FreiLacke

Ultra-High-Solid-Singlelayer

Cost savings with significantly reduced solvent consumption.

Ultra-High-Solid-Singlelayer system

Cost savings in production and logistics

Ever-increasing requirements are being placed on coating systems, whether they pertain to surface quality or the efficiency of the coating process. In addition, there are also VOC requirements which are leading to the rising use of environmentally friendly water-borne coatings, powder coatings and high-solid systems. Users are looking for coating systems with an approx. 80 percent solids content by weight in order to safely stay below the VOC threshold of 420 g/l. These types of system can also be described as Ultra-High-Solid systems.

The requirements placed on high-quality industrial coatings are conventionally met using multi-layer coating structures. As well as cathodic ECs, 2C epoxy primers are also used in combination with 2C PU top coats. This coating system boasts excellent coating properties, both in terms of adhesive strength and corrosion protection and in terms of surface properties, UV resistance and chemical resistances.

The disadvantages of this process are the use of several coating systems as well as the increased time required for application and/or evaporation/drying, which generally results in higher coating costs.

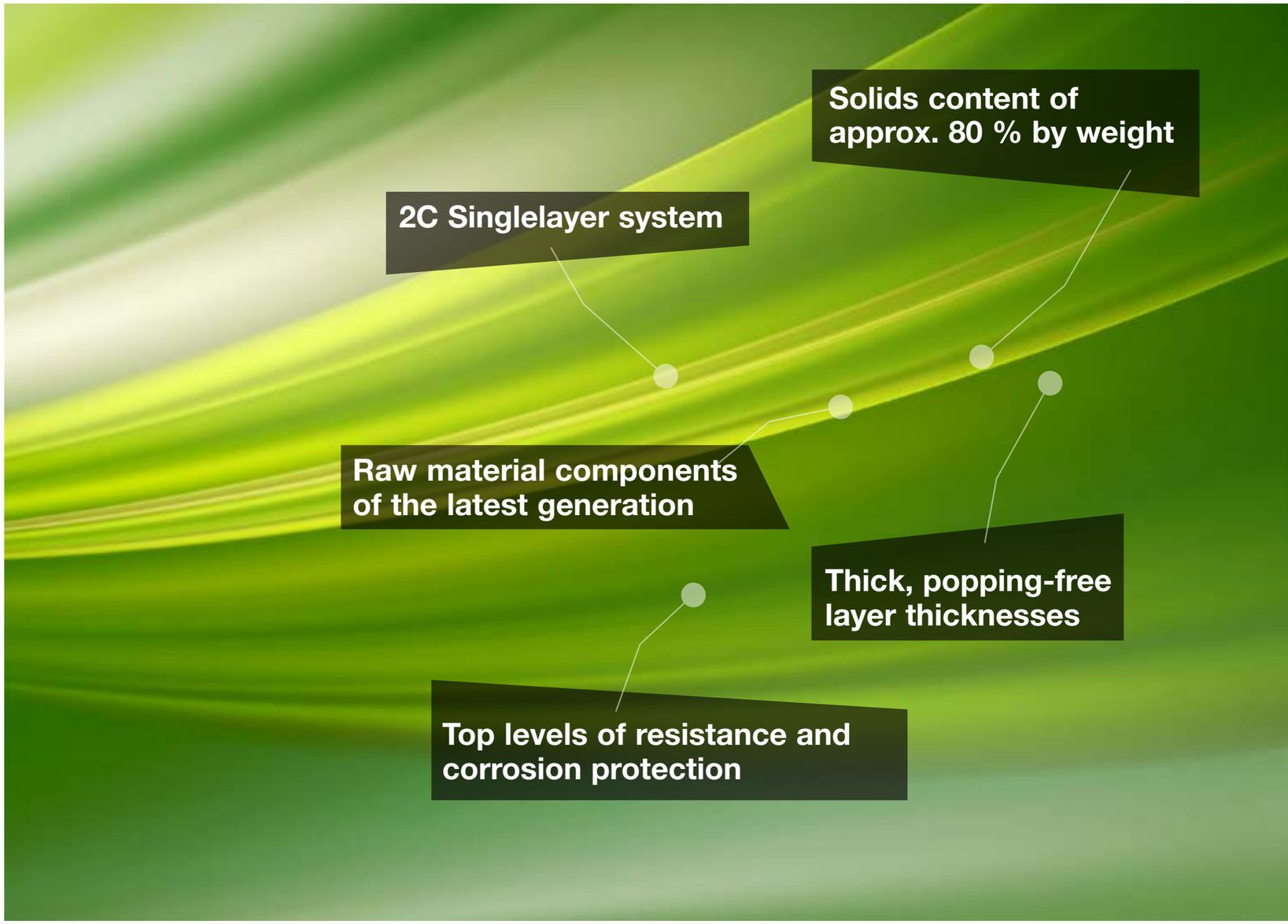
Singlelayer system with multi-coat properties
EFDEDUR Singlelayer UR1422

Singlelayer systems previously available on the market came with disadvantages in terms of application drying times or achievable dry film thicknesses. Limitations were encountered when applying these on blasted substrates and when covering more complex components.

FreiLacke has developed a 2C Singlelayer system with a solids content of approx. 80 percent by weight that uses the latest generation of raw material components.

The system therefore meets the requirements for high-grade coatings with high popping-free layer thicknesses, drying that meets the needs of real-life situations and good surface properties all at once. At the same time, the resistance levels achieved thanks to corrosion protection correspond to those of the multi-layer systems described.

The VOC content of the coating system is significantly below the VOC limit value.



Comparison of coating processes

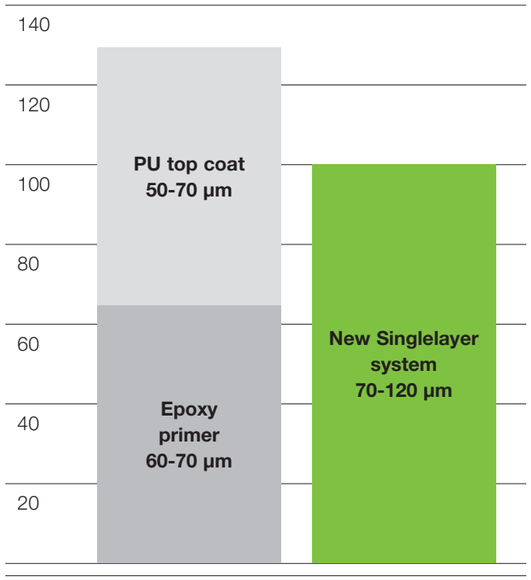
Conventional coating process with two coating layers (primer + top coat):

Singlelayer coating:

Application of the end layer thickness in one coat for short cycle times

Unlike standard multi-layer systems, the entire coating thickness can be applied in a single operation using the new coating system. The elimination of intermediate flash-off time and the interim forced drying of the primer where necessary mean that cycle times for the coating can be significantly reduced. In addition, solvent savings – especially for cleaning purposes – can also be realised.

The properties of the new EFDEDUR UHS Singlelayer coating UR1422 compared to a previous standard two-layer structure consisting of FREOPOX high-solid primer ER1980 or ER1912 and EFDEDUR high-solid gloss coating UR1991 are made clear below.



Comparison: Classic two-layer structure and Singlelayer structure

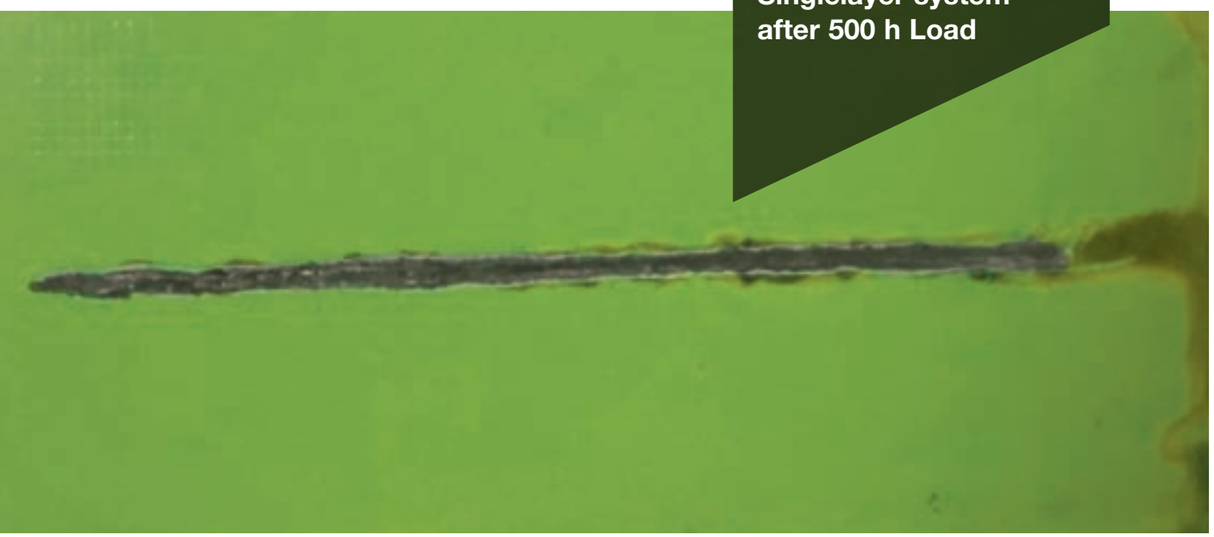
System		Dry film thickness [µm]	Solids content [% by weight]	VOC [g/l]	VOC [g/m²]	VOC total [g/m²]
Singlelayer system		100	80	>350	55	55
Standard two-layer structure	Primer	70	69	440	63	106
	Top coat	60	69	395	43	

Table 1: Comparison of total VOC values

Adopting a new Singlelayer system means that, in addition to increasing throughput, it is also possible to pare down on coating lines. By moving to a single coating system, handling of the coating materials is also optimised with regard to logistics and storage. As well as that, it is possible to avoid any coating product mix-ups during operating processes.

The advantages relating to VOC emissions that result from the significantly higher solids content of the new coating systems are listed in Table 1. The values of the total emissions per coated surface indicate a reduction in the VOC content of the new Singlelayer system of approx. one quarter.

Top levels of resistance and corrosion protection



To achieve a high degree of resistance and corrosion protection, a range of substrate pretreatments such as zinc phosphating, iron phosphating or sandblasting is recommended for Singlelayer coatings on steel.

Table 2 shows the results obtained compared to a standard structure with two possible pretreatment methods in each case (DIN EN ISO 9227 NSS).

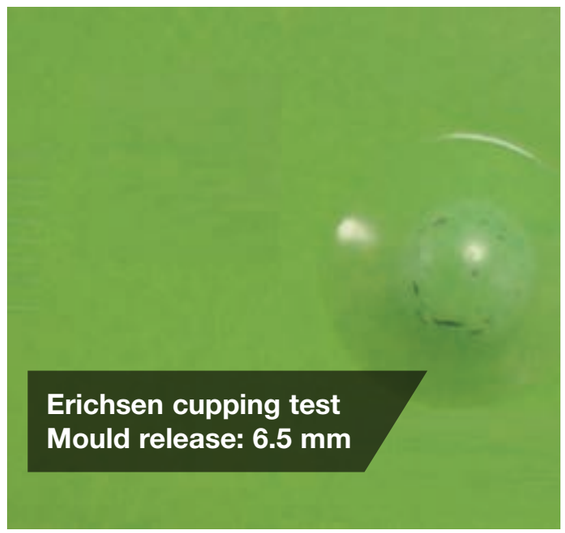
Load duration 500 h	Standard two-layer structure ER1912 & UR1991		UHS Singlelayer coating UR1422	
Substrate	Steel, blasted	Iron phosphate coating	Steel, blasted	Iron phosphate coating
Creepage from scribe [mm]	1	1 - 3	0.5 - 2	0.5 - 4
Adhesion	GT 1	GT 1	GT 0 - 1	GT 0 - 1
Degree of blistering	0 S(0)	0 S(0)	0 S(0)	0 S(0)
Degree of rusting	Ri 0	Ri 0	Ri 0	Ri 0

Table 2: Results of salt spray test

Load duration 500 h	Standard two-layer structure ER1912 & UR1991		UHS Singlelayer coating UR1422	
Substrate	Steel, blasted	Iron phosphate coating	Steel, blasted	Iron phosphate coating
Adhesion	GT 1	GT 1	GT 0 - 1	GT 0 - 1
Degree of blistering	0 S(0)	0 S(0)	0 S(0)	0 S(0)
Degree of rusting	Ri 0	Ri 0	Ri 0	Ri 0

Table 3: Results of the condensed water test in accordance with DIN EN ISO 6270-2 CH

Outstanding mechanical resistance



It is especially the case in industries such as vehicle construction that coating systems are expected to be sufficiently flexible after curing is complete. This means that fully prepared coating films need to be able to resist any deformation of the coated substrate without cracking.

Standard coating structures are usually only moderately flexible, because a less flexible epoxy primer is often used. By contrast, the Singlelayer system boasts outstanding values with respect to deformation and stone-chip resistance. When performing the Erichsen cupping test (DIN EN ISO 1520), a value of over 6 mm deformation can be achieved before initial cracks appear.

Moreover, stone-chip resistance (in accordance with DIN EN ISO 20567-1, part B) is excellent with a value of 1.25.

Thick, popping-free layer thicknesses thanks to excellent stability

Particularly worthy of mention are the stability and popping limit of the Singlelayer system. Dry film thicknesses of up to 150 µm can be achieved in a single operation without running. The maximum possible popping-free layer thickness depends on the method of application. Even using the airless method, which often results in popping, a popping limit of over 200 µm for dry film thicknesses is achieved.

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