Combining excellence in corrosion protection

Utökat korrosionsskydd med kombinerade skikt

Kjell Ahlin – SYF annual meeting 9.3.2017

Technology for tomorrow's solutions
Combining excellence

Agenda

1. Comparison of technologies
2. Process sequence
3. Examples and advantages
4. Summary
Electrolytic plating process sequence

Typical coating layer setup

- **Base material** (Metal substrate)
- **Electroplated zinc / zinc alloy layer**
- **Passivate**
- **Sealer**

- **Pre treatment**

Additional coating properties

Cathodic corrosion protection

Typically ~1 μm

Typically 0.1 – 0.3 μm

Typically 8 – 20 μm

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Zinc flake coating systems

Typical coating layer setup

- **Base material**
  - (Metal substrate)

- **Degreasing / shot-blasting or degreasing / phosphating**

- **Base coat**
  - Typically 8 – 10 μm (2 layers base coat)

- **Top coat**
  - Typically 1 – 6 μm
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Directory of contents

1 Comparison of technologies
2 Process sequence
3 Examples and advantages
4 Summary
Two technologies for cathodic corrosion protection

Dip-spray and base coats

Electrolytically plated zinc and zinc alloys
Passivates and sealers

Top coats

Coatings for cathodic corrosion protection

Electroless zinc flake coatings
Electrolytic coatings
# Process sequence

**Two technologies for corrosion protection**

<table>
<thead>
<tr>
<th>Coatings for corrosion protection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electroless Zn flake coatings</strong></td>
</tr>
<tr>
<td><strong>Electrolytic coatings</strong></td>
</tr>
<tr>
<td>Electrolytically plated zinc and zinc alloys</td>
</tr>
<tr>
<td><strong>Base Coat</strong></td>
</tr>
<tr>
<td><strong>Passivates</strong></td>
</tr>
<tr>
<td><strong>Top coats</strong></td>
</tr>
<tr>
<td><strong>Sealers</strong></td>
</tr>
</tbody>
</table>
Coatings for corrosion protection

- Electroless zinc flakes
  - Top coat
  - Base coat
- Electrolytic coatings
  - Sealer
  - Passivate
  - Electroplated zinc / zinc alloy layer
Process sequence
Two technologies for corrosion protection

Coatings for corrosion protection

Electroless zinc flakes
- Top coat
- Base coat

Electrolytic coatings
- Sealer
- Passivate
  Electroplated zinc / zinc alloy layer

5 µm topcoat
zinc flake basecoat
1 µm sealer
0.2 µm passivate
zinc / zinc alloy
Process sequence
Two technologies for corrosion protection

Combined layer!

Top coat
Passivate
Electroplated zinc or zinc alloy

5µm Top Coat
0,2µm Passivate
Electroplated Zn/Zn alloy
Process sequence
Different technologies for corrosion protection

Corrosive environment

Passivate
Zinc or zinc alloy

0.2 µm passivate
8 – 15 µm zinc or zinc-alloy

Sealer

1 µm sealer
0.2 µm passivate
8 – 15 µm zinc or zinc-alloy

Passivate
Zinc or zinc alloy

Top coat

5 µm top coat
0.2 µm passivate
8 – 15 µm zinc or zinc-alloy

Combined layer!
Possible combinations

- Acid Zn
- Alkaline Zn
- ZnFe
- Acid ZnNi
- Alkaline ZnNi

Blue / iridescent passivation → Silver top coat

Black passivation → Black top coat
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Directory of contents

1  Comparison of technologies
2  Process sequence
3  Examples and advantages
4  Summary
Examples and advantages

ZnNi Silver system
Example and advantages

Zinni® AL 450 + EcoTri® HC 2 + Techseal® Bright Silver SL

Mild steel door lock parts

Treatment:

Zinni® AL 450:
*Barrel alkaline zinc nickel process*

EcoTri® HC 2:
*Barrel Cr(III) thick film passivation*

Techseal® Bright Silver SL:
*Basket dip-spin coating organic top coat*

ISO 9227 NSS result
> 1,000 h minor visual change only
Example and advantages
Alkaline zinc-nickel + passivation + top coat

Alk. ZnNi + passivate + 1x Zintek Top XT

Start

1 cycle
Example and advantages
Alkaline zinc-nickel + passivation + top coat

ACT II test results

Alk. ZnNi + passivate + 1x Zintek Top XT

6 cycles

12 cycles
Examples and advantages

Zn silver system
Example and advantages
Alkaline zinc + passivation + top coat

Coating sequence
Protolux® 3000 + EcoTri® NF + Zintek® Top XT

Excellent white and red rust resistance in NSST ISO 9227
Example and advantages
Alkaline zinc + passivation + top coat

Coating sequence
Protolux® 3000 + EcoTri® NF + Zintek® Top XT

720 h
Excellent white and red rust resistance in NSST ISO 9227

1,200 h
7/10 parts had no white corrosion after 1,200h
Example and advantages
Alkaline zinc + passivation + top coat

Coating sequence
Protolux® 3000 + EcoTri® NF + Zintek® Top XT

2 cycles
6 cycles
10 cycles

Excellent white and red rust resistance in ACT
Examples and advantages

ZnNi Black system
Zinni® AL 450 + Unifix® Ni 3-30 L + Techseal® Black SL

0 h
Parts
Screws M8x50

240 h
Treatment
Zinni® AL 450:
*Barrel alkaline zinc nickel process*

480 h
Unifix® Ni 3-30 L:
*Barrel black Cr(III)-passivation*

720 h
Techseal® Black SL:
*Dip spin coating organic top coat*

1,176 h
NSST
> 1000h minor visual change only
Examples and advantages

ZnFe high alloy Black system
Hiron® – for advanced corrosion protection

Corrosion test result: NSST according ISO 9227

Coating Sequence:
Hiron
EcoTri NC
Zintek Top Black S

Rack: before NSS

Barrel: 1008h

Rack: 720 h
Examples and advantages

ZnNi Black system for GMW 16730
Example and advantages GMW 16730

No visual change

No base material corrosion

240 h + HT

1000 h + HT

FULFILLS THE STANDARD!

Zinni® 210 + Unifix® Ni 3-34 L + Tridur® Finish 300 + 1x Tech Dip Black WL 2 HV
Example and advantages GMW 16730

No visual change

No visual change

240 h

1000 h

240 h + HT

1000 h + HT

FULFILLS AND EXCEEDS THE STANDARD!

Zinni® 210 + Unifix® Ni 3-34 L + Tridur® Finish 300 + 2x Tech Dip Black WL 2 HV
Examples and advantages

ZnNi Black system

Customer success story
Example and advantages
Black systems - Customer success story

Coating sequence

Zinni® 210 + Unifix® Ni 3-34 L + Tridur® Finish 300 + 2 x Techdip® Black SL

2,000 h
only WR, no RR

NSST ISO 9227
Example and advantages

Customer success story

- Production of tiny black screws for smart phones

- Requirements
  - High decorative appearance and high corrosion resistance

- Zinni® 210 / Unifix® Ni 3-34 L / Zintek® Top Black SL

- NSST results

1,000 h

1,200 h
Example and advantages

Customer success story

Zinni® AL 450 S + EcoTri® NC + 2x Zintek® Top Black

- Zinni® AL 450 S
  - Alkaline ZnNi, thickness 8 – 12 µm

- EcoTri® NC
  - Transparent / iridescent thickfilm passivate
  - Co-free
  - Excellent adhesion to top coats
  - Zintek® Top Black S
    - Inorganic top coat

Achievement:  
> 1000 h without WR
> 1000 h without color change
Example and advantages

Customer success story

Process: Zinni® AL 450 + EcoTri® NC + Zintek® Top Black S

NSS DIN ISO 9227

Achievement: > 1000 h without WR
> 1000 h without color change

24 h
312 h
696 h
1,008 h
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Directory of contents

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Combining Excellence

Summary

• Continuous requirement of the industry ...
  
  – Excellent results in ACT and NSS
    – excellent appearance at the same time
  
  – Further properties:
    – Temperature stability
    – Chemical resistance
    – Consistent CoF’s

Combined systems with Zinc/Zinc alloy, passivation and top coat are capable to provide extraordinary corrosion protection, chemical resistance and consistent CoF properties with a very attractive appearance.
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Summary

**Thicker barrier layer – increased protection!**

Corrosive environment

- **Passivate**
  - Zinc or zinc alloy
  - 0.2 µm passivate
  - 8 – 15 µm zinc or zinc-alloy

- **Sealer**
  - 1 µm sealer
  - 0.2 µm passivate
  - 8 – 15 µm zinc or zinc-alloy

- **Top coat**
  - 5 µm top coat
  - 0.2 µm passivate
  - 8 – 15 µm zinc or zinc-alloy

Combined layer!
Thank you

for your attention!

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