Weichenstellung für morgen | *Setting the course for tomorrow*

Innovative rolled steel products for the energy transition

Conserving Resources and increased Cost Effectiveness by using Zinc Magnesium Coatings

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Introduction

- **Working Group** hosted by Steel Institute VDEh focused on Zinc-Magnesium-Aluminum coatings (ZM).

- Study was performed on Zinc-Magnesium-Aluminum coatings in the following composition range:
  - Magnesium: [1.0 % - 3.0 %] *)
  - Aluminum: [1.0 % - 3.7 %] *)

- **Markets for Zinc Magnesium:**
  - Building industry & Construction industry
  - Colour coating industry
  - Automotive industry

ArcelorMittal
SSAB
SALZGITTER FLACHSTAHL
Ein Unternehmen der Salzgitter Gruppe
TATA STEEL
ThyssenKrupp
ThyssenKrupp Steel Europe
voestalpine
Wuppermann

*) *Weight %, Theoretical targets not including technical tolerances.*

Protection of Steel Structures in Civil Construction

- ZM coatings are recommended for harsh environments coastal / agricultural / tropical
- ZM coatings allow bare application of metallic coated steels with lower coating weight than classical hot-dip galvanised

Green Aspects

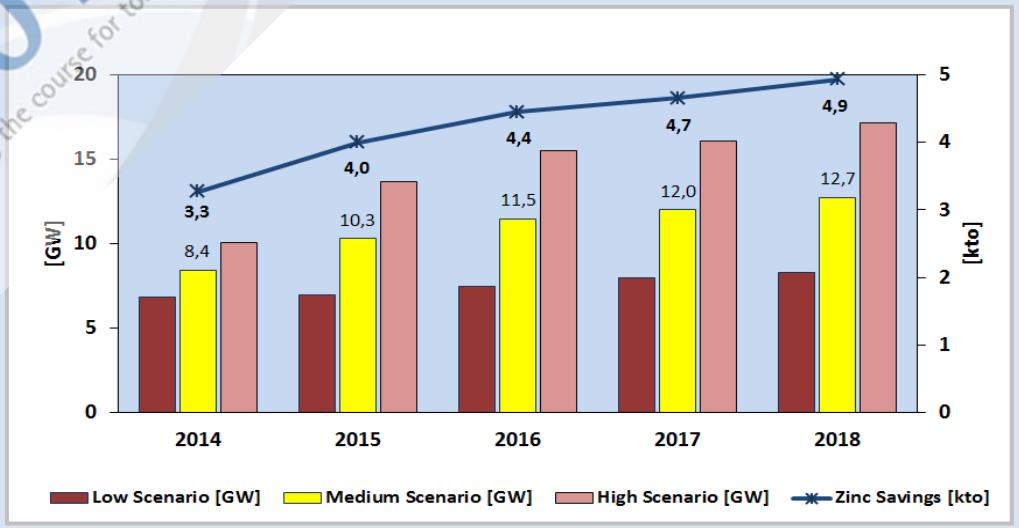
- Less need for zinc: reduction of mining and metallurgical processing
- Reduced maintenance compared to conventional coatings
- No need for replacement of parts
- Reduction of environmental impact

- Less need for separation of steel and zinc in the scrap melting process

Savings along the whole product life cycle: fabrication, serving time and recycling

Protection of Steel Structures in Civil Construction

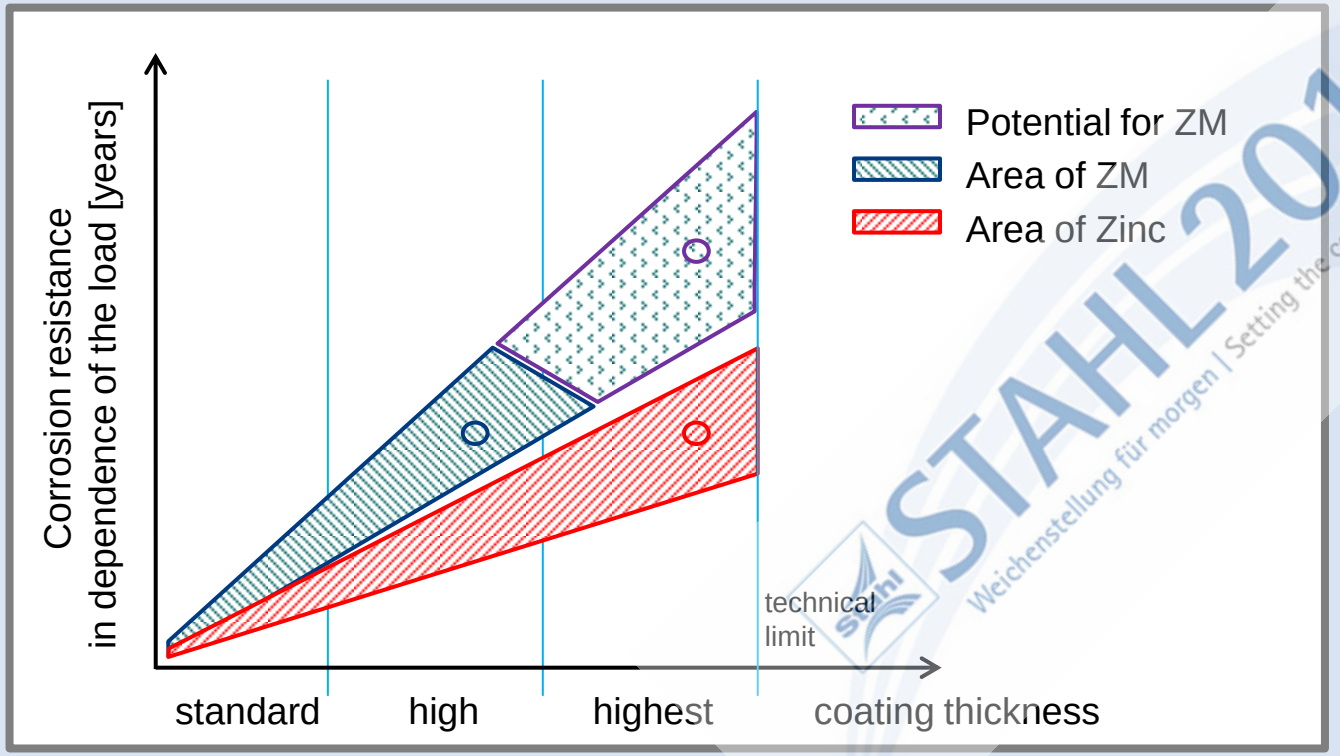
Photovoltaic-installation with ZM-profiles in Austria, Styria



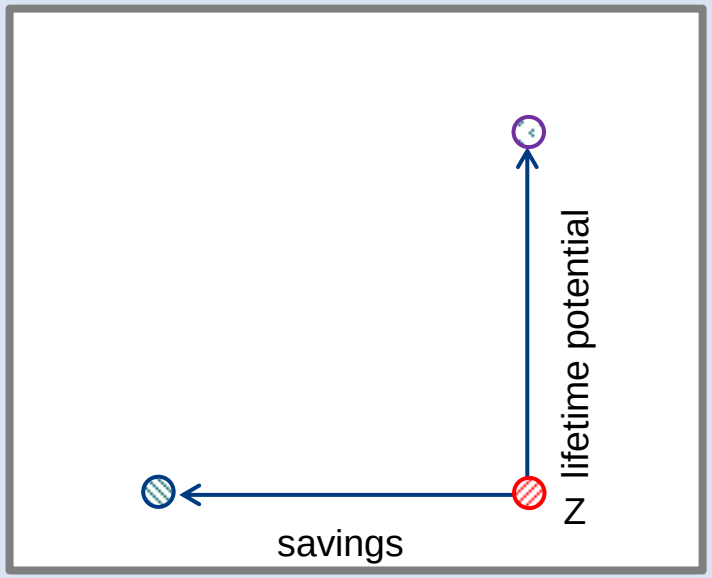
Potential of Zinc Savings in case of substitution Z1000 by ZM600

(source: European Market Outlook for Photovoltaics 2014-2018)

Protection of Steel Structures in Civil Construction



Metal savings and/or lifetime potential



Corrosion Resistance in dependence on the load by years

Protection of Steel Structures in Civil Construction

- DIBt *) certifications since 2013
- Corrosion protection class KII acc. to DIN 55928-8 ZM120
- Corrosion protection class KIII acc. to DIN 55928-8 ZM 250, ZM 310

*) Deutsches Institut für Bautechnik


Domestic airport: Dominican Republic

Excellent corrosion protection and high durability are required for these applications

Organic Coated Steel Sheets

Possible advantages for organic coating:

- Increased corrosion resistance
  - Enlarged durability
  - Coating weight reduction

Economy and Environment

- Overall cost saving across supply chain
- Reduction of energy consumption in the extraction of raw materials
- Protection of Zinc-resources

Successfully in use for more than 10 years

Organic Coated Steel Sheets – Reduced coating weight of base material

Zinc 275
Overall thickness 1.00 mm

Z275 (→ 0,02mm)

Substrate = 0,96mm

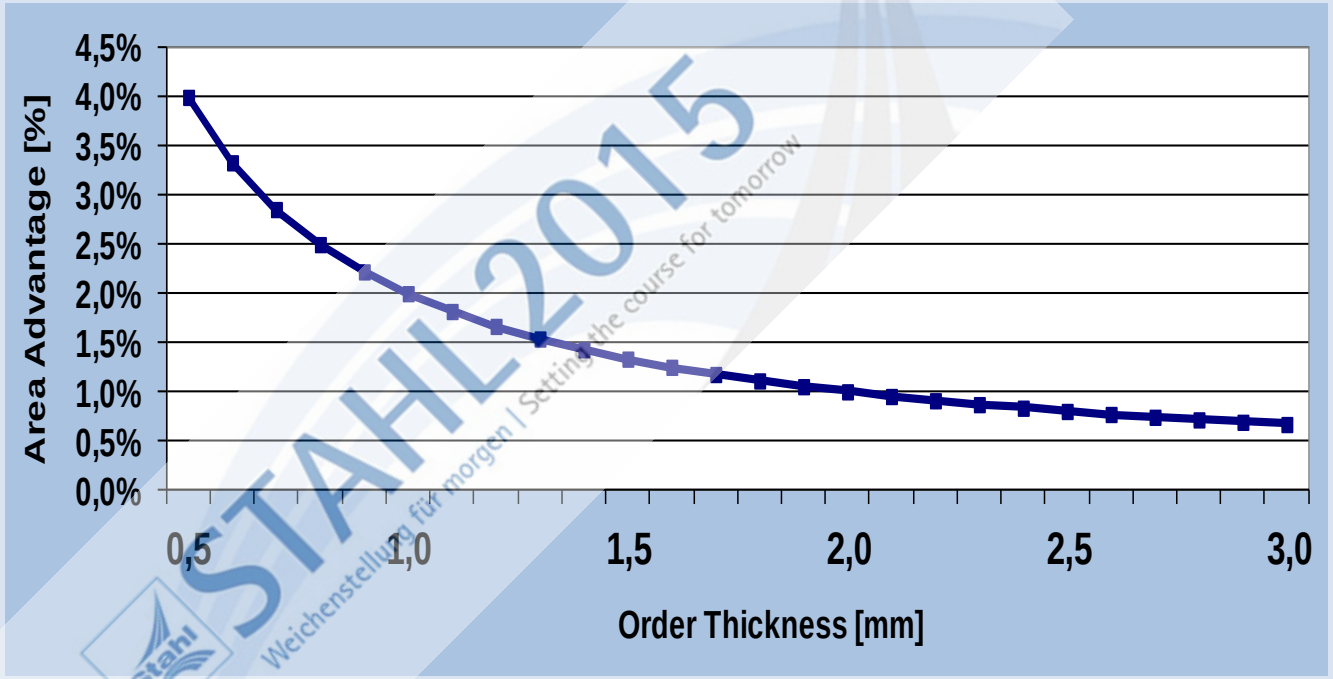
Z275 (→ 0,02mm)

ZM140
Possibility of reducing the thickness to 0.98 mm

ZM140 (→ 0,01mm)

Substrate = 0,96mm

ZM140 (→ 0,01mm)



Conserving resources and increasing cost effectiveness by using ZM Coatings

Organic Coating Steel Sheets - certifications

- DIBt certifications since 2008

- INTERIOR building applications:
  Corrosion protection class KII acc. to DIN 55928-8
  ZM100 + 15 µm Polyester
  (alternative to Z275 + 15 µm Polyester)

- OUTER building applications:
  Corrosion protection class KIII acc. to DIN 55928-8
  ZM 140 + 25 µm Polyester
  (alternative to Z275 + 25 µm Polyester)

Example of outer building application

Zinc Magnesium coated steel sheet became a standard for organic coated products

Automotive

Strategic Importance

- Lightweight is often associated with Aluminum steel solutions were seen as conservative
- Zinc Magnesium coatings significantly improve corrosion protection, press shop performance and environmental compatibility
- Steel solutions in combination with Zinc Magnesium coatings receive considerable attention at the customer

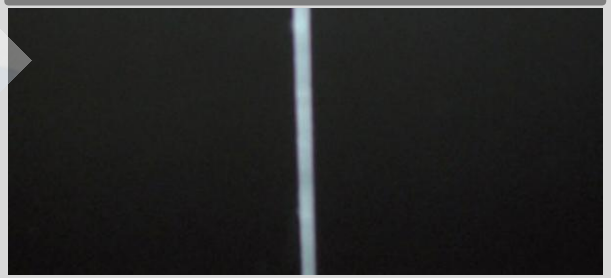
Technical benefits

- Thinner coatings at equal corrosion performance
- Reduced frequency of tool cleaning intervals (less zinc particles)
- More robust operating window in the press shop
- Increased production yield (less scrap)

Automotive

- Zinc Magnesium coating helps to keep steel in automotive industry
- Zinc Magnesium coating is becoming a standard for European automotive
- EN 10346:2015 “Continuously hot-dip coated steel flat products for cold forming”: ZM coatings with 1,5 – 8 wt. % (Al + Mg) have been included

Excellent formability and tribological behaviour

Classical galvanized steel	Zinc Magnesium coated steel
	
Scribe creepage, KTL coated after 10 weeks, VDA Test 621-415	Scribe creepage, KTL *) coated after 10 weeks, VDA Test 621-415

*) Cathodic dip painting

Summary

- Excellent corrosion resistance allows savings along the whole product life
- Metal savings and/or increase of life time
- Increasing cost effectiveness by using ZM Coatings
- Less need for zinc implies reduction of mining and metallurgical processing
- Lower run-off into the soil
- Opening new markets
- Zinc Magnesium helps to keep steel in the business and is becoming a standard in automotive
- Technical approvals for use in various European countries

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THANK YOU FOR YOUR ATTENTION

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