



INDUSTRIALIZATION OF ANAPHORETIC COATING PROCESS ON ALUMINIUM ALLOYS

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HELICOPTERS

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AIRBUS

Presentation plan

1. AIRBUS Helicopters presentation
2. Application of anaphoretic coating process
3. Process description
4. Industrial sites
5. Anaphoretic coating performances
6. Industrialization
7. Reparability
8. Conclusion

1- AIRBUS Helicopters

World leader manufacturer in the civil market

23,059 employees

6.65 bn € turnover in 2016

to serve 3,014 operators

29 Customer Centres

in 152 countries



Conception & Development



Industry & Production



Support & Services

AIRBUS

2 – Application of anaphoretic coating process

Protection of Airframe parts in aluminium alloy

The main aluminium alloys used in aeronautic structures :

| | | | | | | |
|------|------|------|------|------|------|------|
| 2024 | 2618 | 5086 | 6061 | 7075 | 7175 | 7010 |
|------|------|------|------|------|------|------|



Airframe assembly treated by Alodine + Primer



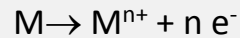
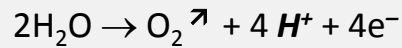
Green technology
Cycle time reduction / Production capability

3 – Process description

E-coat = Electro-coated paint on conductor substrate

Parts to protect = Anode Cathode

Water electrolysis / Metal dissolution :

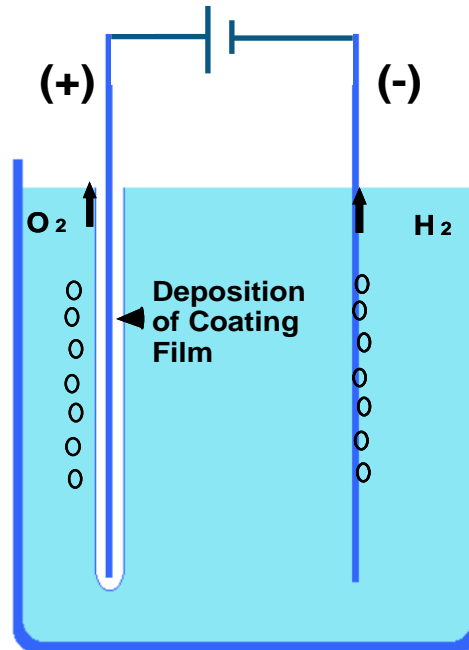


AND painting coagulation :



Key process parameters:

- Solids content
- Pigment/Binder ratio
- pH
- Bath conductivity
- Amines
- Solvents
- Immersion (time, T°, voltage)
- Curing (time, T°)



Alkaline degreasing

Acid etching

Anaphoresis (E-coat)

Curing
110 – 120°C

4 – Industrial sites

- **AH Marignane:** First industrial process implemented \approx 4000L tank
- **SGI (Aalberts Industries)** \approx 500L tank (AIRBUS partner for feasibility tests)
- **SPI Aero** \approx 3000L tank (AIRBUS partner for qualification / industrialization)



Pilot line at SGI (France)

E-coat product = PPG Aerocron™

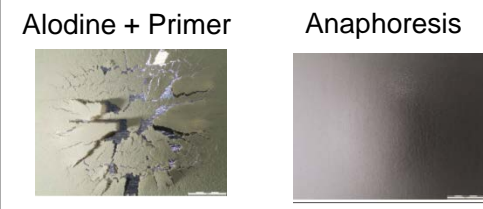


SPI Aero (France)

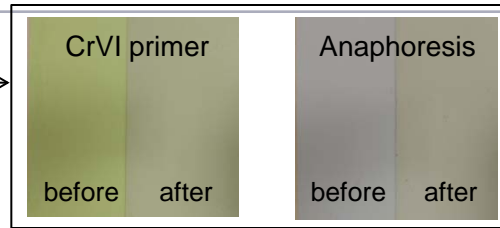


AIRBUS Helicopters
Marignane (France)

5 – Anaphoretic coating performances



| Performances | Test method | Tested materials | RESULT: Comparison to Alodine + primer |
|---------------------------------|--|------------------------|---|
| Adhesion | ISO2409 - (T ₀ , T ₀ +14days of immersion) | 2xxx, 5xxx, 6xxx, 7xxx | 😊 |
| Bending test | ISO1519 (Ø=6mm at RT) | 2024 T3 | 😊 |
| Impact resistance | ISO6272-1 | 2024 T3 | 😊 |
| Scratch resistance | ISO1518 | 2024 T3 | 😊 |
| Corrosion SST | ISO 9227 – 3000h with and without scarification | 2xxx, 5xxx, 6xxx, 7xxx | 😞 Need of an additional paint layer on 2024 , 2618 & 7010 machined 😊 on the other alloys |
| Filiform corrosion | ISO 4623-1 &2 | 2024 T3 | 😊 |
| Confined corrosion | ISO 9227 – 3000h with containment area | 2024 T3 | 😊 |
| Humidity/Heat resistance | 70°C - 85% HR - 3000h | 2024 T3 | 😊 |
| Accelerated aging | -55°C to 90°C and 0% to 70% HR - 3000H | 2024 T3 | 😊 |
| Sea water resistance | ISO 2812-1 | 2024 T3 | 😊 |
| Fire resistance | FAR 25-853 | 2024 T3 | 😊 |
| U.V. resistance | UVB cycles of 20h during 500h | 2024 T3 | 😊 |



6 – Industrialization

Treatment of parts

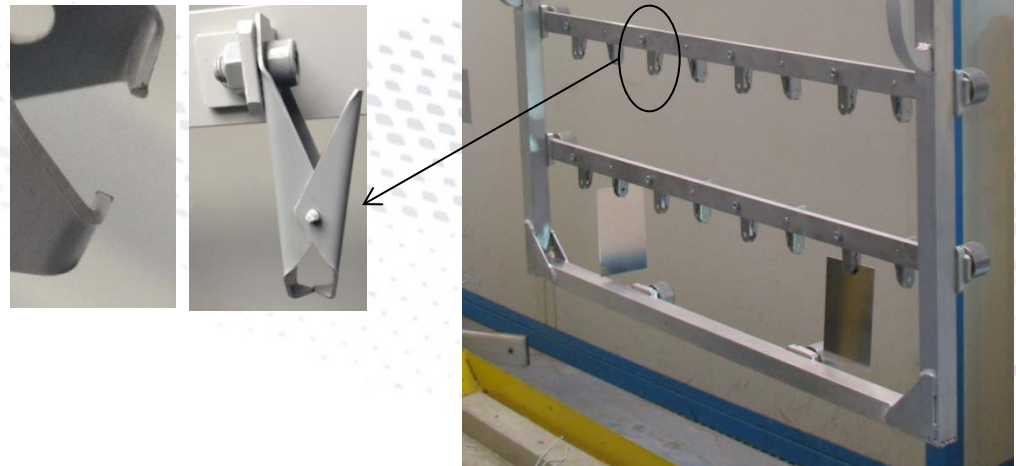
Capability to treat complex geometry

Example of structural parts treated by anaphoresis



Tooling

- ✓ Fluids evacuation
- ✓ Fixation / Contact points
- ✓ Conductivity: Aluminium & Stainless steel tested



Impact of the treated surface

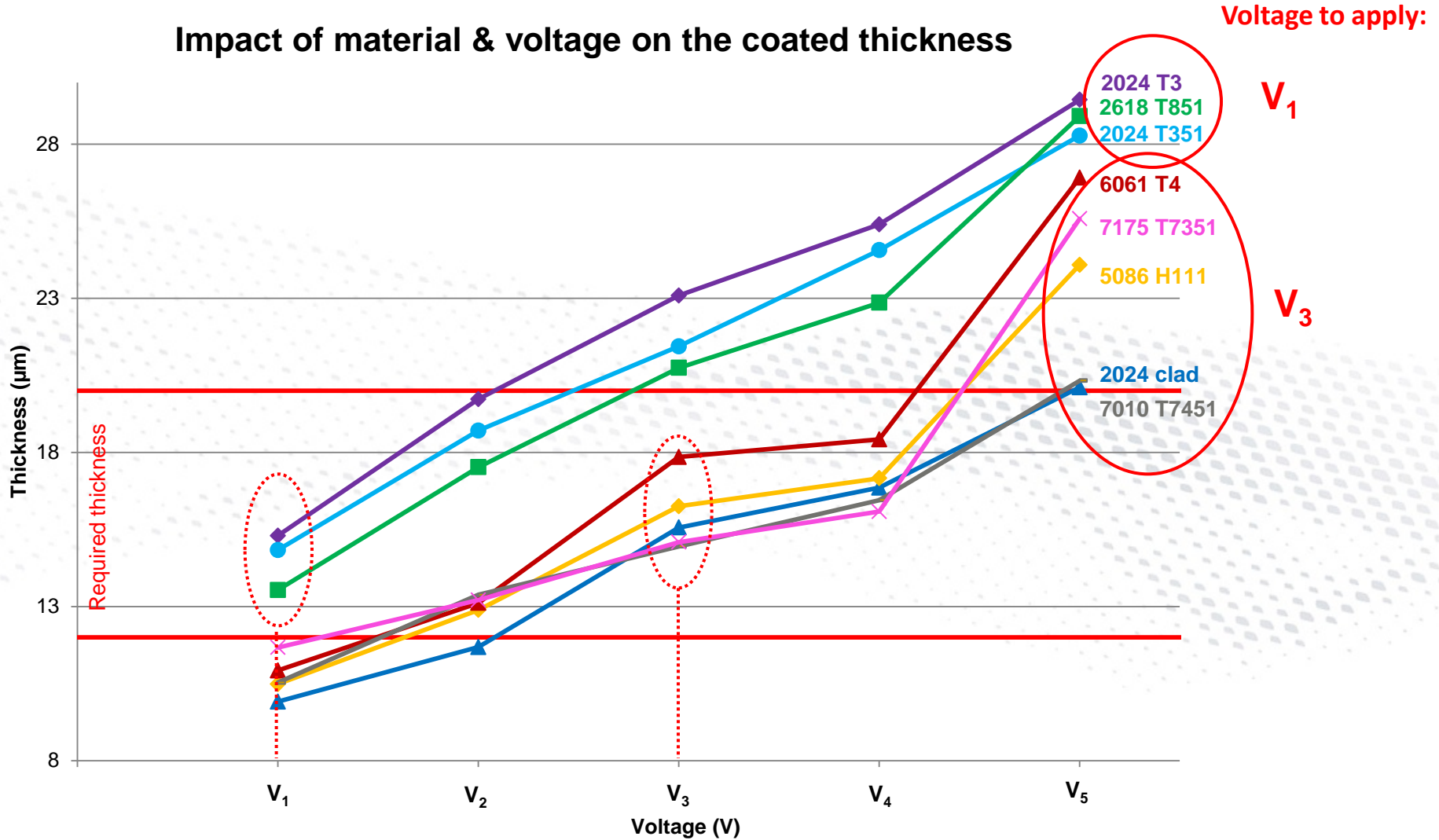
| 2024 T3 sheet surface | E-coat thickness |
|-----------------------|------------------|
| 0,04 m ² | 11,5 µm |
| 4 m ² | 11,4 µm |



No influence of the surface treated on thickness

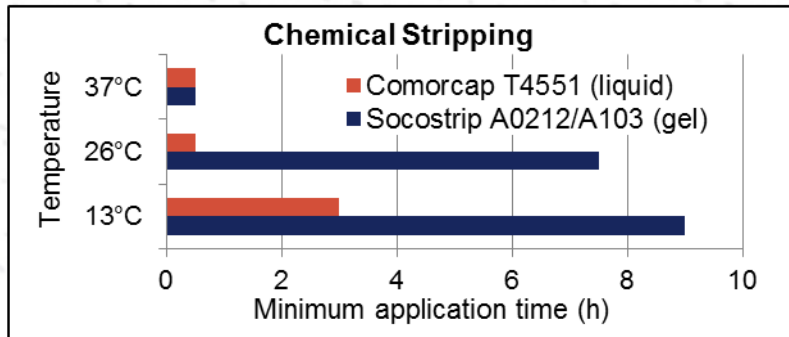
6 – Industrialization

Impact of material & voltage on the coated thickness

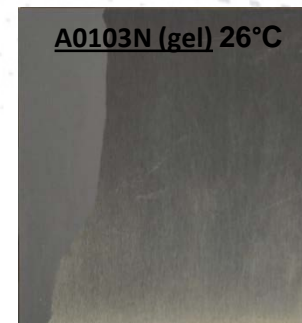


7 – Reparability

| Stripping process | | Results |
|----------------------|--------------------------------|---------|
| Manual stripping | Scotch brite | 😊 |
| Mechanical stripping | Polymer media | 😊 |
| Chemical stripping | Socostrip A0212 / A0103N (gel) | 😊 |
| | Comorcap T4551 (liquid) | 😊 |

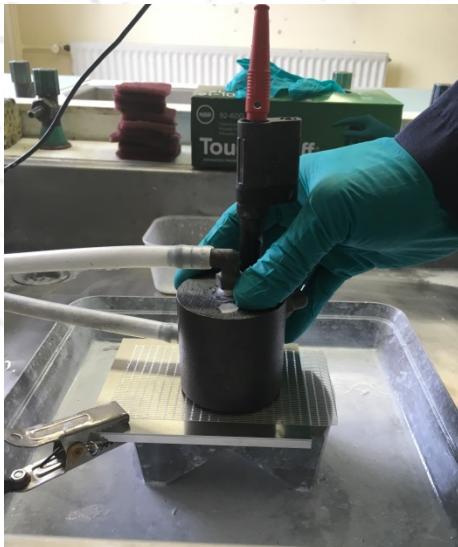


Chemical stripping



| Local Touch-up process | Results |
|--|--|
| Reprocessing by immersion (anaphoresis bath) | 😊 Thickness OK after mechanical stripping + reprocessing |
| Local touch-up: CCC + primer | 😊 Qualified with Alodine 1132 sticker + CrVI primer Qualification in progress with CrIII CCC + CrVI free primer |
| Local touch-up: Anaphoresis by a DALIC process | Development in progress |

Anaphoresis local touch-up cell



DALIC® Métallisation Electrochimique
Selective Plating

Applications on 2024 T3

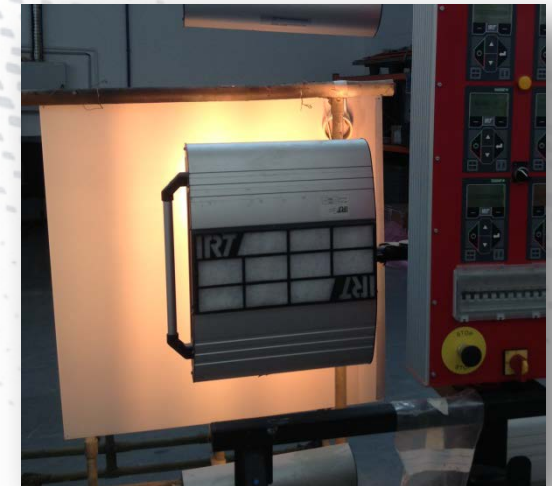


0,16 dm²



0,8 dm²

Local IR curing



- Thickness 😊
- Adhesion 😊
- Polymerization test 😊
- Salt Spray on going

8 – Conclusion

- REACh compliant process in 1 treatment step (oxydation + paint)
- Interesting performances to consider it as an effective replacement of current aluminium protections
- Industrial applications: possibility to treat different alloys with complex shape
- Several possibilities to repair the e-coat



Thank you for your attention

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