



# Fluorinated Resins for Ultra-Durable Coatings



*Ferrari World, Abu Dhabi*

**AGC**

Your Dreams, Our Challenge



Marina Bay Sands, Singapore

Burj Al Arab, Dubai

Akashi-Kaikyo Bridge, Kobe

## A FLUORINATED RESIN FOR HIGHLY DURABLE COATINGS

AGC developed its solvent-soluble fluoropolymer, LUMIFLON™, an OH functional polyol, in 1982. Its unique alternating structure is key in providing ultra-weatherability and allows LUMIFLON™-based coatings to be highly durable and far longer lasting than other coatings. They can be cured at room temperature or at elevated temperatures. LUMIFLON™ is suitable for use in both field-applied and shop-applied coatings.

The use of LUMIFLON™ helps to maintain the original appearance of buildings, vehicles, windmills and bridges for several decades, offering protection against UV rays, oxidation, humidity, corrosion and acid rain.

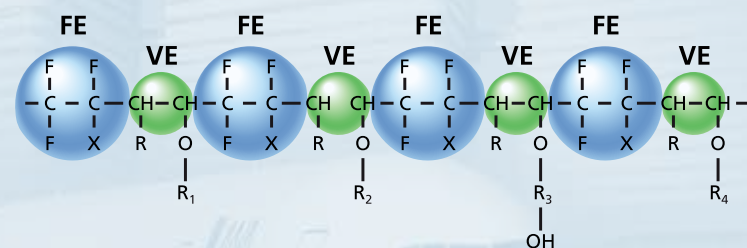
LUMIFLON™ resins can be formulated into coatings with a wide range of gloss and colour. The use of a topcoat based on LUMIFLON™ significantly reduces repainting and cleaning costs for the lifetime of the coated structure.

The product is used on many iconic structures, such as Ferrari World in Abu Dhabi, Marina Bay Sands in Singapore, the Burj al Arab hotel in Dubai, the Expo Bridge in Milan as well as the aircraft of the Japanese airline, ANA.

## FEATURES

- Fluoropolymer based on fluoroethylene & vinyl ether monomers (FEVE resin)
- Available as solvent borne, water based & powder grades
- Curable from room temperature to high temperatures – from 10°C to 230°C
- Highly transparent film
- Protects aluminium, steel, fibreglass, concrete, polycarbonate & other materials from sun, corrosion, wind, rain & chemical exposure

### Polymer Structure of LUMIFLON™ Resins



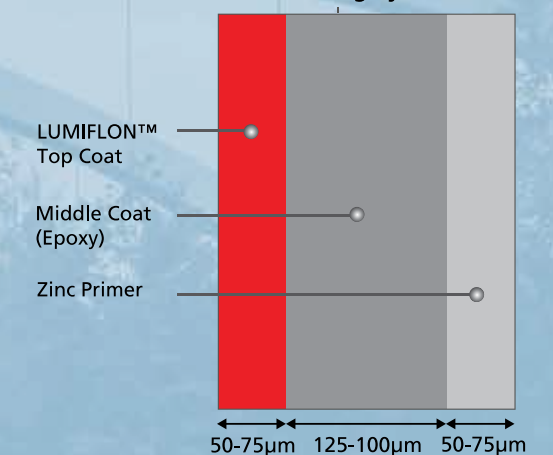
### Key

- FE (Fluoroethylene for Durability)
- VE (Vinyl Ether for Functional Groups)
- Functional Groups (R)
  - R<sub>1</sub> : Transparency, Gloss & Hardness
  - R<sub>2</sub> : Flexibility
  - R<sub>3</sub> : Cross-linkability
  - R<sub>4</sub> : Pigment Compatibility & Adhesion

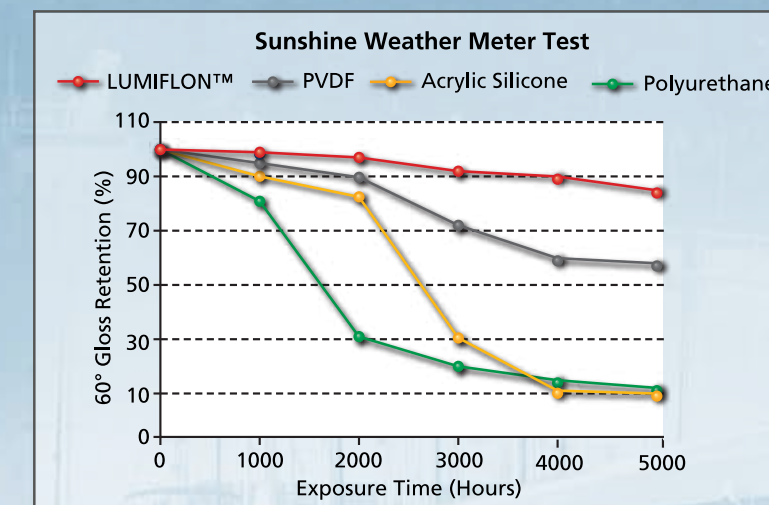
## BENEFITS OF FEVE COATINGS

- Aesthetics – wide range of colour & gloss achievable; long-lasting colour & gloss retention
- Corrosion prevention & chemical resistance
- Minimal erosion of coating thickness over years
- OH functional – polyurethane chemistry means standard paint equipment can be used
- Low chalking thanks to outstanding resistance to UV light & weathering
- Low maintenance which minimises costs
- Sustainable – less paint consumption & reduced emissions
- Extended coating life/long life cycle of up to 60 years
- Curable at both ambient & elevated temperatures – for field or shop-applied coating
- Can easily pass ISO12944 C5 very high (VH) & CX

### Cross Section of a Coating System

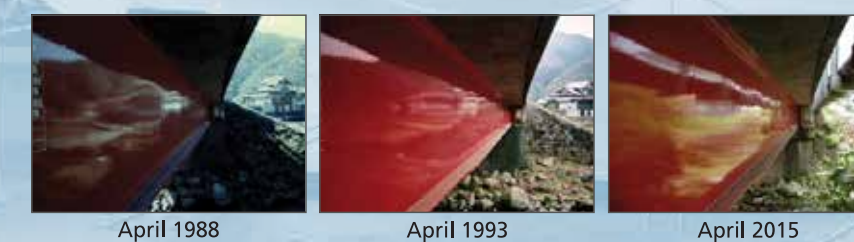


The LUMIFLON™ coating prevents corrosion initiators penetrating the topcoat & degrading the zinc primer below.



## CASE STUDY - TOKIWA BRIDGE

Fluoropolymer topcoats have been used on bridges in Japan for over 30 years. The Tokiwa Bridge in Hiroshima has benefitted from a LUMIFLON™ based coating since 1988.







Aldar Headquarters, Abu Dhabi

IBG and Tax Offices, Groningen

Expo Bridge, Milan

### SUSTAINABILITY

The weatherability, longevity and the ability to formulate low VOC (volatile organic compound) coatings with LUMIFLON™ resins are all features that contribute to its sustainability. AGC Chemicals’ vision for LUMIFLON™ is “to reduce consumption of non-renewable resources, minimise waste, and create healthy, productive environments”.

#### Consumption Reduction

LUMIFLON™ coatings are expected to last up to 60 years without fading, reducing life cycle costs related to the maintenance, re-application and/or replacement of underlying surfaces. On existing roofs, a LUMIFLON™ topcoat can stop the degradation of the underlying reflective coating, thus extending the life and solar reflectance capability of the roof and minimising the use of raw materials derived from oil.

#### Waste Reduction

By extending the life of roof and wall systems, LUMIFLON™ topcoats reduce waste created from disposal of damaged roofing and walls, avoid energy consumption in the production, transportation and installation of new systems and maintain energy and equipment savings from continued high-performance of the building envelope. In addition, the energy consumed in removing a coating from a building or structure can be avoided through the use of a new paint product containing a LUMIFLON™ clearcoat with excellent durability and weatherability.

#### Creation of Healthy, Productive Environments

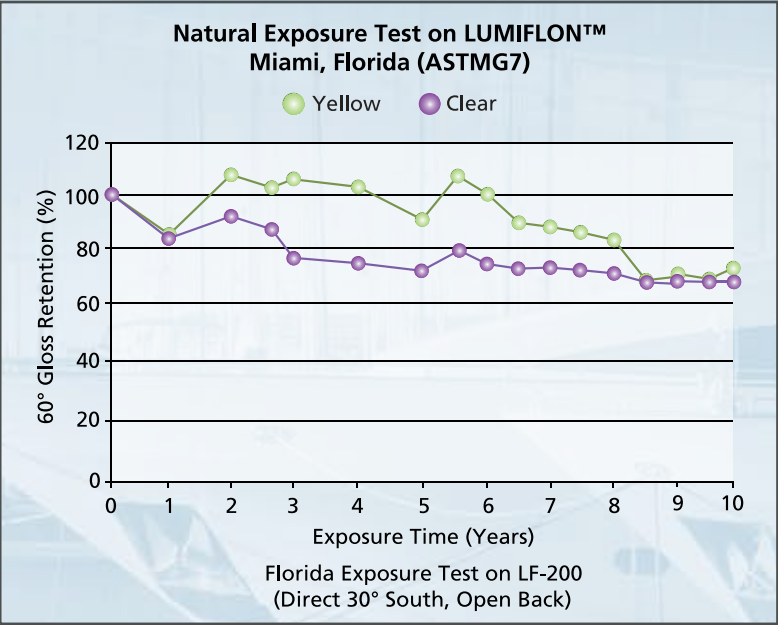
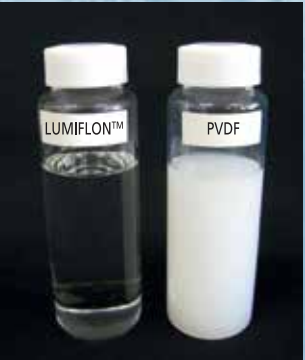
There are four types of LUMIFLON™ resins, three of which – solid, powder, and emulsion grades contain either zero volatile organic compounds (VOCs) or can be formulated to contain less than 50 g/L of VOCs, meeting the most stringent green building criteria in Europe.

Due to its longevity, LUMIFLON™ reduces the environmental impact associated with production, transportation (energy consumed, greenhouse gases emitted), and VOCs off-gassed during the repainting/recoating process.

### OUTPERFORMS PVDF COATINGS

LUMIFLON™-based coatings are used in the construction industry on structures such as buildings, bridges and windmills and in the transport industry on aeroplanes, cars and ships. Tests and studies have been conducted in laboratories, simulators and real-world environments showing that LUMIFLON™ outperforms high performance polyesters and other competitive materials, like PVDF.

	LUMIFLON™ vs. PVDF	
	LUMIFLON™	PVDF
Resin Type	Solution	Polymer Dispersion
Curing Temperature	10°C - 230°C	>250°C
60° Gloss	10 - 90	20 - 35
Colour Range	>230 Colours	Colour Selection is Limited
Recoatability	Excellent	Difficult



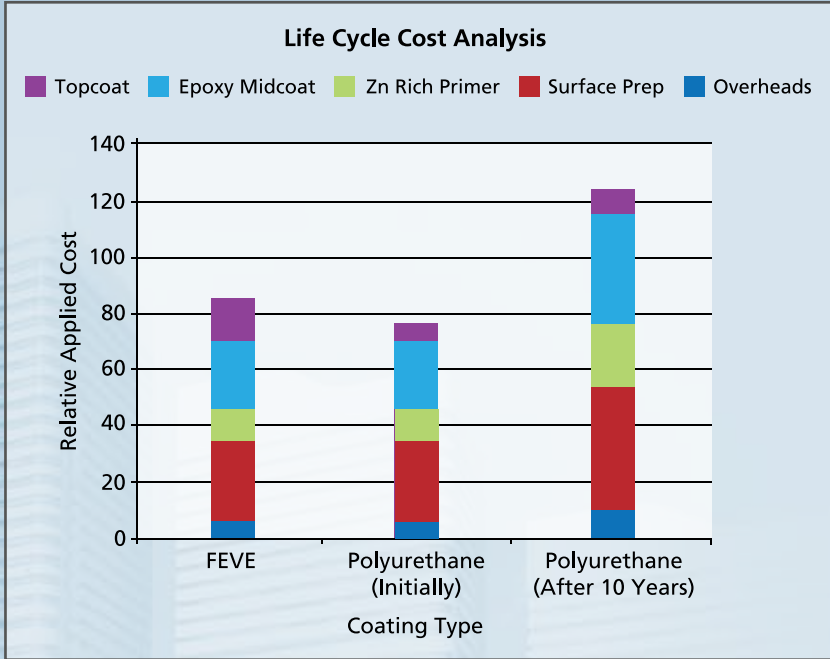




EYE Film Museum, Amsterdam

LOWER LIFE CYCLE COST

Initial investment in a LUMIFLON™ FEVE coating could be 5-10% higher than a standard polyurethane topcoat. However, the lifetime expectation of such a coating is from 30 to over 60 years and a polyurethane topcoat would have required 2-3 repainting cycles during this period. With the use of LUMIFLON™ additional costs associated with repainting, such as asset downtime, staging costs, environmental costs and emissions and CO<sub>2</sub> from equipment, can be avoided. Over the lifetime of a project the cost difference can be significant and therefore LUMIFLON™ offers better long-term value for money.



Mercedes-Benz Museum, Stuttgart

LUMIFLON™ PRODUCT SELECTION

SOLVENT GRADES

Grade	LF200	LF600X	LF910LM
Solid Content (%)	60	50	66
T <sub>g</sub> (°C/F)	35/95	20/68	37/99
OH Value	52	57	100
Acid Value	0	0	0
Solvent	Xylene	Xylene	Xylene
Applications	General Protective Coating	Coil Coating	Heavy Duty Aerospace

POWDER GRADES

Grade	LF710F
Solid Content (%)	100
T <sub>g</sub> (°C/F)	52/125
Softening Point (°C/F)	90/194
OH Value	46
Acid Value	0
Applications	Architecture, Window Frames, Hydrants

SOLID GRADES

Grade	LF200F	LF916F
Solids	>98%	>99%
T <sub>g</sub> (°C/F)	35/95	34/93
OH Value	49	100
Softening Point Celsius	119	117
Applications	General Protective Coating, Heavy Duty, Industrial Maintenance	

WATER BASED GRADES

Grade	FD1000	FE4300	FE4400
Type	Dispersion	Emulsion	Emulsion
Solids	40%	50%	50%
OH Value	85	10	49
Min. Film Forming Temp (°C/F)	29/84	30/86	55/31
Ionic Character	Anionic	Anionic	Anionic
Applications	General Protective Coating, Heavy Duty, Industrial Maintenance		

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