Super Durable Fluoro-polymer Coating

of Lumiflon (since 1982)

Pertubuhan Akitek Malaysia (PAM) Meeting
on 19th Sept. 2015
Super Durable Fluoro-Polymer Coating of Lumiflon

9:50-10:15
1. What’s Lumiflon
2. Characteristics of Lumiflon
   a) High Gloss & Wide Color Range
   b) Durability
3. Lower Life Cycle Costs
4. Asia Pacific and Global Projects

11:30-12:00
Case study: Green Protecting Coating
Reduction of
1. VOC: Water and Powder
2. CO2: Long Term Use
3. Energy: Reflecting Coating
4. Dirt Picking Up
Applications 1 (since 1982)

Architectures

- Sonpo Japan > 20 years
- Mistui 18 years
- Ark Mori 19 years
- Carrot Tower 20 years
- Marunouchi 7 years
- Tokyo Forum > 15 years
- Land Mark Tower > 16 years
- Queens Square 12 years
- Continental Hotel 13 years
Application 2 (since 1982)

Protective coating
Application 3 (since 1982)

Vehicles

ANA over 100 planes

< Durability >
• -50°C ~ R.T. Thermo Cycle
• Rain Erosion
• Plane Oil Resistance
• Strengthen UV ray

Polyurethane 4 years → Fluoro Polymer paint ⇒ over 8 years

Shinkansen

F R P Ships

Auto Mobile

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What are Fluoropolymers?

Positives
- Excellent Weather-ability
- Corrosion Resistant
- Low Surface Energy

Negatives
- Not Solvent Soluble
- Applied With Heat
- Limited Range of Gloss and Colors
Chemical Structure of Lumiflon®

$LUMIFLON® = FEVE$ (Fluoro-Ethylene / Vinyl Ether copolymer)

In 1982, Lumiflon was commercialised the first solvent-soluble fluoro-polymer in the world.

Fluoro Ethylene

Vinyl Ether

Perfect Alternative Sequence

Fluoroethylene Segment
1. Weatherability
2. Durability
3. Chemical resistance

Vinyl Ether Segments
- $R_1 = \text{Clarity, Gloss, Hardness}$
- $R_2 = \text{Flexibility}$
- $R_3 = \text{Crosslinking site (-OH)}$

Now, We can supply Water Base and Powder Grade as same structure with good pigment compatibility.
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Aesthetics
LUMIFLON® makes world colorful
<table>
<thead>
<tr>
<th>Brand Name</th>
<th>LUMIFLON®</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoro-polymer Type</td>
<td>FEVE (3F)</td>
<td>PVdF (2F)</td>
</tr>
<tr>
<td>Polymer Type</td>
<td>Thermo-set</td>
<td>Thermo-plastic</td>
</tr>
<tr>
<td>Appearance</td>
<td>Transparent (Solution)</td>
<td>Milky White (Dispersion)</td>
</tr>
<tr>
<td>Cure Temp.</td>
<td>Room Temp. to 230°C</td>
<td>&gt;250°C</td>
</tr>
<tr>
<td>Gloss</td>
<td>15 to 80%</td>
<td>25 to 35%</td>
</tr>
<tr>
<td>Color Range</td>
<td>Wider</td>
<td>Limited</td>
</tr>
<tr>
<td>Re-Coatability</td>
<td>Excellent</td>
<td>Poor</td>
</tr>
<tr>
<td>Exposure Time (hr)</td>
<td>0⇒1500 *QUV test</td>
<td></td>
</tr>
<tr>
<td>Haze (%)</td>
<td>0.5⇒2.9</td>
<td>13⇒36</td>
</tr>
<tr>
<td>Yellow Index(-)</td>
<td>0.6⇒3.2</td>
<td>9.7⇒14</td>
</tr>
</tbody>
</table>
Lumiflon® coatings achieve high gloss and wide range of colors.
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Lumiflon® coating protects undercoat as top coat

Resins = Main Ingredient

Pigments
* Colorants
* Extender Pigment
* Metal Pigment

Additives
* Dispersing Agent
* Leveling Agent
* Deformer Agent
* Hardener

Solvents
* Water
* Xylene
* Toluene
* Mineral turpentine spirits

Lumiflon coating ⇒ long lasting in harsh environment

UV

Salt

Topcoat (Lumiflon)

Under & Middle Coat

Substrate (Metal, Concrete, etc)
Accelerated Exposure Test

QUV-A (ASTM D4587)

Weather-ability of Lumiflon® Coatings

Graph showing the gloss retention of Lumiflon, Polyester Urethane, Acrylic Urethane, and Siloxane over hours of QUV-A exposure. Lumiflon shows excellent weatherability.
Long Term Application over 15-25 years

National Library, 25y, 1986, Concrete

Yushima Shrine, 22y, 1989, Concrete

Okayama Castle, Water base, 15y, 1996, Concrete
Long Term Application over 22-32 years

Yellow metallic color without Clear top
28y, 1988, Concrete

Rail Way Station
22y, 1989, Aluminum Panel

Metallic Blue with Clear top
23y, 1990, Aluminum Panel

Blue Enamel, 32y, 1984, PC Panel

Excellent Appearances
15y exposure samples at Hiroshima

A Alkyd paints
B Chlorinated Rubber pains
C Polyurethane Paints
D Fluoro-Polymer Paints

No Chalking for 15 years

D : No chalking : Fluoro-Polymer paint film
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Preservation of color and gloss

- **Lumiflon® coated bridge over 27 years**  
  Tokiwa Bridge in Hiroshima, Japan

In 2014

<table>
<thead>
<tr>
<th></th>
<th>Gloss Retention</th>
<th>Color Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washed Surface</td>
<td>100%</td>
<td>2.3 ΔE</td>
</tr>
<tr>
<td>Unwashed Surface</td>
<td>92%</td>
<td>3.5 ΔE</td>
</tr>
</tbody>
</table>
### Durability and LCC comparison of Fluoro-polymer paint and Chlorinated rubber System

<table>
<thead>
<tr>
<th>System</th>
<th>Fluoro-polymer</th>
<th>Chlorinated rubber</th>
<th>Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top coat ($)</td>
<td>502</td>
<td>101</td>
<td>5.0</td>
</tr>
<tr>
<td>Paint cost ($)</td>
<td>1,724</td>
<td>278</td>
<td>6.2</td>
</tr>
<tr>
<td>Manpower cost ($)</td>
<td>3,696</td>
<td>2,796</td>
<td>1.3</td>
</tr>
<tr>
<td>Scaffolding cost ($)</td>
<td>3,957</td>
<td>3,297</td>
<td>1.2</td>
</tr>
<tr>
<td>Total repaint cost ($)</td>
<td>9,377</td>
<td>6,371</td>
<td>1.5</td>
</tr>
<tr>
<td>Durability ( years)</td>
<td>&gt; 27</td>
<td>8</td>
<td>&gt;3.3(durability)</td>
</tr>
<tr>
<td>LCC: cost($) / year</td>
<td>347</td>
<td>796</td>
<td>&lt; 0.43</td>
</tr>
</tbody>
</table>

**LCC is below 1/2 during 27 years**
## Estimated Lifetime by The Japanese Authorities

<table>
<thead>
<tr>
<th>Authority</th>
<th>Fluoro-polymer Top system</th>
<th>Polyurethane Top system</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPMA</td>
<td>60 years</td>
<td>18 years</td>
</tr>
<tr>
<td>JSSC</td>
<td>50 years</td>
<td>30 years</td>
</tr>
<tr>
<td>JCA</td>
<td>60 years</td>
<td>40 years</td>
</tr>
</tbody>
</table>

**JPMA:** The Japan Paint Manufacturers Association  
**JSSC:** The Japanese Society of Steel Construction  
**JCA:** The Japan Bridge Association
Initial costs for coatings
Lumiflon is **6%** higher than polyurethane

Initial costs for coatings & iron body
Lumiflon is only **0.07%** higher than polyurethane
**Life Cycle Cost (LCC) Reduction**

- **LCC Evaluation Index**

- **Initial Costs for Coatings**
  - Every 5 years
  - Every 8 years
  - Every 12 years
  - Over 30~60 years

- **Polyurethane** (94)

**Reduction of Life Cycle Costs**
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Lumiflon® based Coatings in Thailand

Software Park

New Bangkok International Airport, Concourse Canopy

The Challenger Exhibition Center

Export Mart

Shinawatra Building

The Gallery (CRC Tower)
Lumiflon® based Coatings in Indonesia

Regent Four Seasons Apartment

World Trade Center II

Regatta
Lumiflon® based Coatings in Malaysia

- Government Buildings at the Federal Government Administrative Center, Putrajaya
- Wisma Sanyan
- Seravista
- Balai Felda
- Damansara Mosque
- Shangri-La Hotel
- LKT Precision Engineering Factory
- Kuching International Airport
- Prince Court Medical Centre
- Motorola Factory
A Mosque in Kuala Lumpur
Malaysia

A Mosque in Istanbul
Turkey
Shinjuku Railway Station
Tokyo, Japan

Software Park
Bangkok, Thailand
[STONE FINISH]
PETRON in Malaysia

PETRON
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TOKYO SKYTREE®
Worlds’ tallest electric wave tower
634m high
Tokyo, Japan
Steel, Coated in 2011

©OBAYASHI CORPORATION

TOBU TOWER SKYTREE CO., LTD.
- Anti-corrosion primer: Zinc-rich paint 75μm
- Undercoat: Epoxy resin paint 120μm
- Middle / topcoat: Thick-coating fluoropolymer paint 55μm

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Ferrari World  (Yas Island, Abu Dhabi, U.A.E.)
Burj Al Arab (Dubai, U.A.E.) ALPOLIC®
Projects in Australia

1 Lunar Park (Sydney)
2 National Australia Bank (Melbourne)
3 Qld Brisbane Head Office
Victoria University, St Albans Campus (Melbourne, Australia)
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Water Base Coating & Powder Coating
Okayama Castle (Okayama, Japan)
Powder Coating

Deloitte Center New Zealand

Pearl River

Aldar Headquarters, ABU DHABI

Perth Arena, Australia

Royal Clock tower, Marrakesh
The creative designs would not be possible without the use of fluoro-polymer protective coating.

Thank you!

EQX Building
Questions?