⁾



(1) As of December 31, 2020

(2) Source: ICIS Top 100 Chemical Distributors

SERIOUS
ABOUT SAFETY

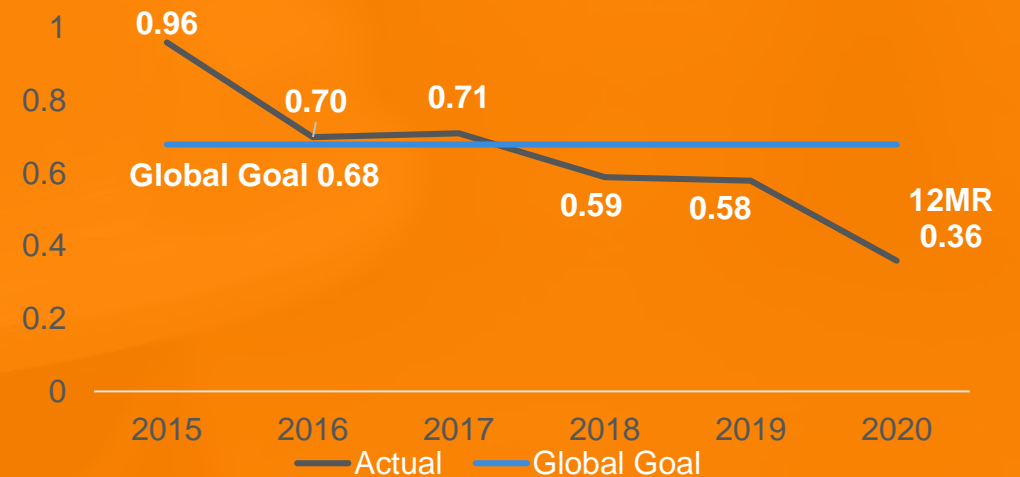
2020 Was Our Safest Year Ever

Continuing our commitment to reduce our TCIR* on our path to our ultimate goal of zero.

It's our first priority—every day, everywhere.

We are 100% dedicated to:

- Safe product transport and storage
- Safe operational practices and working conditions
- Extensive training, retraining, and auditing to improve processes
- Protecting employees, customers, suppliers, and the environment



*Total Case Incident Rate is the OSHA method for calculating workplace injury rates and is the generally accepted method for comparing injury rates across industry segments

Univar Solutions Technical Capability

- A global network of **46 formulation labs, development kitchens, and research centers** around the globe.
- **More than 100 formulation and application experts** to provide insights, recommendations, and product development consultation
- Houston Formulations Laboratory:
 - 20,000 square feet facility near Bush (IAH) Airport
 - CASE, Personal Care, MWFs, HIC, Lubricants, Pharma, Analytical Labs
 - CASE Lab very well equipped
 - 2 Full-time Employees
 - Formula Development, Testing, Analysis

Formulation

Testing

Analysis

Univar Solutions'
Coatings
Laboratory
Capability

Adhesion Promoter for Aluminum & Galvanized Steel

- New Technology
- Very Low VOC
- Very Low Odor
- Very Low Viscosity
- Very Low Usage Levels
- Effective with a wide range of coatings
- Can be used to boost performance of conversion coating process: original usage for technology

Aluminum

- Forms a thin oxide layer (~5 nm at room temperature) that helps to protect the metal from further corrosion by oxygen
- Is corroded by dissolved chlorides, such as sodium chloride (sea water); loses brightness and becomes rough, with a yellowish gray patina on the surface
- Used to make many alloy types
- Aluminum & alloys undergo surface corrosion & need to be protected, especially in marine environments



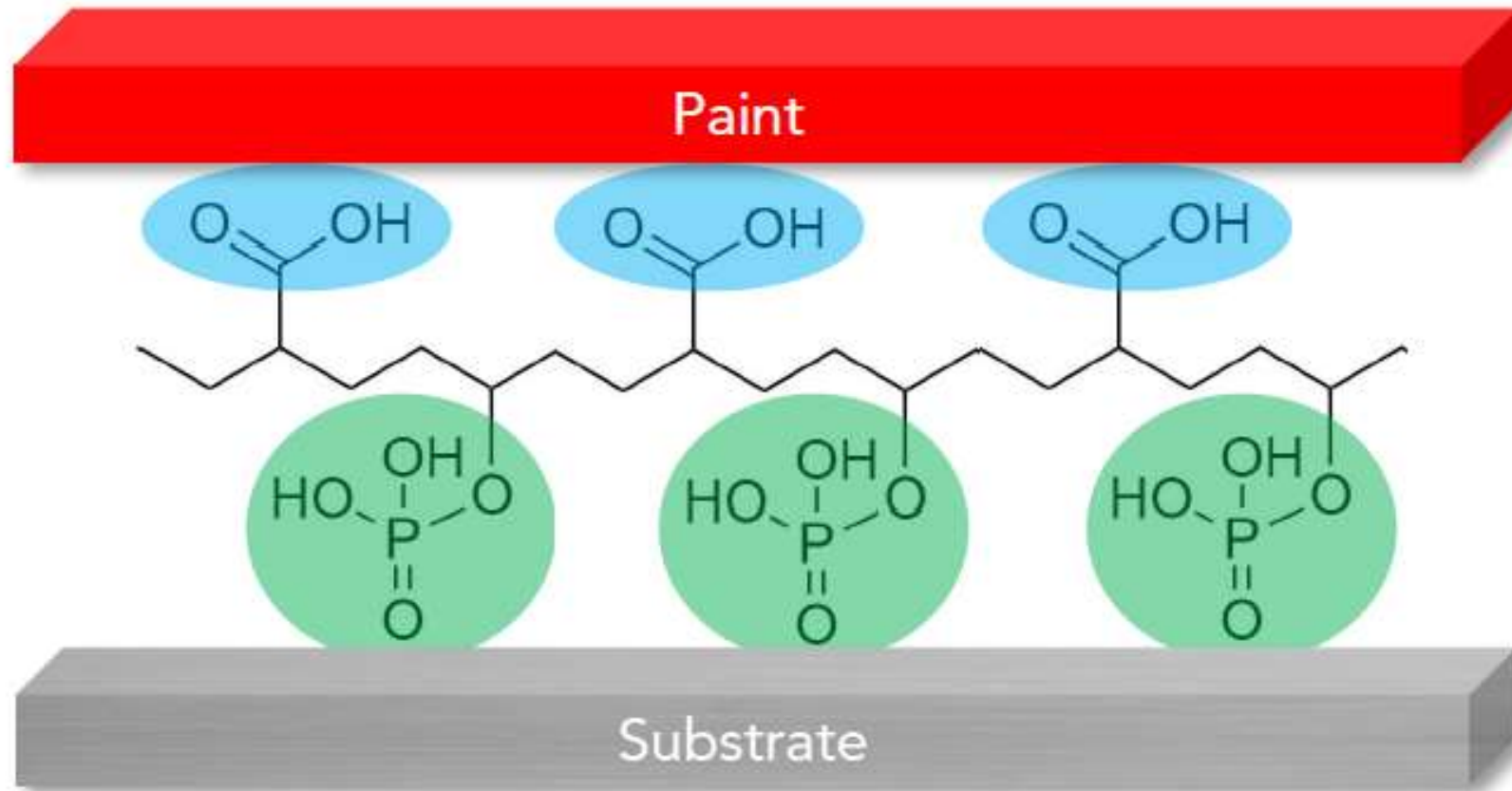
Current Coating Options For Aluminum

- Choose a coating known to adhere well
- Mechanical preparation
- Silane Primer
- Wash Primer: coatings containing zinc chromate/phosphoric acid
- Conversion Coating: multistep chromating process
- Anodizing: multistep oxidation process



New Priming Technology for Aluminum

Chemically bonds or strongly interacts with the paint



Covalently bonds with the oxide/metal surface

Chemistry of New Technology

Chemical Name: VINYL PHOSPHONIC ACID – ACRYLIC ACID COPOLYMER (20% SOLUTION IN WATER)

CAS Number: 27936-88-5

SPECIFICATIONS

Appearance

Residual Acrylic Acid, % w/w

Residual Vinyl Phosphonic Acid, %w/w

Solids, % w/w

Molecular Weight, g/mol

RESULTS

Clear, Colorless to Pale Yellow Liquid

0.50 Max

0.50 Max

18.0 – 22.0

30000 – 90000

Formulas Tested

Dipping Formula

Additive 021

Del Water

Total

Weight %

0.1

99.9

100

Process

Dip metal in Dipping Formula for 14+ minutes; air dry.

Formulas Tested

Coating Formula

Additive 021

DeI Water

Wetting Agent EFC V2

Total

Weight %

0.1

99.8

0.1

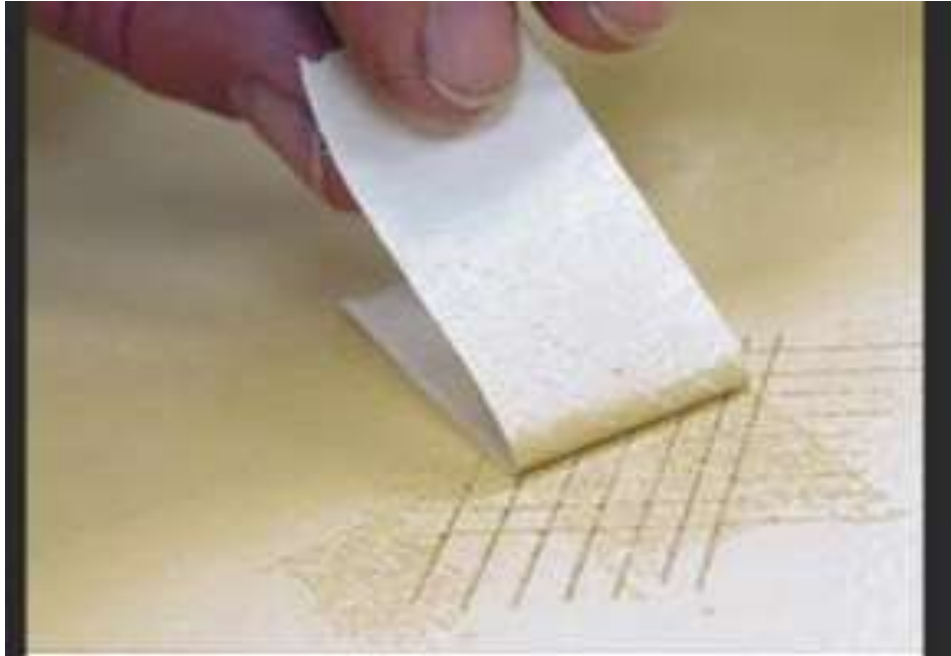
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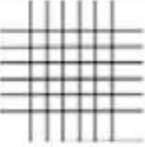
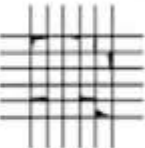
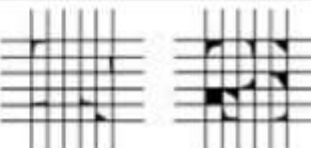

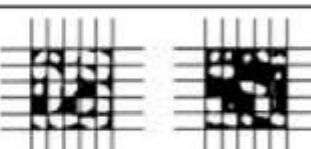
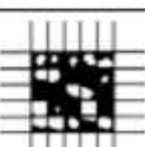
Process

Spray Coating Formula onto surface; air dry.

Adhesion Testing: ASTM D3359

- Standard Test Methods for Rating Adhesion by Tape Test



<p>ISO Class: 0/ASTM Class: 5B The edges of the cuts are completely smooth; none of the squares of the lattice is detached.</p>	
<p>ISO Class: 1/ASTM Class: 4B Detachment of small flakes of the coating at the intersections of the cuts. A cross-cut area not significantly greater than 5% is affected.</p>	
<p>ISO Class: 2/ASTM Class: 3B The coating has flaked along the edges and/or at the intersections of the cuts. A cross-cut area significantly greater than 5%, but not significantly greater than 15%, is affected.</p>	
<p>ISO Class: 3/ASTM Class: 2B The coating has flaked along the edges of the cuts partly or wholly in large ribbons, and/or it has flaked partly or wholly on different parts of the squares. A cross-cut area significantly greater than 15%, but not significantly greater than 35%, is affected.</p>	
<p>ISO Class: 4/ASTM Class: 1B The coating has flaked along the edges of the cuts in large ribbons, and/or some squares have detached partly or wholly. A cross-cut area significantly greater than 35%, but not significantly greater than 65%, is affected.</p>	
<p>ISO Class: 5/ASTM Class: 0B Any degree of flaking that cannot even be classified by classification 4.</p>	

Adhesion Test Results: Additive Improves Adhesion to Aluminum

Aluminum ASTM Adhesion Rating, 5 best

<u>Coating</u>	<u>Substrate Cleaned</u>	<u>Dipping Formula</u>	<u>Coating Formula</u>		
			<u>1x</u>	<u>2x</u>	<u>3x</u>
			Green Aerosol Solvent-Based Alkyd	3B	5B
Gray High Solids Solvent-Based Aerosol Alkyd	5B	-	-	-	-
Pink Aerosol Solvent-Based Acrylic	4B	-	-	-	-
Clear Gloss Solvent-based Polyurethane	0B	3B	1B	5B	5B
Gray Solvent-based Aerosol Primer	0B	2B	0B	2B	4B+
Solvent-based Automotive Primer Aerosol	5B	-	-	-	-

Adhesion Test Results: Additive Adhesion Results on Galvanized Steel

<u>Coating</u>	<u>Galvanized Steel ASTM</u> <u>Adhesion Rating, 5</u> <u>best</u>	
	<u>Substrate</u> <u>Cleaned</u>	<u>Dipping</u> <u>Formula</u>
Green Aerosol Solvent-Based Alkyd	0B	2B
Gray High Solids Solvent-Based Aerosol Alkyd	5B	-
Pink Aerosol Solvent-Based Acrylic	3B	4B
White Aerosol Solvent-Based Acrylic	0B	1B
Gray Solvent-based Aerosol Primer	5B	-
Solvent-based Automotive Primer Aerosol	5B	-

Adhesion Test Results: Additive Improves Adhesion to Aluminum



Adhesion Test Results: Additive Improves Adhesion to Aluminum



Success Story



Without Additive
Pre-treatment

With Additive
Pre-treatment

Summary

- New Additive:
 - Improves Coating Adhesion to Aluminum & Galvanized Steel
 - Improves corrosion resistance
 - Very Low VOC
 - Very Low Odor
 - Very Low Viscosity
 - Very Low Usage Levels
 - Effective with a wide range of coatings
 - Can be applied by dipping or coating
 - Can be used to boost performance in conversion coatings
 - Minimal change to appearance of topcoat
 - Needs to be applied as a separate pre-treatment, not a coating additive
 - Commercially Available

Other similar additives exist.



**More solutions.
More capabilities.
More ways to grow
your business.**



**Leading Distribution for the
Coatings Industry**