

# DSM Carbon Footprint Study for Industrial Coatings applied on a Metal Substrate

*Focus on Powder Coating*

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Technical Marketing Officer

# Introducing DSM:

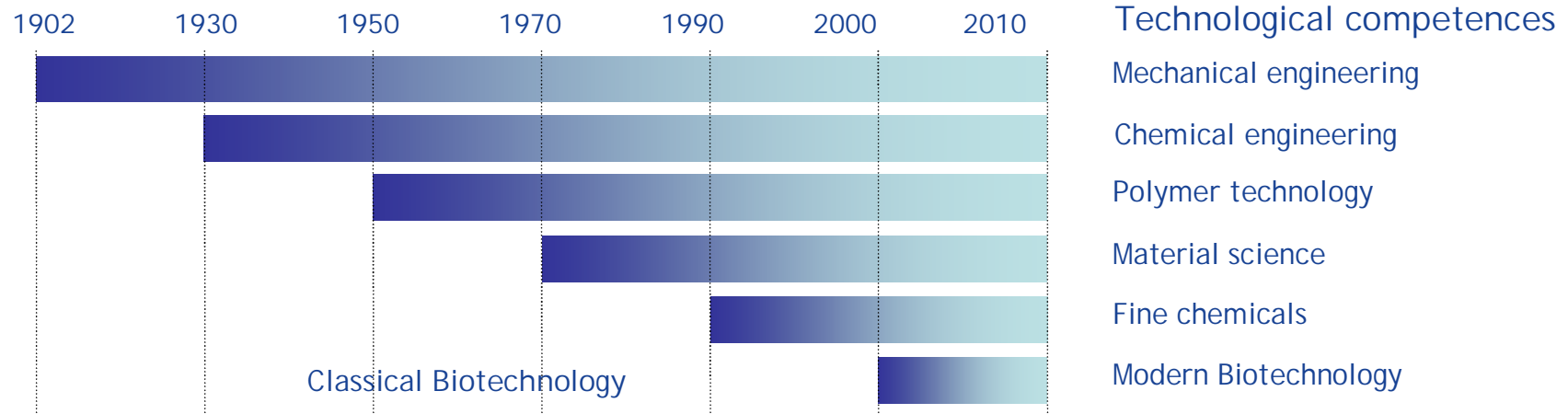
*DSM is everywhere*

- Located on five continents
- Approx. 22,700 employees
- Annual net sales of € 8 billion
- No 1 in Dow Jones Sustainability World Index
- Winner of 2009 Outstanding Corporate Innovator Award

Royal DSM N.V. creates innovative products and services in Life Sciences and Materials Sciences that contribute to the quality of life.

# DSM's Ability to change:

## *100 years of successful transformation*



# DSM and the Dow Jones Sustainability Index:

DSM is the No. 1 player in the chemicals market sector of the Dow Jones Sustainability Index

DSM takes responsibility for the Environment:

- As a company
- With the products it makes

DSM Sustainability Awards



World Business Council for  
Sustainable Development



FTSE4Good



# Our world is facing serious challenges.

If current consumption continues,  
we will need 2 globes by 2040(\*)

- 
- Growing world population
  - Resource constraints: scarcity of food, land, materials

- 
- Carbon constraints
  - Over exploitation of global eco-system

\* Source: WWF, Living Planet Report October 2008

# Climate Change and Global Warming force society to think and act differently.

Policy makers and industry sectors across the world are working to understand their role and required actions.

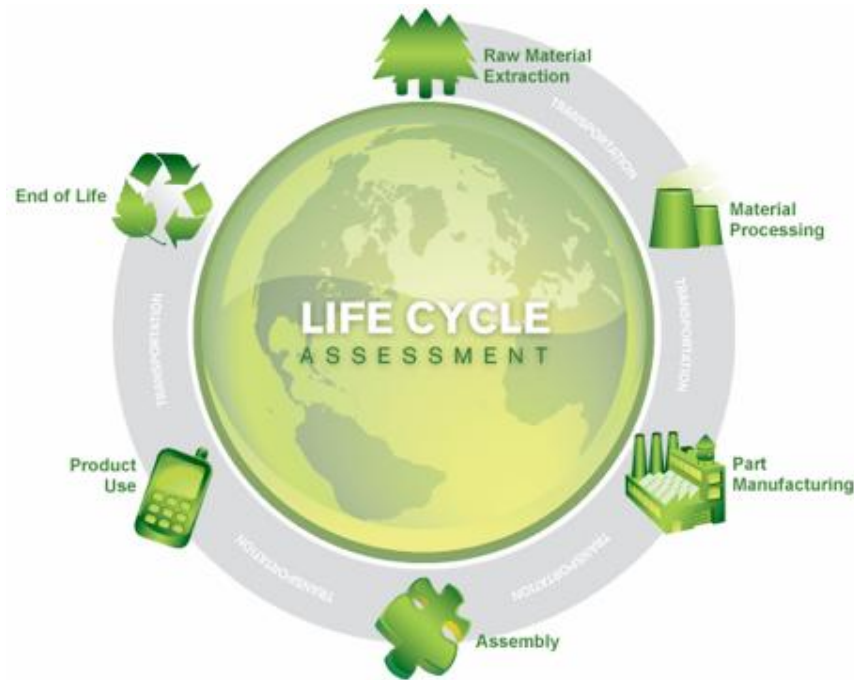


Sustainability has never been more relevant than today!

Chemical companies are aligning their innovation efforts to energy efficiency and overall environmental impact.

\* Source: WWF, Living Planet Report  
October 2008

# DSM conducts LCA\* studies to maintain its high-level of commitment to Sustainability.



DSM LCA\* methodology:

- SimaPro and EcolInvent database for environmental impact data
- Eco Indicator 99 for total Eco impact
- IPCC GWP 2007 for Carbon Footprint
- Own department for executing LCA
- Working with independent 3rd parties

\* Life Cycle Assessment

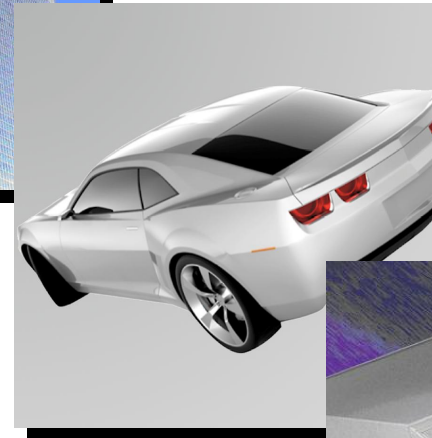
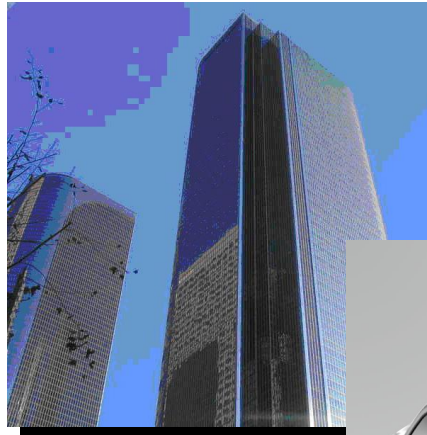
# DSM's Innovation Targets:

## *sustainable coating solutions*

Coatings are all around us.

Within DSM's Performance Materials cluster, the focus on innovation includes sustainable coatings solutions.

But how well, really, do we know how much impact any coating has on the Carbon Footprint?





# DSM has conducted an LCA study for Industrial Coating systems.

This LCA determines the Carbon Footprint of the resin and coating manufacturing process and the application of the coating on metal, and defines the CO<sub>2</sub> emission of coating applied on 1 m<sup>2</sup> metal.



This study\* includes:

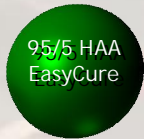
- Resin production  
*(both raw materials and energy)*
- Coating production  
*(both raw materials and energy)*
- Coating application  
*(solvent addition and energy)*

❖ Note: The study was verified and its results validated by CE Delft, an independent and objective third party, in conformity with PAS2050 Carbon Footprinting standards.

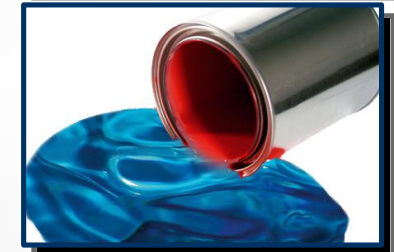


# The coating formulations covered in this DSM study are:

## Powder Coatings *(for interior and exterior use)*



## Water-borne industrial alkyd coatings



## Solvent-borne polyester and acrylic-based high solids coatings



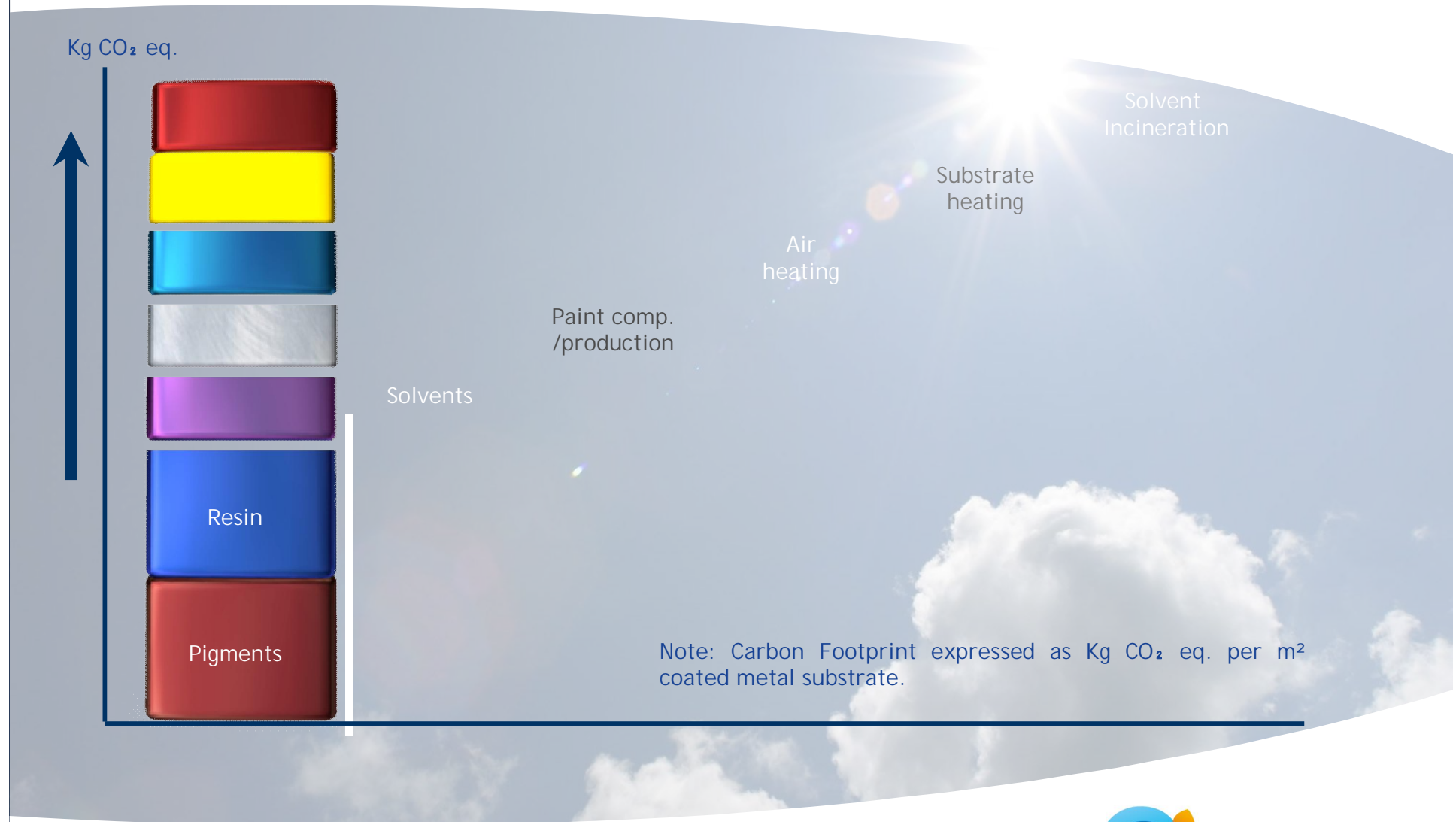
The coating formulations were analyzed on the basis of the amount of energy spent and impact on CO<sub>2</sub> emissions.

The analysis does not include the CO<sub>2</sub> emissions occurring upon destruction of the paint at the end of the service life of the coated object.

# Assumptions:

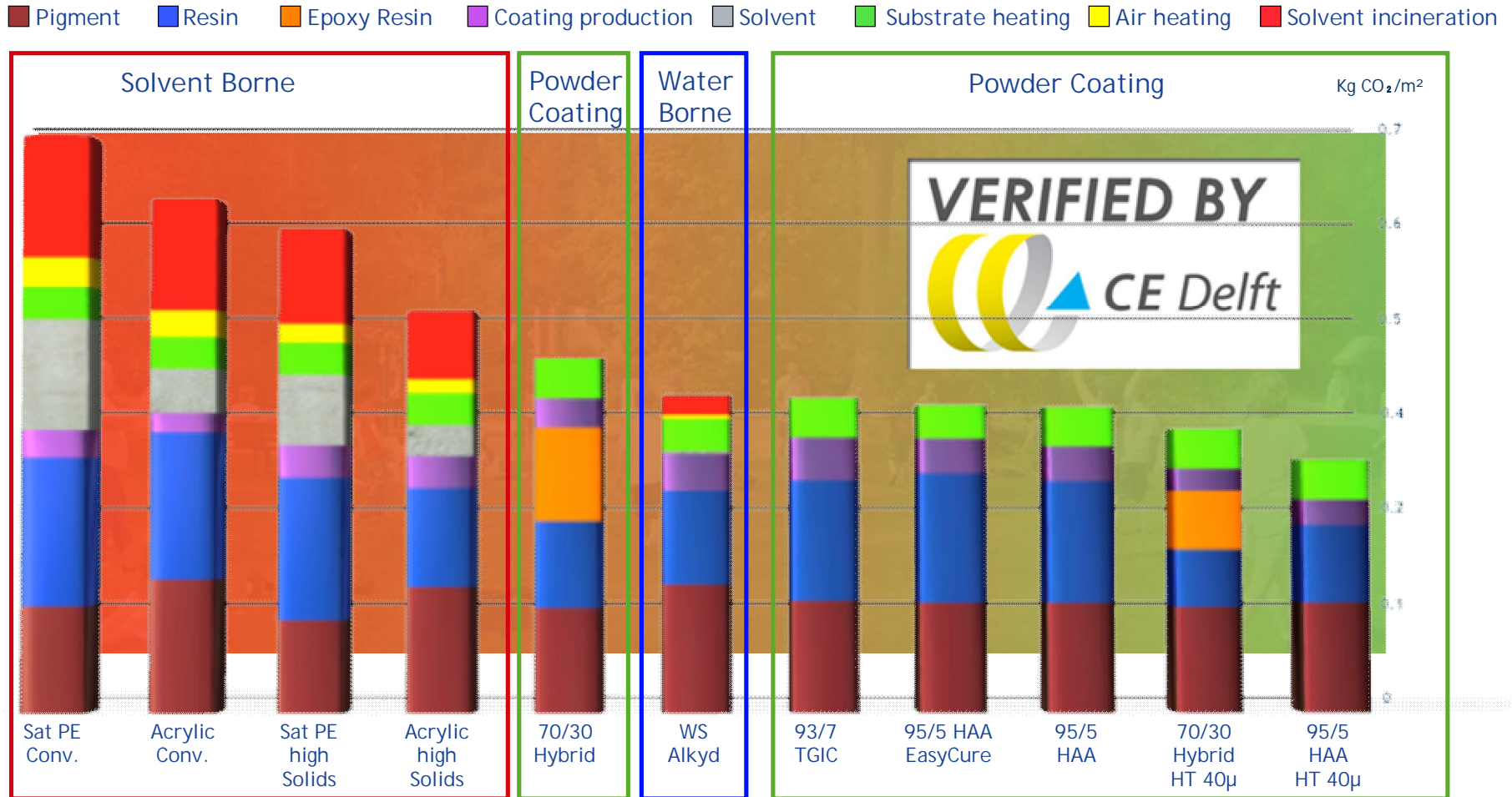
Industrial Metal	Surface: 1 m <sup>2</sup> , flat Thickness: 1mm
Coating	TiO <sub>2</sub> based white coating
Carbon Footprint Resin Technology	Assumed to be equal for all paints
Pigment / Resin Ratio Pigment	Dependent on product formulation
Curing Temperature	180°C Powder (Uralac® EasyCure™ at 155°C) 150°C others
Layer Thickness	40µ -60µ Powder 30µ others
Overspray	0% Powder 35 % for Solvent-borne and Water-borne
Drying Temperature	As defined per paint
Solvent Treatment	Incineration
Durability / Functionality	No differentiation

# The components of the Life Cycle Analysis of Coatings:





# The results of the DSM study:



Note: Carbon Footprint expressed as Kg CO<sub>2</sub> eq. per m<sup>2</sup> coated metal substrate.

# More than one sustainable coating solution:

There are different coating solutions for different applications.  
For a 1 mm thick industrially coated flat metal substrate we proved that:



Water-borne paints and Powder Coatings produce the lowest Carbon Footprint.



Solvent based coatings typically produce the highest Carbon Footprint.

# Powder Coatings can help reduce CO<sub>2</sub> emissions.

THE STUDY - CO<sub>2</sub> emissions:

*On a flat metal surface Powder Coatings produce the lowest Carbon Footprint compared to other industrial coating systems.*

Powder coatings at thinner layers generate less than 0,33 kg CO<sub>2</sub> eq per m<sup>2</sup>.

Powder coatings at thicker layers and Water-borne paints generate 0,35 - 0,41 kg CO<sub>2</sub> eq per m<sup>2</sup>.

Solvent-borne and High Solids (@30μ) coatings generate 0,47 - 0,67 kg CO<sub>2</sub> per m<sup>2</sup>.

Powder Coatings reduce CO<sub>2</sub> emissions by 25 - 60% against conventional solvent-borne coating systems.

# Powder Coating reduces GHG emission.

If all solvent-borne coatings on metal applications in which currently powder coatings can be applied would be replaced by powder coatings, then the Green House Gas (GHG) emissions avoided would be equivalent to:

*the annual emissions of approximately 9.5 million cars*

*or*

*to approximately 2.9 million trips around the world in a car,*

*or*

*the average annual carbon footprint of 1,5 million people in Western Europe*





# DSM innovates to make Powder Coatings even more sustainable.

THE STUDY - CO<sub>2</sub> emissions:

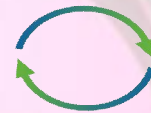
*The Innovation efforts of DSM in Powder Coating Resins are mainly based on:*

Reducing Layer Thickness



Uralac® HiTone™

Epoxy and Hybrid Replacement



Uralac® Veranda™  
Uralac® Corres™

Lowering Curing Temperatures



Uralac® EasyCure™

DSM in Powder Coating Resins works to develop resins that possess the properties that will help us reduce the Carbon Footprint of Powder Coatings even further.

# Current portfolio

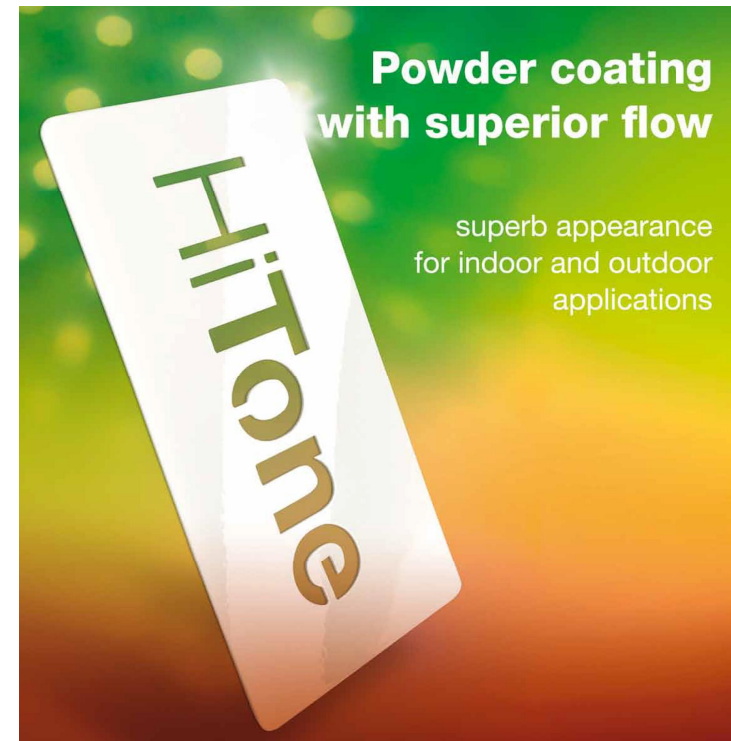
## Reducing layer thickness

### Outdoor

- Uralac® P 780 (5% HAA)
- Uralac® P 781 (3.5% HAA)
- Uralac® P 782 (4% HAA)
- Uralac® P 785 (5% HAA); higher Tg

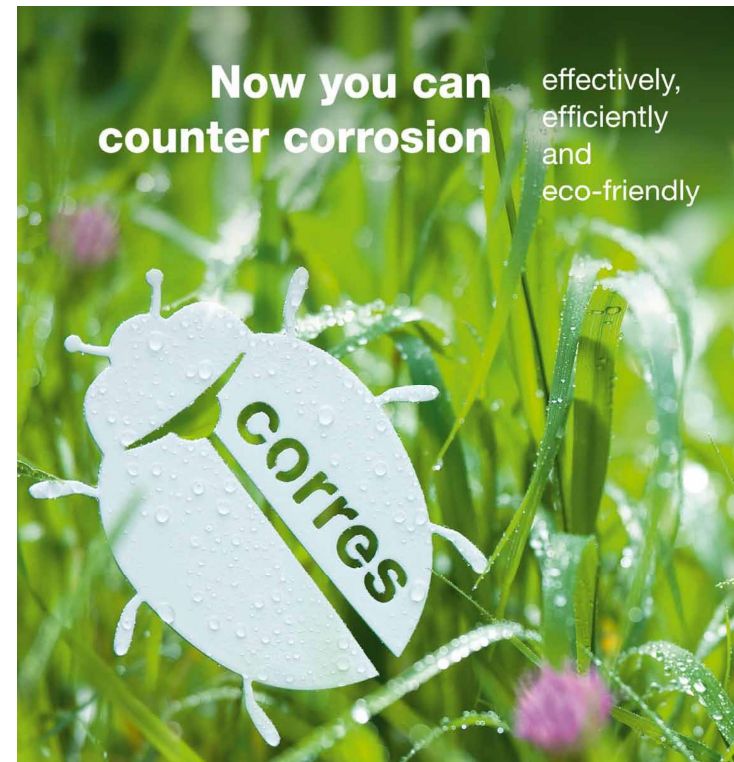
### Indoor

- Uralac® P 770 (70/30)
- Uralac® P 772 (70/30); higher reactive
- Uralac® P 773 (70/30); tribo
- Uralac® P 775 (70/30); higher Tg
  
- Uralac® P 760 (60/40)
- Uralac® P 765 (60/40); higher Tg



# Current portfolio

## Epoxy and hybrid replacement



# Current portfolio

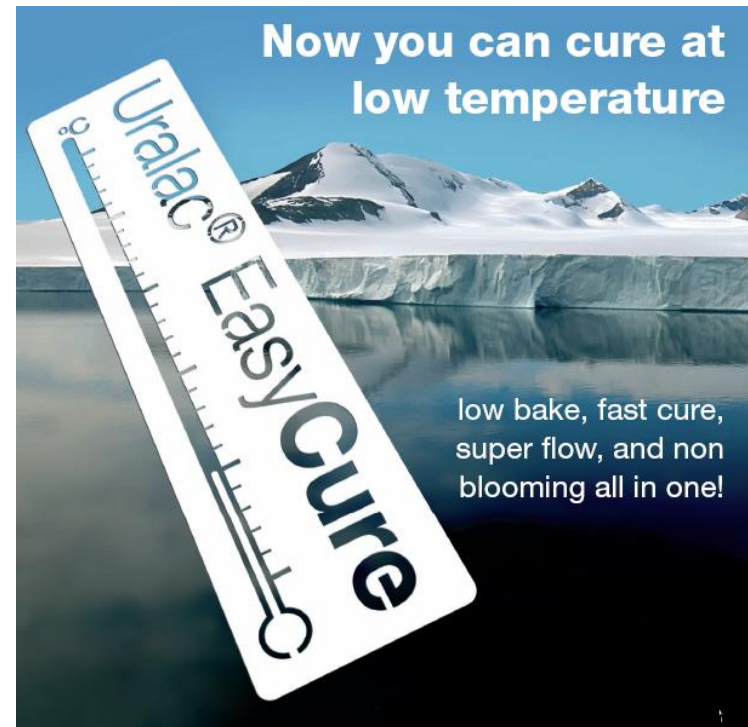
## Lowering curing temperatures

### Outdoor

- Uralac® P3210 (5% HAA)
- Uralac® P3211 (5% HAA); higher Tg
- Uralac® P3220 (7% HAA)
- Uralac® P3230 (7% HAA); SD grade

### Indoor

- Uralac® P 3170 (70/30)
- Uralac® P 3160 (60/40)





DSM has confirmed the long-held hypothesis that Powder Coatings are among the most sustainable coating solutions.

Next to the economic and technical benefits of Powder Coatings, the hypothesis has long been that Powder Coating Systems very likely produce the lowest Carbon Footprint.

This is the first quantitative analysis to confirm that statement.

# Want to know more about this study?

If you would like to know more about this study, or how much impact the coating formulation you use has on the Carbon Footprint, contact:

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[www.dsmcoatingresins.com](http://www.dsmcoatingresins.com)

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make the right  
choices.





Acknowledgement to APAL  
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Questions?