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“New Challenges in Performance for Galvanized Steel”

BRUGAL® Sustainable Surface Treatment Technology
Spanish Chemical Company, based in Barcelona area, with more than 40 years of experience.

First company, at least in Europe, who designed chemical treatments for metal surfaces based on acrylic resins (Film Forming treatments).

It was a great innovation on 1972 versus traditional inorganic treatments!

Our own Technology is well known around the world under the registered brandname of:
We have very modern facilities and we are well equipped to develop our R&D Projects with high success.
Traditional Supply Chain

STEEL MILL

STEEL COIL PRODUCED

TRANSPORTED TO CGL

GALVANIZING LINE

COIL IS CLEANED, GALVANIZED AND CHEMICALLY TREATED

TRANSPORTED TO SERVICE CENTER OR END USER

SLIT, BLANKED, FORMED OR CUT TO LENGTH

END USER

TRANSPORTED TO CCL

COIL IS CLEANED, TREATED, PRIMED AND PAINTED

COIL COATING LINE

TRANSPORTED TO SERVICE CENTER OR END USER
Treatments used at the CGL: Passivations

- **PASSIVATION** is the most common chemical treatment used on zinc coated steel. It is an inorganic chemical product, and till few years ago, based on hexavalent Chromium.

- It is applied by spray (or by dipping) plus squeezing rolls.

- At present, the new Cr6 free passivations are currently applied by Roll-Coaters.

- The main purpose of passivations is to avoid rusting during transport and handling.

- Passivations reacts with the galvanized surface producing a strong conversion.

Surface conversion: 0.10 µ
Treatments used at the CGL: Thin Organic Coatings (TOC)

- TOC products have been also named Antifingerprint or Acrylic products.
- The use of TOCs on Zn-Al alloy steel is very common, but its use on HDG, Galfan and EG is increasing year per year a cause of the benefits that they offer.
- They have been designed to be applied at the CGL by Roll Coater and one Oven to achieve a PMT temperature up to 60ºC.
- They contain resins (organic chemistry) and an inorganic package to:
  - A single layer produces a light conversion of the surface plus a physical barrier.

![Zinc Layers](image)

Coating weight: 0.80 - 2.00 µ

Double contribution to corrosion protection
## Differences in terms of performances

<table>
<thead>
<tr>
<th>PROPERTIES</th>
<th>PASSIVATIONS</th>
<th>TOCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion Resistance (SST: ASTM B-117)</td>
<td>Temporary ≤ 72 h (SST)</td>
<td>High 200 h – 300 h (SST)</td>
</tr>
<tr>
<td>Anti fingerprint Quality</td>
<td>Not</td>
<td>Yes</td>
</tr>
<tr>
<td>Post-paintability (liquid and powder paints)</td>
<td>Very Poor Good pretreatment is required</td>
<td>Excellent Pretreatment is not required</td>
</tr>
<tr>
<td>Formability</td>
<td>Very Low µ ≥ 0.40 Oil is required</td>
<td>Excellent µ ≤ 0.15 Oil is not required</td>
</tr>
<tr>
<td>Weldability</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Adhesion to PU foams</td>
<td>Not</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
Which of both offers a higher contribution to sustainability?

- One real example: Domestic appliance manufacturer (white goods)

  The responsible of one washing machines factory had to decide to use passivated HDG steel or HDG coated with BRUGAL TOC.

  So, he analyzed every process of their production line with both chemicals, such as:

  - **forming** and
  - **painting** processes.
Forming Process: Using **Passivated HDG steel**

- **Forming Process:**
  
The surface of a passivated HDG steel has not sufficient lubricity to be formed, then oil is required.

  During this process (stamping, profiling, bending,...) some powder of zinc is pulled out from the surface.

  The mixture of this zinc powder and oil produces an abrasive residue which can damage the tools and the formed elements.

- **Consequences:**
  
  - forming tools have to be cleaned very often to avoid rejected elements:

    a) Maintenance and cleaning cost.
    
    b) Cost of rejected elements
Painting Process: Using Passivated HDG steel

- Because the formed elements are dirty with dust, with a mixture of zinc particles and oil, it is very important to make an efficient degreasing to leave the elements completely clean before the painting stage.

- Passivated surfaces offer a very poor adhesion with liquid and powder industrial paints, then, it is very important to use a good pretreatment section at the painting line to enhance its paintability.

- Once the elements are completely clean and a good pretreatment has been made, they can go to the painting section.
Painting Process: Using Passivated HDG steel

1. Alkaline Degreasing
2. Rinsing
3. Rinsing
4. Etching
5. Rinsing
6. Rinsing

7. Drying
8. Rinsing
9. Rinsing
10. Pretreatment

Painting Line with at least 10 stages previous painting cabinet

11/27
Forming Process: Using HDG steel coated with TOC

Because the TOC:

- **Covers completely the galvanized surface**, forming a physical barrier (film), zinc particles cannot be pulled out from the surface.

- **Contains a dry lubricant additive**, which increases a lot the lubricity of the galvanized surface, at least three times more compared with a passivated surface, forming oil is not required.

Then, the problem caused by passivated steel is solved!

Benefits at the Forming Process using TOC instead Passivations:
- Lower Maintenance Cost
- Savings on Rejected Elements
Painting Process: Using HDG steel coated with TOC

Alkaline Degreasing → Rinsing → Rinsing → Etching → Rinsing → Rinsing

Drying ← Rinsing ← Rinsing ← Pretreatment

Painting Line of only 1 stage previous painting cabinet

The painting line is reduced a lot!
Production Results

- Corrosion Results after 672 hours in SST (ASTM B-117) HDG coated with BRUGAL® TOC + Standard Polyester paint

Max 3 mm

Max 5 mm

BRUGAL® TOC 300 G

BRUGAL® TOC 010 G
Because ProCoat is searching every day new Sustainable chemical solutions, we introduced the Coloured TOC products into the market, which are being used for many indoor and outdoor applications.

- It’s a cheaper option than prepainted steel
- It offers a new aesthetic finish, coloured but transparent, with a low coating weight (1.2 – 3.0 µ).
- It offers all advantages explained before, plus colour.
- It avoids the painting process at the end steel good producer facilities.
Main uses of Coloured BRUGAL® TOC: Roofing

BRUGAL® TOC GREEN

BRUGAL® TOC BRICK RED

BRUGAL® TOC BLUE

Products designed to be applied at the Continuous Galvanizing Line, and of course, at the Coil Coating Lines
VERY RECENT INNOVATION AWARD RECEIVED FROM THE LARGEST STEEL MILL COMPANY AROUND THE WORLD
Main uses of Coloured BRUGAL® TOC

- Industrial shelves
- Aerial trays
- Steel Framing
- Domestic Appliances
- Rain Water Goods
- Electronic Devices
- Network Cabinets
Main uses of Coloured BRUGAL® TOC: Roofing

- Corrugated Sheets (Roll formed or by barrel)
- Profiled Sheets
- Structural Profiles
THE MOST SUSTAINABLE TREATMENTS FOR PREPAINTED STEEL

PRETREATMENT-PRIMERS:
BRUGAL® PRETREAT 600 (Cr⁺⁶)
BRUGAL® PRETREAT 020 (Cr Free)
Steel coil produced

Transported to CGL

Steel mill

Transported to CCL

Coil is cleaned, galvanized and chemically treated

GALVANIZING LINE

Coil is cleaned, treated, primed and painted

Coil coating line

Transported to service center or end user

SLIT, BLANKED, FORMED OR CUT TO LENGTH

End user
THE MOST SUSTAINABLE ANSWER FOR PREPAINTED STEEL

PRESENT SCENARIO:

- **Oil is the most common treatment** used on coils which have to be painted at CCL, in order to protect the coils against rusting, but many times this protection is not enough. Once the oil is removed at the degreasing section of CCL, a **good pretreatment must be done** to offer sufficient adhesion with coil coating paints.

- **Passivations** offer **temporary corrosion protection** but not enough to solve quality problems of prepainted steel caused by white rust during the storage period between CGL and CCL.

Moreover, **passivations offer very poor adhesion** with paints, then an effective pretreatment is required at the CCL.

Then, Coil Coaters would need a pretreatment, which would be applied at the CGL, to protect the coils more efficiently against corrosion during the storage period, and offer a good adhesion with coil coating paints.
The most sustainable answer for prepaint steel

- **ProCoat** developed the first Pretreatment-Primer, **BRUGAL® PRETREAT 600**.

- It’s a water born treatment, based on hexavalent Chromium, designed to be applied at the CGL with a Roll Coater.

- It offers:
  - at least 3 times more of **corrosion protection** (> 200 h in SST) than current Cr6 passivations and
  - an **excellent adhesion** with the most common coil coating paints.

- This product is **Multimetal**, it can be applied on HDG, Galfan, Electrogalvanized, Al-Zn alloy, CRS, Aluminium,....

- Thanks to this product, several **compact coil coating lines** have been designed and some coil coaters have enjoyed of significant savings in terms of investment.

- Today ProCoat has already developed a **Cr Free Pretreatment-Primer, BRUGAL® PRETREAT 020** which has already demonstrated excellent performances with several Cr free Top Coats.
BRUGAL® PRETREAT
600/020

EXCELLENT CONTRIBUTION TO SUSTAINABILITY
TYPICAL COIL COATING LINE: AREAS OF POTENTIAL COST REDUCTIONS

Cleaning Section
- Energy
- Water
- Chemicals
- Maintenance
- Hazardous Waste

Chemical Coater Section
- Energy
- Chemicals
- Maintenance
- Hazardous Waste

Primer Section
- Primer
- Energy
- Maintenance
- Waste

Waste Treatment
- Chemicals
- Water
- Maintenance
COST SAVINGS AT THE COIL COATING LINE

- On 2010 ProCoat made a study, with the collaboration of the two largest coil coaters in USA, to evaluate the savings at the coil coating line when BRUGAL is applied at the CGL line.

The conclusion was:
- Savings about 23.4% when Primer is applied.
- Savings about 62.4% when PRIMER is NOT applied.

SIGNIFICANT SAVINGS JUST PLACING ONE CHEMICAL PRODUCT AT THE CGL!!
I’ll be pleased to answer your Questions.
Thanks a lot!