Thermoplastic Coatings for Metal Protection and Corrosion Prevention of Lighting Columns

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Plascoat Systems Ltd.
Introduction

- Plascoat Systems Ltd.
- Tradition paints v. thermoplastics
- Excellent barrier properties
- Functionalised Polyolefin Alloys
- How they are processed
- Excellent corrosion protection
- Case studies on various metals
Plascoat Systems Ltd.
- Has manufactured plastic coating powders since at least 1965
- Therefore, one of the most experienced manufacturers in this field
- Two material manufacturing sites strategically located in the UK and the Netherlands
- Over 30,000 tonnes per year of capacity
- Sales network all over the world
- Probably the widest range of thermoplastic coating powders produced by any company worldwide.
What are traditional paints?

- Based mostly on "thermosets" such as polyester, epoxies, polyurethanes or acrylcs.
- Differ for thermoplastics in that the molecules chemically "cross-link" to form a 3-dimensional matrix that solidifies and will not melt again on heating.
- This technology is used in solvent based paints and in traditional powder coatings.
What are thermoplastics?

- Commonly referred to as “plastics”.
- Melt on heating and re-solidify on cooling.
- Common plastics are polyethylene, polypropylene, nylon, PVC etc.
- Used mostly for moulding into articles such as bottles, caps and components or by extrusion into packaging, carrier bags, pipes and fibres etc.
Thermoplastics in Coatings

- Extrusion
  - Packaging
    - Aluminum Foil
    - Paper
    - Cans
  - Fencing Wire
  - Pipes
- Emulsion
  - Plastisols
    - Wallpaper
    - Automotive under-seal
  - Non-stick coatings
- Hot Melt
  - Bitumen
  - Tie-layers
    - Laminates
    - Multi-layer systems
- Reasons for use
  - Barrier properties
  - Flexibility
Why Use Thermoplastic Powders?

- **Barrier Properties**
  - Vapour
  - Liquids
  - Chemical Resistance

- **Thicker coatings**
  - Barrier properties
  - Excellent Salt spray
  - Edge and weld coverage - material dependant
  - “Grip” and “warmth”

- **Flexibility**
  - 50-1000% elongation
  - No cracking or chipping even at low temperatures
Comparison of Thermoplastic and Thermosetting Powders

- **Thermosetting Powders**
  - Brittle pre cure
  - Ground to below 75 mics
  - Produce coatings up to 100 microns

- **Thermoplastics**
  - Tough no chemical change
  - Ground below 300 mics - Fluid bed coatings 250 to 750 mics
  - Ground below 150 mics - ES Spray coatings 170 to 300 mics
Functionalised Polyolefin Alloys = Acid modified polyolefins

- Polyolefin are hydrophobic:–
  - Prevent moisture passing through the coating
  - Excellent in marine and Industrial environments

- Acid Groups Provide:–
  - Long term adhesion without need of a primer
  - Excellent salt spray resistance

- FPAs contain only C,H,O
  - Food/water contact approvals
  - Low smoke/toxicity on burning

- FPAs are Elastomeric/ Very flexible
  - Ductile impact properties
  - No cracking/chipping
  - Temperature range -70 °C to +70 °C (M.Pt = +100 °C)
  - Good chemical resistance
How do you process Functionalised Polyolefin Alloys?

- **Fluid bed**
  - Pre-treatment
    - Degrease
    - Grit-blast or iron phosphate
  - Pre-heat 220-315°C
  - 3-5 sec dip
  - Post heat (170 °C if necessary)
  - 250-750 mils

- **Electrostatic spray**
  - Pre-treatment
    - Degrease or
    - Zinc phosphate or light grit-blast
  - Cure - 160-220 °C for 5 - 40 min depending on metal thickness
  - 30-50 kV
  - 150-300 micron
Physical Properties of Functionalised Polyolefin Coatings

Elongation at Break: 700 to 800 %

Tensile Strength: 14 MPa

Impact Str. on 1 mm steel: > 160 in.lbs (18 Joules)

Low Temp. Flexibility: -70°C

Abrasion Resistance: 60mg (Taber)
How good is the corrosion protection of Functionalised Polyolefin Alloys?

- Water and salts cannot permeate through
- Thicker coatings and adhesion improve this
- Many thousands of hours salt spray
  - No blistering
  - No corrosion
- Minimal under film corrosion even if damaged
  - Flexible so no cracking
  - Resistant to alkalis
- UV resistance
  - 5000 hrs QUV - no significant colour change
  - 5 years in Florida no significant colour change
  - 12 years in Northern Spain - No significant colour change
Corrosion Testing of Functionalised Polyolefin Coatings

- Salt-spray resistance Mild Steel
  - Grit blasted - unscribed - 10,000 hrs - No blistering or corrosion
  - Grit Blasted - scribed - 1,000 hrs - 5 - 8 mm loss of adhesion

- Salt-spray resistance Galvanised Steel
  - Phosphated - scribed - 1,000 hrs - 2 - 4 mm loss of adhesion
  - Chromated - scribed - 1,000 hrs - 0 - 1 mm loss of adhesion

- Salt-spray resistance Aluminium
  - Lubricant free - scribed - 1,000 hrs - 0 mm loss of adhesion
Graffitti Removal
Functionalised Polyolefin Coatings - Construction
Fencing

- Middle East, US, Australia, Spain, UK, Hong Kong, Philippines
- Chain Link, Framework, Ornamental, Security Mesh
- Meets requirements of ASTM F1043, 668 and 626
- Fence in Dubai coated in FPA after 7 years.
10 years of success under demanding conditions

San Sebastian, Northern Spain, Loyola’s footbridge
Footbridge
Marine - Northern Spain
12 - year test

FPA after 12 years

No under-film corrosion after 12 years

Paint re-coated 3 times
Marine
Brisbane, Australia - 6 - years

Galvanized and polyester coated mesh after 6 years

FPA coated mesh after 6 years
Fencing
Brisbane, Australia

Aluminum coated in polyester after 12 months by the sea in Brisbane, Australia

Fencing re-coated in FPA after 24 months
Lampposts

La Réunion, Indian Ocean, 5 years
Stockholm, Sweden, 11 years

Bilbao, Spain, 5 years

Functionalised Polyolefin coatings - one of only three coatings given the estimated lifetime of over 50 years by the Swedish Corrosion Institute.
Even the toughest of graffiti paints
Functionalised Polyolefin Coatings

- Ideal for marine, industrial, hot, and cold climates
- Electrostatically sprayable
- 12 years world-wide field and laboratory experience - proof of performance
- Very long-term corrosion protection
- Very low toxicity - food/water approvals
  - No VOC’s, no TGIC, no phthalates, no halogens, no isocyanates
- Vandal resistant - easy removal of Graffiti
The Role of Thermoplastics for Metal Protection and Corrosion Prevention of Lighting columns

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Pipes and Fittings
Gothenburg, Sweden

Variety of Approvals
- UL classification to NSF61

Pipe coated in functionalized polyolefin laid in 1990

Pipe after 11.85 years in soil

- Rusting Zero
- Blistering Zero
- Cracking Zero
- Flaking Zero

Spread of deliberate defects
- From scratch Zero
- From circular hole Zero
- From blow mark Zero

Adhesion 100%

Lifetime of pipes est. 200 y
Road Culverts - Sweden