

Aerospace Sustainability trends

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Market Segment Manager Maintenance**



Aerospace Coatings

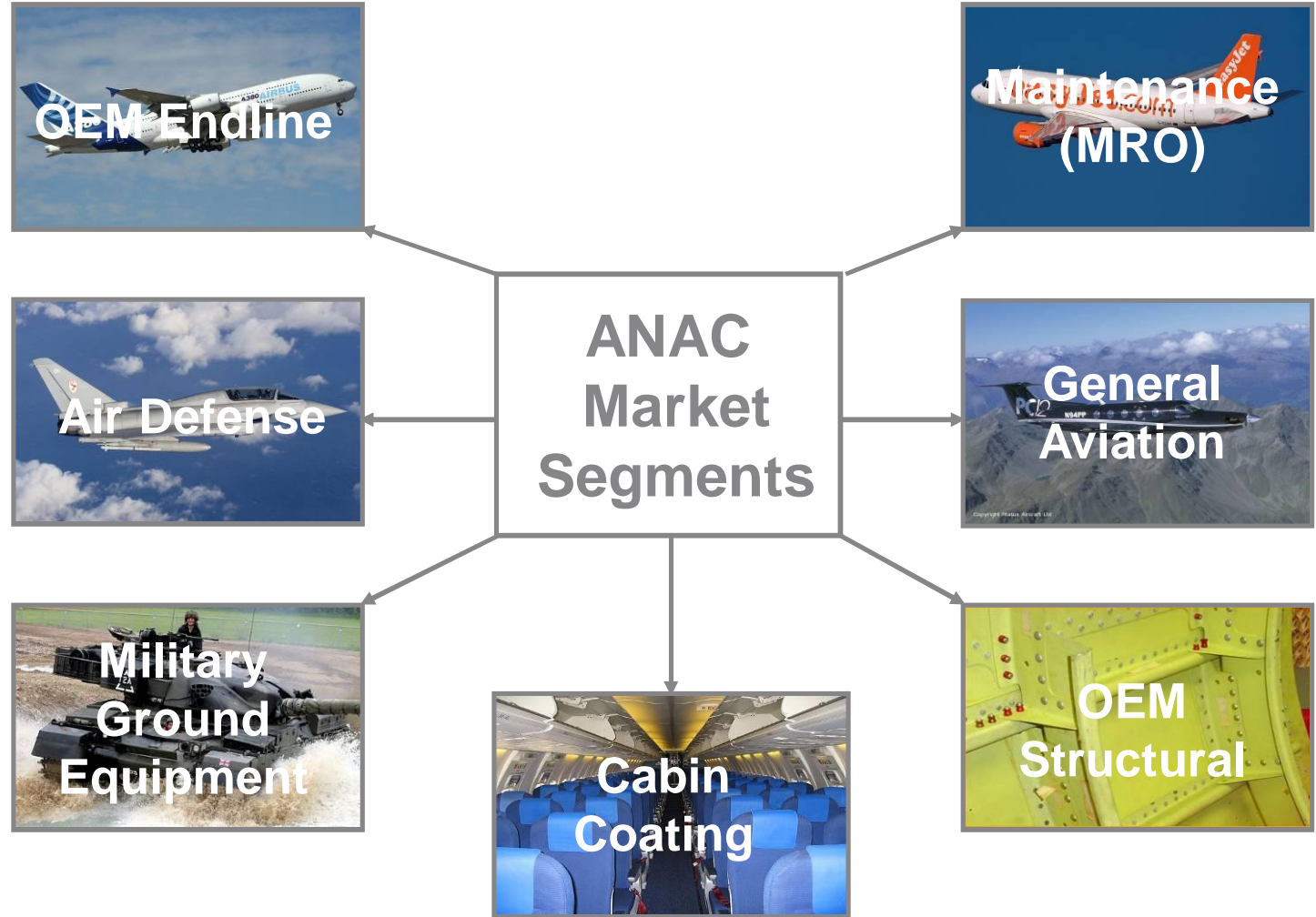
- Global market size is €250 million¹
- External and internal coatings for commercial, general aviation and military markets for both OEM application and maintenance and repair
- Market strongly driven by commercial sectors (airlines), both in new building and maintenance (livery changes)
- Complex manufacturer specifications.



¹ External sources and company estimates



Aerospace Coatings Market Segments





Why new developments?

Legislation/ eco-efficiency:

- Toxicity
- Energy use
- Material use
- Emissions and waste
- Extended durability
- Hazard potential



New developments

- Faster cure
- Low temperature cure
- Solvent emission reduction
- Less toxic ingredients
- Extend durability
- Reduced dry film weight
- High coverage
- Consistent quality
- Easy stripable systems



Customer:

- Image / aesthetics
- Ease of application
- Easy maintenance
- Low process cost
- Extended durability
- New specifications



Main drivers in Aerospace sustainable developments

- Extended durability (lower emission, waste, maintenance costs);
 - Base coat clearcoats
- Solvent emission reduction
 - Low VOC and zero VOC
- Less toxic ingredients
 - Chrome-free developments
- Lower fuel consumption
 - Low drag project
 - Reduction of weight



Low VOC and zero VOC

Focus on products for Defense segment:

- National qualification bodies driving enforcement of environmentally friendly products
- Appearance key requirement of Commercial aviation.

Ask the expert: Ruud.vanOverbeek@akzonobel.com

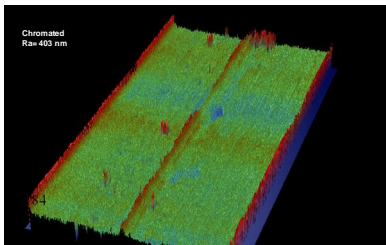


Chrome Free Developments

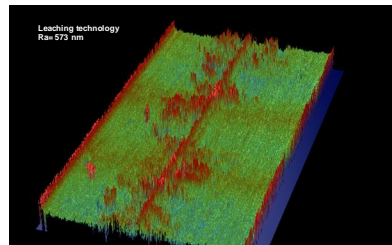
New HS and WB Chrome Free Developments

The new technology provides improved corrosion protection compared to state of the art Chrome free Technology

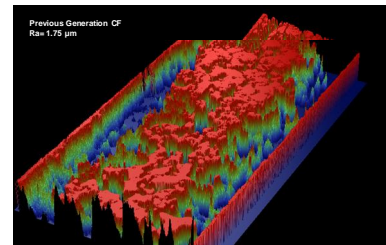
Fast and Effective passivation of damaged area



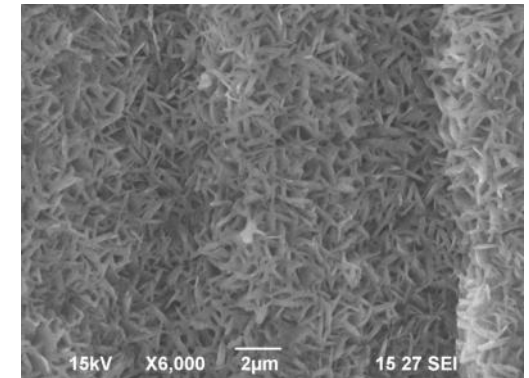
Chromated



New CF technology



Previous CF technology



Generation of Passivation layer

Ask the expert: Peter.Visser@akzonobel.com



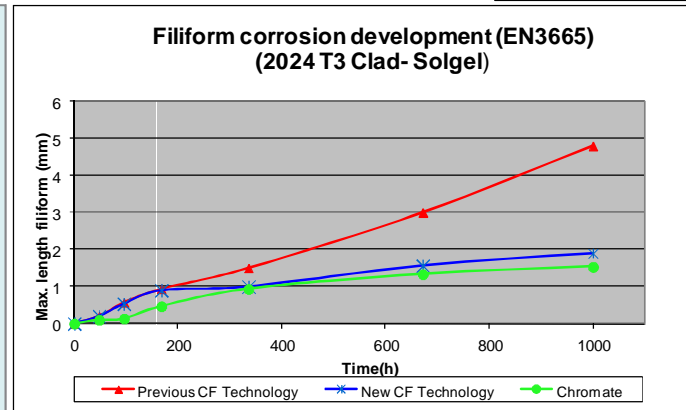
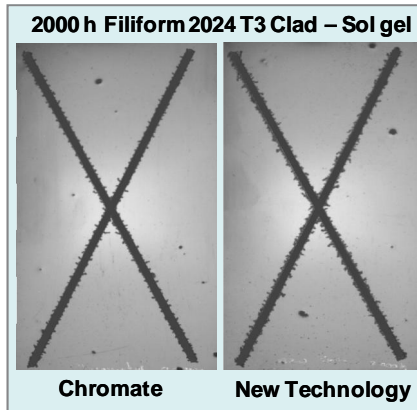
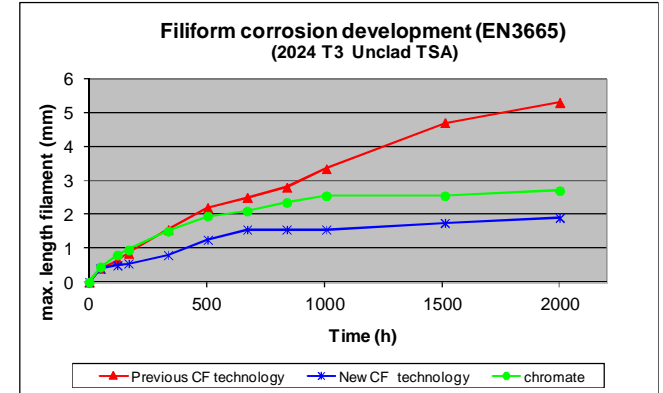
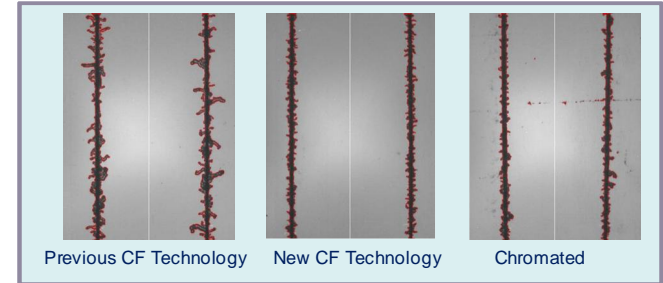
Chrome Free Developments

New HS and WB Chrome Free Developments

New Chrome free Technology provides active filiform corrosion inhibition.

This results in:

- Low corrosion rate
- Shorter filaments
- Low corrosion area

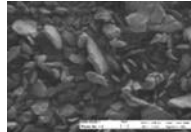


Chrome free developments

Aerodur® 2100 MgRP

Development time line:

ANAC - North Dakota State University
collaboration on magnesium rich primer
technologies



Proof of concept established,
technology license and joint
development program established

Coatings development in
ANAC, with testing and
assistance through CTIO
and AFRL

MgRP formula "locked"

Submitted for evaluation,
qualification and field
testing



Final stage of
qualification
MILPRF-32239
MIL-PRF-23377

2004 2005 2009 Present

New Protection mechanism for Aerospace applications:

Aerodur® MgRP primers used as a system with appropriate pretreatments and topcoats provide a fully chromate-free system which exceeds the corrosion capabilities of commercial and military standard products.



Chrome free developments Aerodur® 2100 MgRP

Technology based on Magnesium metal particles as corrosion inhibitor in a 2 K epoxy system

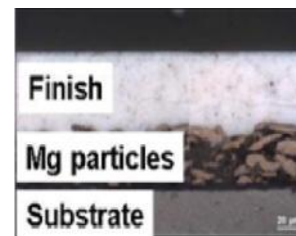
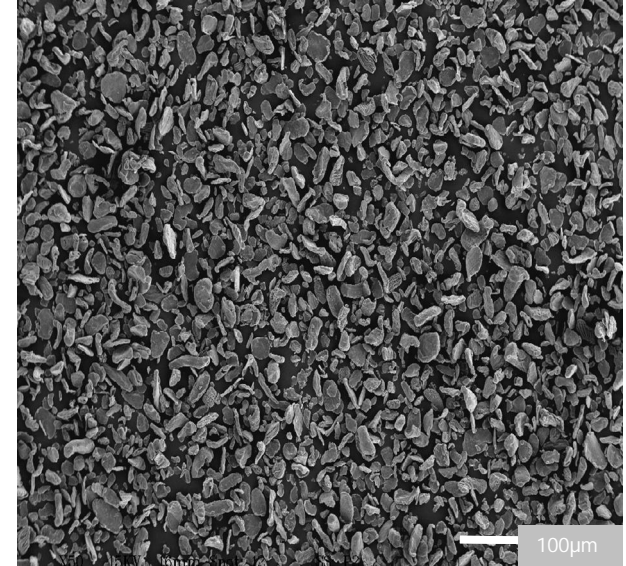
The anti-corrosive properties of this coatings is mainly based on a galvanic protection mechanism

Cathodic protection

provided by Mg metal powder
Analogous to Zn rich primers for steel

Secondary effects:

Barrier protection
Leaching



High PVC of sacrificial metal provide electrical conductivity between Mg particles and the substrate

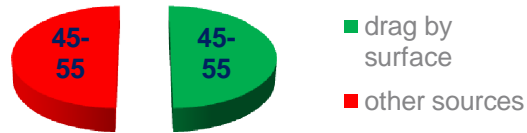


Magnesium Rich Primer Technology Neutral Salt Spray (ASTM B-117)

Traditional Chromate System versus Chromate Free System on
2024-T3, 3000 hours of NSS ASTM-117



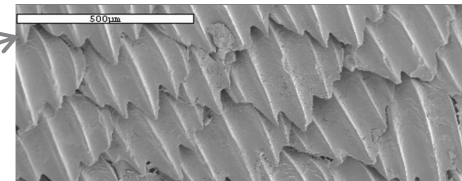
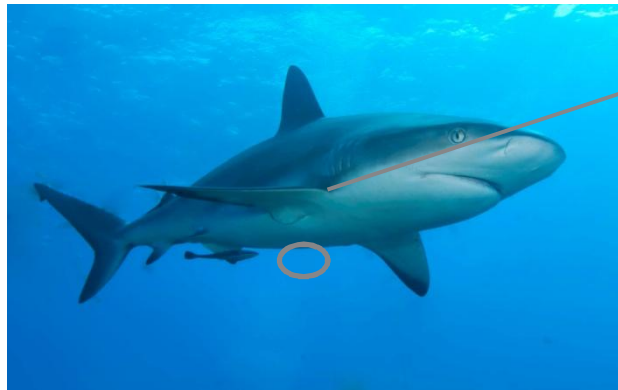
Reduce Aircraft fuel consumption by surface drag reduction



Reduction of Aircraft fuel consumption by applying a micro structured surface

- Current aircraft surfaces have some turbulent airflow along the skin.
- Riblets will guide the airflow along the skin, which leads to reduced skin friction.

The idea originates from an example from nature.

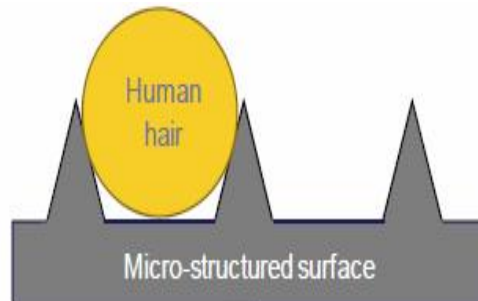
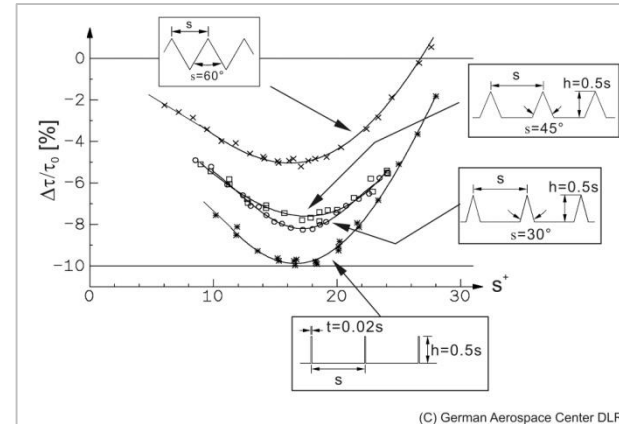
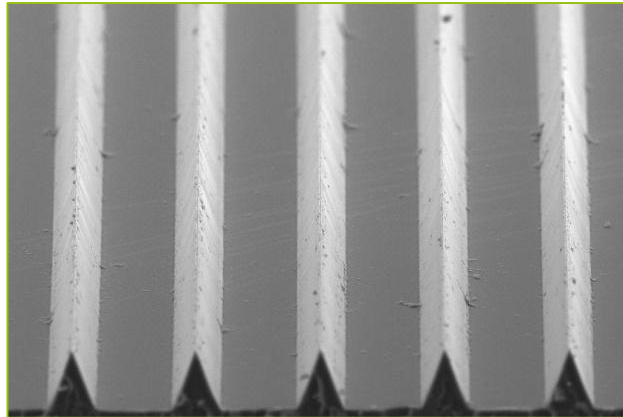


Airbus Operation and Fraunhofer IFAM are taking part in Clean Sky Joint technology initiative
AkzoNobel A&AC develops a demanding commercial clearcoat for the process

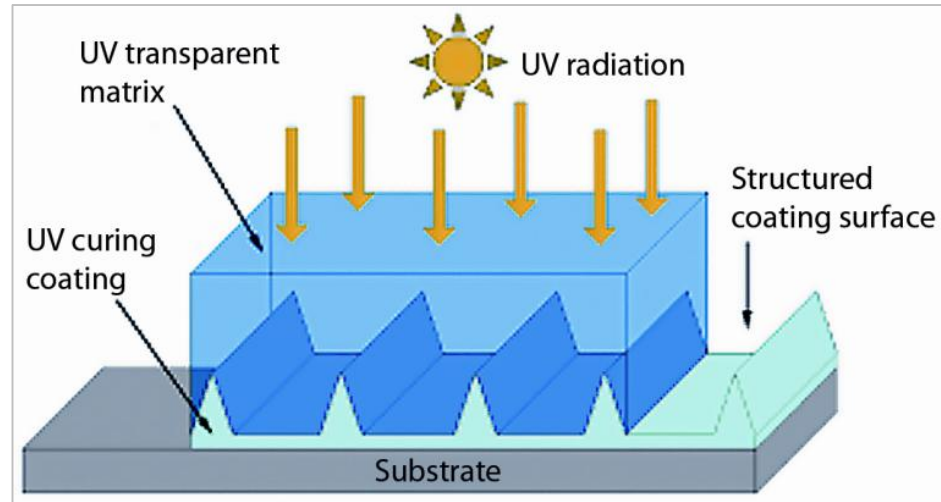
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Riblet structure



Principle of riblet coating application

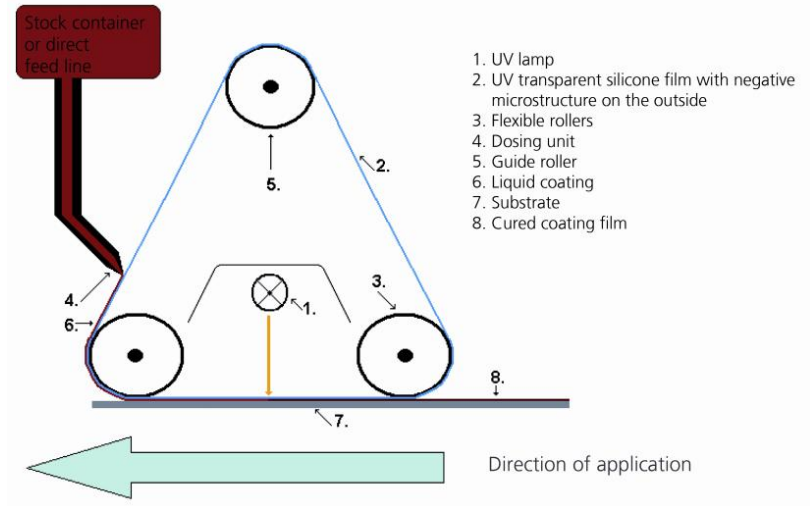
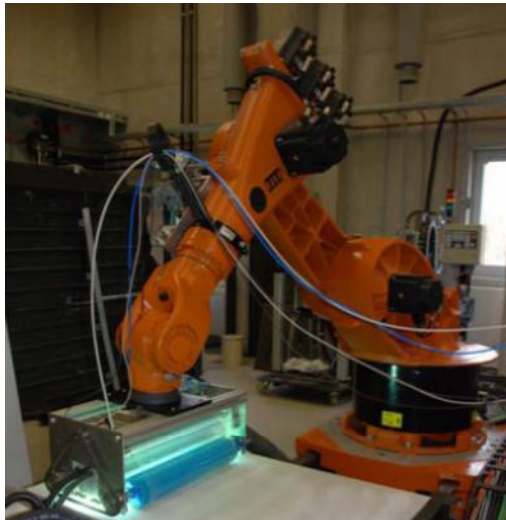


Coatings requirement and sustainability performance

- Aerospace Clearcoat properties like
 - Flexibility
 - Chemical resistance
 - Durability
- No VOC, current clearcoat has VOC 480 g/l
- Reduction of drag between 6-10% resulting in fuel savings of 1-2%
- Transfer efficiency around 100%
Clean process (no overspray, no cleaning of hangar etc)



The process



ot application with riblet clearcoat at IFAM, Bre

Thanks for your attention!

