Aerospace Sustainability trends

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Aerospace Coatings

- Global market size is €250 million\(^1\)
- 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

- OEM Endline
- Maintenance (MRO)
- General Aviation
- OEM Structural
- Cabin Coating
- Air Defense
- Military Ground Equipment
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.
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

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

Cr Control
23377 Qualified
Over 5541 Type 1 CCC

MgRP
Cr Free Primer
Over CF Pretreatment
Reduce Aircraft fuel consumption by surface drag reduction

45-55

45-55

drag by surface
other sources
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.
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
Robot application with riblet clearcoat at IFAM, Brema
Thanks for your attention!