Performance and Benefits of Architectural Coatings on 21st Century Facades

Ben Mitchell, Marketing Manager, AkzoNobel
Skyscraper Cities: Built To Last

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About the Presenters

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What we will discuss....

• Performance testing and weatherability
• What is paint? Discussion of resins, pigments, paint options, powder vs. liquid, anodizing
• Case studies
• Liquid paint vs. powder coat applications
• The importance of color
• How to choose a finish
Vertical Cities

Vertical cities are not a new concept.

What *is* new is the number of skyscraper cities now being built and their success in the marketplace.
Buildings as Art Objects

Aesthetics are important in the “experience economy.”
Curtain Walls

Inspired by early Vertical Cities, curtain walls remain popular.
The “Best” Finishes

Designers should not gamble by using anything less than coatings that meet the highest standards
Quality Organizations for the Fenestration Industry


- Qualicoat: Qualicoat *licenses* plants and issues a quality label that ensures finished coated aluminum products meet the organization’s technical specifications.
AAMA Standards

American Architectural Manufacturers Association

Most commonly referenced coating standards for painted fenestration products:

• AAMA 2603
• AAMA 2604
• AAMA 2605

Coatings meeting the AAMA 2605 standard are appropriate for use on high-end building exteriors and are expected to last the lifetime of the building.
Performance Testing

A few of the many tests required during a coating’s research and development include:

- Impact resistance
- Adhesion to multiple substrates
- Multiple pretreatment systems in varying regional conditions
- Humidity resistance
- Mortar resistance
- Acid resistance
- Corrosion resistance
- Etc.
Weatherability

The performance test that is of most concern to the end user is weatherability, particularly UV resistance.

Tests that are specific to weatherability measure a coating’s

- Color retention
- Chalk resistance
- Gloss retention
- Erosion resistance
- Adhesion
Test panels

The most complete weathering data is obtained in natural environments that provide exposure to the full spectrum of light in combination with other factors.

Panels testing to the AAMA 2605 standard can not fade more than 5 delta E or chalk more than a rating of 8 in a 10 year period.
South Florida Weathering Data

Panels may be sent to a facility in south Florida for weathering tests. Data from these facilities are considered to be the global ‘gold standard’ of testing data.
What Is Paint?

Whether **liquid or powder**, paint is comprised of two principal ingredients:

- Resin
- Pigment
Resins

The most important part of a coating is its resins.

Resin provides the film with:
• mechanical characteristics, such as adhesion, chemical resistance and gloss-retention.
• resistance to abrasion, scratching, and dirt accumulation.
Resins used to define paint:

- Fluoropolymer (PVDF & FEVE)
- Silicone Modified Polyesters
- Polyester
- Urethane
- Acrylic
- Epoxy
Pigments

The second most important part of a coating is its pigment.

Pigment provides the color and some other qualities.

Pigments can have a variety of qualities, but some basic ones are:

- Organic-bright
- Ceramic-durable
- Silica-gloss
Paint Options

Coating Ranges Specifications

AAMA 2603 Qualicoat Class I

1 year Florida

Powder
• Standard Durable

Liquid
• Conventional Acrylic
• High Solids Polyester

AAMA 2604 Qualicoat Class II

5 year Florida

Powder
• Super Durable

Liquid
• Silicone Polyester
• 50% PVDF

AAMA 2605 Qualicoat Class III

10 year Florida

Powder
• Hyper Durable

Liquid
• 70% PVDF
High Performance Resin Types

The most widely known resin types available to the fenestration industry are:

- Polyvinylidene fluoride (PVDF)
- Fluoroethylene vinyl ether (FEVE)

Both of these are Fluoropolymer resins.
Powder or Liquid?

“Liquid” and “powder” refer only to the application method, not the finished material.

- Either can perform well depending on the ingredients used.
- A poorly formulated coating in either system may fail prematurely.
- Must use the correct coating for the application.
- Use the correct coating, regardless of application method, that meets your performance requirements.
Liquid versus Powder Coating

In each case, the resin builds the film and binds the coating to the substrate, providing the weather resistance and durability properties desirable in an architectural coating.

There are two basic weathering failure modes:
- **Chalk**: failure or degradation of the resin
- **Fade**: breakdown of the pigment

High quality resins resist chalking. High quality pigments resist fading. *This is why you must have the quality and durability of both!*
Anodizing

Anodizing is not a true coating -- it is a process that increases the thickness of the naturally occurring oxide layer by electrochemical means. The anodic film of aluminum oxide acts as a protective layer.

Anodized aluminum:
• Is very hard, making it mar and scratch resistant
• Has a very popular metal look
• Has poor mortar and chemical resistance
• Requires extremely high volumes of water for processing
Anodizing is thought to be environmentally friendly because there are no VOCs emitted during processing.
Case Study

Emissions of Carbon Dioxide per Profile

- Powder
- Liquid
- Anodizing

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Cost Comparison

Cost components of AAMA 2605 coatings in North America

- Relative cost
- Pre-treatment
- Heat
- Electricity
- Anodizing Chemicals
- Paint

Powder | Liquid | Anodizing
Conclusions on Environmental Performance

• **Powder and liquid coatings are better** than anodizing in most countries (*The exception is countries with a very large share of nuclear or hydro power, e.g. France*)

• **Powder has no VOCs**, thus it results in fewer emissions.

• **In liquid coatings, VOCs are destroyed** in most production in USA, thus eliminating 95% of emissions

• **NO LEED POINTS FOR FACTORY APPLIED FINISHES.**
This illustration shows the typical film requirement of a liquid PVDF application.
This illustration shows a powder coating system that is a single coat system but requires higher film.
The Importance of Color

Color is becoming increasingly important in marketing.
## Qualities of Liquid Coatings

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<tr>
<th>Feature</th>
<th>Description</th>
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<tbody>
<tr>
<td>Wide range of color choices</td>
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<td>Holds metallic flake very well</td>
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<td>Custom colors can be created by simply mixing paints in numerous individual batches at the coater’s site</td>
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<td>Low to medium gloss</td>
<td>Not susceptible to mortar damage</td>
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<td>Liquid paints containing PVDF resin types are softer paints and are not as scratch- or abrasion- resistant as powder coatings</td>
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<td>Can be easily mixed, which results in short lead times – as little as a few hours. Also allows for fast turnaround times.</td>
<td>Liquid coatings can be used to match the original color of a coated material and can be used for field touch-ups on powder- or liquid coated substrates. Some liquid paints can be touched up or repainted in the field, which is a major advantage when repairs become necessary.</td>
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Qualities of Powder Coatings

- Single coat application achieves a uniform finish without runs, drips, sags or bubbles.
- Available in a wide range of colors.
- Increasingly able to include brighter smooth metallics.
- Powder coated substrates can be touched up with liquid paint.
- Not susceptible to mortar damage.
- Wide range of gloss choices.
- Powder may have longer lead times.

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Qualities of Anodized Surfaces

- Susceptible to chemical change and damage as the result of coming into contact with mortar
- Color variations in the metal itself are apparent in the finished surface
- Attractive metallic sheen
- Abrasion-resistant finish
- Environmentally costs of anodizing are high in most countries
- Comparatively inexpensive
- Damage areas cannot be touched up

High recycled content may result in mottled appearance

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How to Choose a Finish

For designers, the key to a successful outcome when specifying a coating is to consider the geographical location of the building, its end use, and coating performance requirements.

The method used to apply a coating is not as important as its resin and pigment chemistry when it comes to product suitability and performance.

*Put your finish first... for a finish that lasts.*
Questions?