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BASKET TRAY

EZ

New Zinc Whisker stopper formula

Guide for Whisker free Electrolytic Zinc Coatings

KRUGE 

EZ Coating

Zinc Whisker Stopper

"Zinc whiskers" are extremely thin metallic filaments that can spontaneously form on zinc-coated surfaces. These filaments represent a potential risk for electronic devices due to their ability to generate short circuits and electrical faults in critical systems.

EZ

EZ COATING

SCOPE of RESEARCH and RESULTS

During this research, developed over 4 years, 9 coatings based on electrolytic zinc and hot-dip galvanization were observed through an electron microscope for at least 12 months following the evolution of the zinc filaments.

- 1 Electrolytic zinc coating (Acidic) + passivation Cr3 + Zn layer > 10µm
- 2 Electrolytic zinc coating (acid) + passivation
- 3 Electrolytic zinc coating + sealant (black)
- 4 Electrolytic zinc coating + passivation (black)
- 5 Electrolytic zinc coating + powder coating
- 6 Zinc spraying + powder coating
- 7 Electrolytic Zn-Ni Alloy
- 8 Pre-galvanized
- 9 Hot dip galvanized

*Observations through electronic microscope scanning showed that all electrolytic zinc coatings developed Zn whiskers on the surface except coatings 1 and 7.



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Check-list for a Whisker Free Coating

The analysis revealed that the following factors during the coating process have a significant impact on reducing the formation of zinc whiskers



1. Control of electrolyte composition

Acidic electrolytic zinc coatings experience longer incubation periods than all galvanized coatings and show a lower density of mounds and whiskers after 12 months compared to alkaline electrolytic coatings. The inclusion of suitable additives such as surface tension inhibitors and leveling agents decreases the internal stress in the coating.

2. Optimization of coating parameters

- A moderate current density (2-3 A/dm²) reduces the risk of residual stresses.
- Controlled temperatures between 25-30 °C ensure uniform deposition.

3. Adequate substrate preparation

Cleaning with chemical or mechanical methods reduces irregularities that can act as whisker nucleators.

4. Application of post-treatments

- Heat treatments at 60-80 °C for 24 hours help to release internal stress.
- Passivation coatings with trivalent chromium-based solutions protect against oxidation and whisker formation.

5. Final coating thickness

The greater the coating thickness, the lower the incidence of whiskers. From 10 microns of zinc thickness, the generation of whiskers is considerably reduced.

Conclusion

The formation of zinc whiskers in zinc-based electrolytic coatings can be significantly reduced by controlling critical factors during the coating process.

These include the 5 factors mentioned: optimization of the electrolyte composition, deposition parameters, substrate preparation and post-treatments, where three of these factors are key when it comes to reducing the risk of generating this phenomenon: the electrolyte must be acidic and never alkaline, it must contain trivalent chlorine, and the final coating thickness must be greater than 10 microns. Compliance with these measures contributes to improving the quality of the coating and mitigating the risks associated with this phenomenon.



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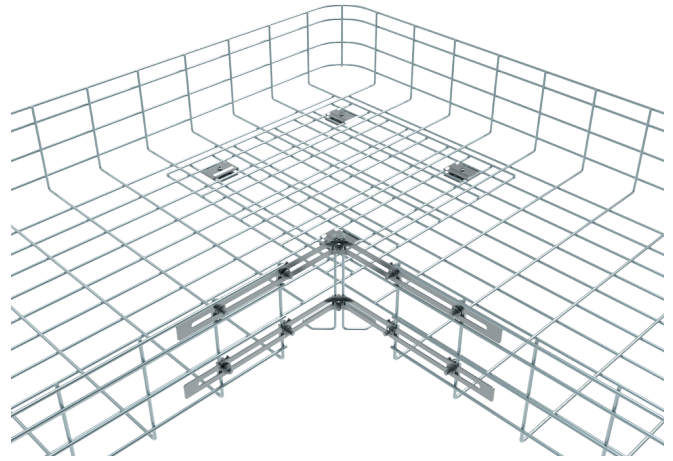
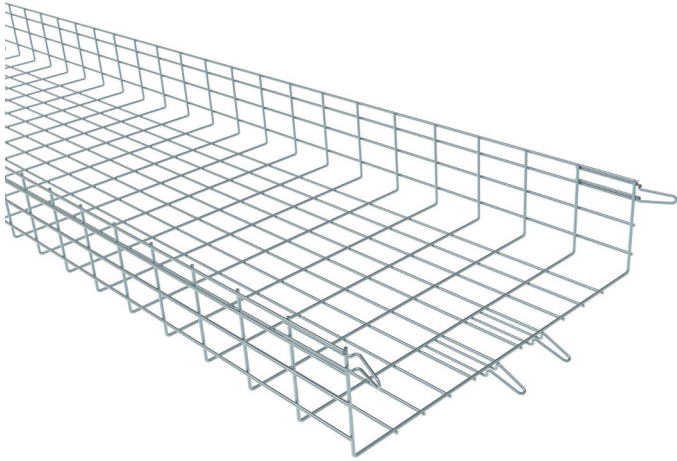


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Zinc Coating for Data Centers

This research about the Zinc Whisker phenomenon, the most exhaustive carried out to date, has allowed us to set the conditions for our EZ coating to reduce whiskers to a negligible amount that eliminates the risk associated to this phenomenon.



01

Thicker zinc layers (+10 μ m)

Reduce residual and compression stress thus slowing growth rate of whiskers.

02

Passivation with trivalent chromium

Salts (Cr3 +) as Cr inhibits the onset of whiskers.

03

Acidic electrolytic process

Provide longer incubation periods and reduce density of hillocks and whiskers.



VALDINOX EZ coating

the most efficient and reliable solution
to stop zinc whiskers.



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