



## MAINCOTE™ 1100 Emulsion

### Regional Product Availability

EMEA

### Description

MAINCOTE™ 1100 Emulsion is a versatile binder for use in Industrial Maintenance and DIY primers and topcoats. This product based on AVANSE™ Technology and self-crosslinking possibilities facilitates for an excellent balance of properties like enhanced pigment wetting resulting in good performance in corrosion control; gloss and exterior durability. MAINCOTE™ 1100 Emulsion can be formulated as well into midcoat or cost effective DTM (direct-to-metal coatings) for a variety of bare metal and painted substrates. MAINCOTE™ 1100 Emulsion offers formulations with low VOCs in most cases lower than 100 grams per liter meeting the most severe regulations for industrial coatings. MAINCOTE™ 1100 Emulsion ambient curing binder is a suitable candidate to replace solvent borne alkyd paints.

### Characteristics

- Remarkable corrosion resistance
- Excellent cost/performance balance by reducing the need for dispersants and rheology modifiers and providing good barrier properties by using inexpensive extenders better
- Remarkable corrosion resistance
- High gloss potential and very good durability
- Single resin that can be used in many different applications including direct-to-metal coatings. Offers a high performance system approach with a single resin
- Lowest VOC formulations at 100g/L or less
- APEO free \*
- Ambient self-crosslinking, providing excellent durability, dirt pickup resistance and solvent/chemical resistance
- Enhanced adhesion to various metal substrates (e.g., steel, galvanized, aluminium) and other coatings (e.g., alkyds)

\* APEO is not intentionally added and is not knowingly introduced from another raw material.

### Typical Physical Properties

(These properties are typical but do not constitute specifications).

Property	Typical Values
Appearance	Milky white liquid
Solids Content	50-51%
pH	8.5-9.5
Brookfield Viscosity	50–550 mPs
Minimum Film Formation Temperature	13–15°C

## Formulations

### Formulation Guidelines

In many cases the choice of the various paint ingredients can impact the protective, aesthetic, and application properties of a coating, and thus each additive should be evaluated carefully.

The following guidelines should provide suggestions to the paint formulators to get familiar with this new binder and achieve quickly well performing starting point formulations. Formulations should be adapted to individual needs and fully evaluated prior to commercialization.

### Coalescents

The selection of coalescents or other film formers is extremely important because corrosion resistance is very dependent on the quality of film formation. It is necessary to develop a package suitable for the intended application. MAINCOTE™ 1100 Emulsion requires approximately 6-8% on polymer solids of a slow-evaporating coalescent or coalescent/plasticizer blend to insure good film formation under marginal drying conditions such as low temperatures and high ambient Relative Humidity. Some suitable slow- evaporating water immiscible or partially miscible coalescents and plasticizers include Texanol ester alcohol, DOWANOL™ DPnB Glycol Ether, DOWANOL™ PPh Glycol Ether, Eastman™ TXIB additive.

Only these types of products with low or no water miscibility contribute to adequate film formation in adverse climatic conditions. Some of these products do not count as VOC but their drawback is obviously a slow hardness development and in some cases poor rheological properties at application. In some cases, replacement of some of the slow- evaporating coalescent or plasticizer with a higher level of a fast-evaporating coalescent can maintain good film formation and improve freeze-thaw resistance of paint in can or improve flow and levelling or extend open time at application. In such a case, the partly or totally water-miscible coalescent DOWANOL™ DPM Glycol Ether has been shown to be very effective for this purpose. A combination of 4% Texanol or DOWANOL™ DPnB Glycol Ether with 9% DOWANOL™ DPM Glycol Ether yields good film formation, maintains VOC levels below 100 g/L, and provides at least three cycles of freeze-thaw resistance.

### Freeze-Thaw Protection

The use of a co-solvent such as propylene glycol may extend the freeze-thaw resistance to 3 or more cycles. Depending on the level of volatile coalescent present, a typical gloss white DTM formulation can maintain a VOC level below 100 g/L. For example, using 8% DOWANOL™ DPnB Glycol Ether calculated on binder solids in an 18% PVC white paint allows about 6% of propylene glycol to be added and still be at 100 g/L total VOC. This paint passes three freeze- thaw cycles. However, co-solvents such as the glycols are slow- evaporating and can cause water sensitivity in the fresh film. For improved early water resistance, do not use glycol solvents such as propylene glycol. Another possibility to obtain freeze-thaw resistance with MAINCOTE™ 1100 Emulsion is given with the use of faster-evaporating, partially water-miscible coalescents. Like DOWANOL™ DPM Glycol Ether, for example, this has been found to contribute to both film formation and freeze-thaw resistance with this binder.

### Use of pigments

Several grades and types of titanium dioxide were found to give good results with MAINCOTE™ 1100 Emulsion. A highly durable grade, such as Ti-Pure R-706; Tiona RCL-696 or Tioxide TR-92 is suggested for the best gloss and durability in topcoats and DTM used in exterior environment. For white and grey primers, a less durable grade can be used.

### **Dispersants**

It is not surprising that the choice of dispersant is critical for corrosion protection. Copolymer dispersants such as OROTAN™ 165A Dispersant and OROTAN™ 681 Dispersant, at 1 to 2% on pigment (solids/solids), are suggested as a starting point. Surfynol CT-211 is also suitable as a co-dispersant with OROTAN™ 681 Dispersant. In general, polyacrylic acid and polymethacrylic acid dispersants are not good choices, as they normally reduce corrosion resistance and should be avoided.

Other phosphate based dispersant like Hydropalat 3204 or Calgon used in low concentrations might help in maintaining good storage stability of the paints and are particularly adapted in primers where reactive pigments are used. High levels of dispersant should be avoided as it might increase water sensitivity and lower corrosion resistance.

### **Thickeners**

Non-ionic urethane thickeners such as ACRY SOL™ RM-8W, ACRY SOL™ RM-12W, ACRY SOL™ RM-2020 and ACRY SOL™ SCT-275 Rheology Modifiers are key to formulating a high-quality, corrosion-resistant coating. The use of cellulosic or alkali-soluble thickeners significantly degrades the water and corrosion resistance. The expected method of application is an important parameter to consider when selecting rheology control agents. Brushing formulations require higher viscosity under high shear conditions for best brush drag. On the other hand, lower high shear viscosity is desired for ease of atomization during spraying. The viscosity range suitable for brushing is 1.5 to 2.0 poise, while 0.5 poise is characteristic of a paint with good atomization. A suitable viscosity range for airless spray is 95 to 105 Krebs Units to minimize sagging tendencies. For brushing, formulate to lower values of approximately 85 KU so that brush marks flow out. ACRY SOL™ RM-8W and ACRY SOL™ RM-12W Rheology Modifiers are suggested for paints designed for spray application. ACRY SOL™ SCT-275 or ACRY SOL™ RM-12W Rheology Modifiers are suitable for spray applications where flow/sag balance is critical. ACRY SOL™ RM-2020 Rheology Modifier is more suitable for brush or roller application. Having a paint that offers optimum viscosity for both brush and spray application is difficult and having a viscosity of 90 Krebs Units/1.0 poise (low shear/high shear viscosity) is a compromise. To attain this rheology profile, it would be necessary to use both thickeners. In primer formulation the use of a silica like Aerosil R 972 can help in avoiding settling of pigments.

## Defoamers

Foam control is a major concern in waterborne paint formulation design. Defoamers are needed to eliminate foam during manufacture and film application. The choice of defoamer type and level will depend primarily on the formulation and mode of application. Deeptone formulations for airless spray application, which use pre-dispersed colorants, will require the most effective defoamer package. Brushing formulations prepared with in-house, factory- dispersed dry pigments are typically easier to effectively defoam.

A good start in choosing the right defoamer package is to have a silicone-based defoamer in the grind followed by a non-silicone in the letdown. Effectiveness of the defoamer can be screened by the shaker test, but the best candidates should be checked by actual application. Drawdowns should be made to check for surface defects and impact on gloss. Defoamer persistence should be checked by oven aging and retesting the defoaming capabilities. Our testing has shown Drewplus L-493 to be an effective defoamer for the grind stage, and Tego Foamex 1488 to be a good choice for the letdown. Tego Airex 902W at 0.5–1.0% by weight as supplied on total formulation has been found to assist in reduction of microfoam during airless spray application.

### Flash Rust Inhibitors

In waterborne paints for steel, the water phase should contain flash rust inhibitors since rapid rusting (flash rust) can occur as the paint is drying. Ammonium benzoate or Lopon DV can be suggested. Addition in a diluted form (5-15% aqueous solution) is suggested to prevent stability problems and grit formation. Other inhibitors are available but need careful evaluation since might have negative effects on adhesion or stability.

### Reactive Pigments

Reactive or inhibitive pigments are often used in primer formulations to increase the corrosion resistance. The type and level of these pigments can also have a strong effect on the paint stability, and so these pigments should be thoroughly evaluated. We suggest either Heucophos ZMP or ZCPP or Halox SZP-391 for use in primers at a level of approximately 5%. Lower levels of reactive pigment are sometimes used in DTM finish coats, but can have a negative impact on gloss levels. Micronized reactive pigments should be preferred.

Good salt spray results have been obtained also with new types of Zn-free pigments like K- white ZF-150 W from Tayca.

### Extenders

The choice of extenders can play an important role in barrier properties. In our primer formulation work, we have found a talc, or talc/calcium carbonate combinations such as Microtalc AT/Durcal 5 to yield the best corrosion resistance. In general, higher PVC leads to a more porous coating and lower corrosion resistance. For this reason, we suggested primers to be formulated at approximately 25 to 30% PVC.max. When preparing low gloss coatings, flattening with silica flattening aids is generally preferable to increasing PVC with an extender because of the lower impact on barrier properties.

## Colorants

The selection of colorants and tinting pastes, like most additive choices, should be done very carefully for waterborne maintenance coatings, since pre-dispersed colorants can negatively impact corrosion resistance due to the high level of surfactants or additives used to disperse and stabilize the colored pigment pastes.

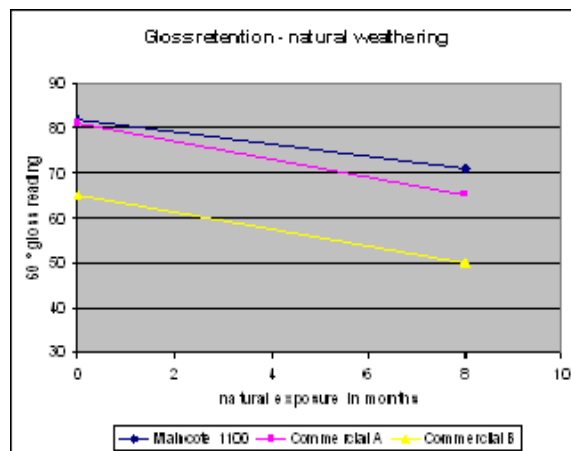
## Formaldehyde and aldehydes

MAINCOTE™ 1100 Emulsion uses ambient temperature cross-linking chemistry in a one-pack system. Paints formulated with MAINCOTE™ 1100 Emulsion will oxidatively cure during and after the latex particles have coalesced to form a film with improved toughness and resistance properties. Formaldehyde or aldehyde releasing additives will adversely affect the performance of paints based on MAINCOTE™ 1100 Emulsion and are not recommended.

## Performance Data

The typical reference formulation for MAINCOTE™ 1100 Emulsion in a semigloss white DTM is shown below. The coating is formulated at less than 100 g/L. Although König hardness is situated in a low range between 20 and 30 sec., film hardness as measured by the pencil hardness test is similar to resins with higher Tg and higher VOC requirements such as MAINCOTE™ HG-54K Acrylic Resin.

Dirt pickup resistance is also comparable to harder resins after a short air cure, and actually exceeds that of conventional resins after self-crosslinking is allowed to occur, such as after exposure to UV light. Solvent resistance, as measured by MEK double rubs, also improves significantly after a short UV exposure reaching over 80 double rubs. This resin allows to formulate paints with high gloss potential, and durability is also excellent, as it can be demonstrated by the gloss retention after natural exposure at our Spring House research center near Philadelphia, USA.



**Figure 1: Gloss retention after natural weathering**

Figure 1 compares the gloss retention of MAINCOTE™ 1100 Emulsion with a commercial waterborne acrylic paint based on a conventional resin and formulated at a higher VOC (200 – 250 g/L). Coatings based on MAINCOTE™ 1100 Emulsion give excellent protection to metals particularly when applied in a double coat or as a primer and topcoat system.

Over 300 hours salt spray resistance according ASTM 117 D is obtained with double coats systems at about 120- 150  $\mu$  dry coat (see figure 2). Formulation details are given as ESG - DTM – 1100.

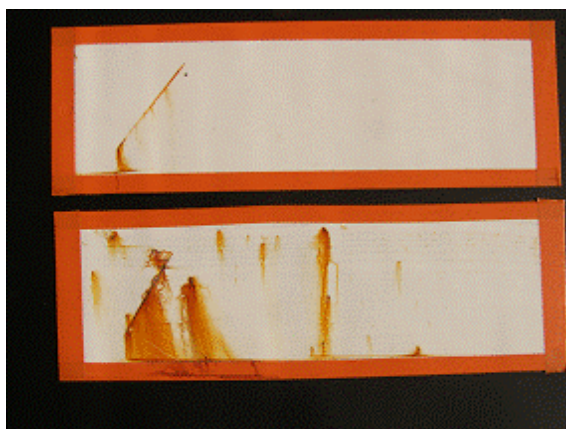


Figure 2: Corrosion resistance results after 340 hours salt spray test

**White Metal Semi-Gloss Protective Coating Based on MAINCOTE™ 1100 Emulsion**

Formulation ESG-DTM-1100

Materials:		Parts by Weight:	
<b>a) Grind</b>			
Water		59.6	
OROTAN™ 165 Dispersant (21.5%)		11.9	
Dehydran 1620 defoamer		1.7	
DOWANOL™ DPM Glycol Ether		5.0	1.86% Coalescent
Tioxide TR-92 pigment		214.5	16.47% PVC
Durcal 5 filler		76.5	8.8% PVC
Ricorin RZ		2.0	0.25% PVC
	Total	371.2	
<b>Grind in Cowles at high speed for about 20 minutes. Then add:</b>			
MAINCOTE™ 1100 Resin (50.5%)		536.2	
Surfynol 104 DPM surfactant		5.0	
Water		17.9	
DOWANOL™ DPM Glycol Ether		11.9	4.44% Coalescent
Texanol ester alcohol		16.7	6.23% Coalescent
Grind Above		371.2	
Lopon DV corrosion inhibitor (8%)		20.9	
RM5000/DOWANOL™ DPM Glycol Ether/Water 1/1/3		19.1	
Byk 024 defoamer		1.2	
<b>Paint Constants</b>			
pH:		8.8	
Krebs Stomer/ICI Viscosity:		105 KU / 1.6 P	
Weight Solids %:		57.4	
Volume Solids %:		42.8	
Pigment Volume Conc. %:		25.6	

**Handling Precautions**

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

**Storage**

Store products in tightly closed original containers at temperatures recommended on the product label.

**Disposal Considerations**

Dispose in accordance with all, local or national regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local or national regulations. Contact your Dow Coating Materials Technical Representative for more information.

**Chemical Registration**

Many countries within EMEA require the registration of chemicals, either imported or produced locally, prior to their commercial use. Violation of these regulations may lead to substantial penalties imposed upon the user, the importer or manufacturer, and/or cessation of supply. It is in your interests to ensure that all chemicals used by you are registered. Dow does not supply unregistered products unless permitted under limited sampling procedures as a precursor to registration.

**Note on EMEA Product Line**

Product availability and grades vary throughout the countries in the EMEA area. Please contact your local Dow Coating Materials representative for further information and samples.

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Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

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