

# AEROSOL COATINGS

A selection of binders & additives for Solvent borne and Waterborne coatings

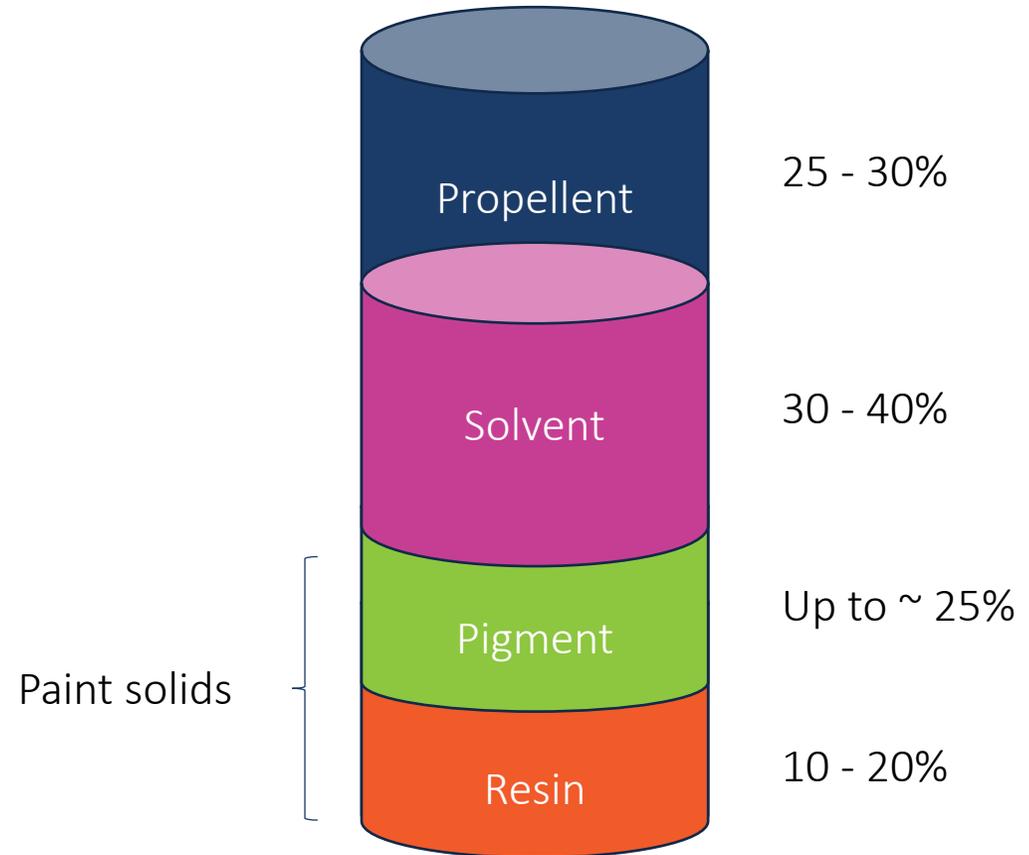


# Composition of aerosol coatings

Key Components of Aerosol Coatings are:

1. Resin
2. Pigment
3. Solvent
4. Propellant

- **Compatibility** of these elements is critical for package stability and proper application properties.

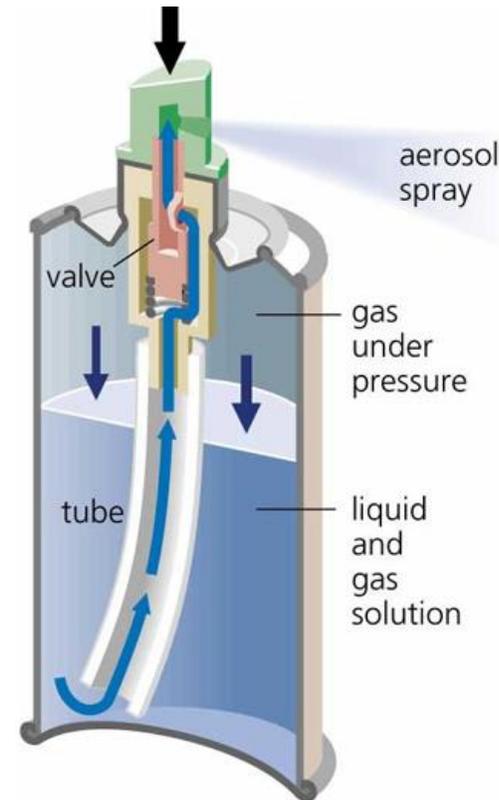


# How does it work?

Data source : Wikipedia



- Aerosol paint (commonly spray paint) is paint that comes in a sealed, pressurized container and is released in an aerosol spray when a valve button is depressed.
- The advantages of an aerosol over typical liquid coatings include the ease and speed of application, a smoother finish with no brush streaks and no post-application brush cleanup.
- The aerosol does not require the mixing and measuring of a second component. After shaking the can, the aerosol is ready to use.



- Propellant at the top of the can presses down on the mixture of paint and propellant in the bottom, forcing the mixture up through the dip tube when the valve is opened.
- A typical paint valve system has a "female" valve; the stem is part of the top actuator. The valve can be preassembled with the valve cup and installed on the can as one piece, before pressure-filling. The actuator is added afterward.

Video: <https://www.youtube.com/watch?v=1jbiPfR6fII>

# Solvent based & Waterbased Aerosol paints

## Solvent based Aerosol paints

- A solvent-based spray paint contains both a propellant and a film-forming paint resin formulation. Most commercial solvent-based aerosol paints contain mixtures of low molecular weight hydrocarbons as a propellant. Most often a mixture of propane and isobutane is used.
- To form a uniform and smooth coating when the paint is applied, the resins in the formulation should be in one phase with the solvents and the propellant during application. The propellant can also act as a solvent in the paint. It is important to have resins in solution for satisfactory application of paints to substrates. Compatibility resin with propellant always recommend to check first
- The introduction of dimethyl ether (DME) as an aerosol propellant has provided the opportunity to remove toxic aromatic solvents or methylene chloride and formulate attractive, low-toxicity, solvent-based aerosol paints.
- To check whether the resin is compatible with LPG (propellant), mixed the resin/binder with solvent like N-Hexane. If compatible with N-Hexane it means resin/binder compatible with LPG (propellant). Normally ratio paint : LPG is 100:33 by weight.
- 2 grade aerosol paint very popular in SEA is NC base or Acrylic base (1/2K)
- To know their aerosol base is acrylic base or NC paint base, we can mix with benchmark resin with xylene, ratio 1:1 or 1:2. If the paint is gel does mean it's a NC paint. If there is homogenous so it's a acrylic base.

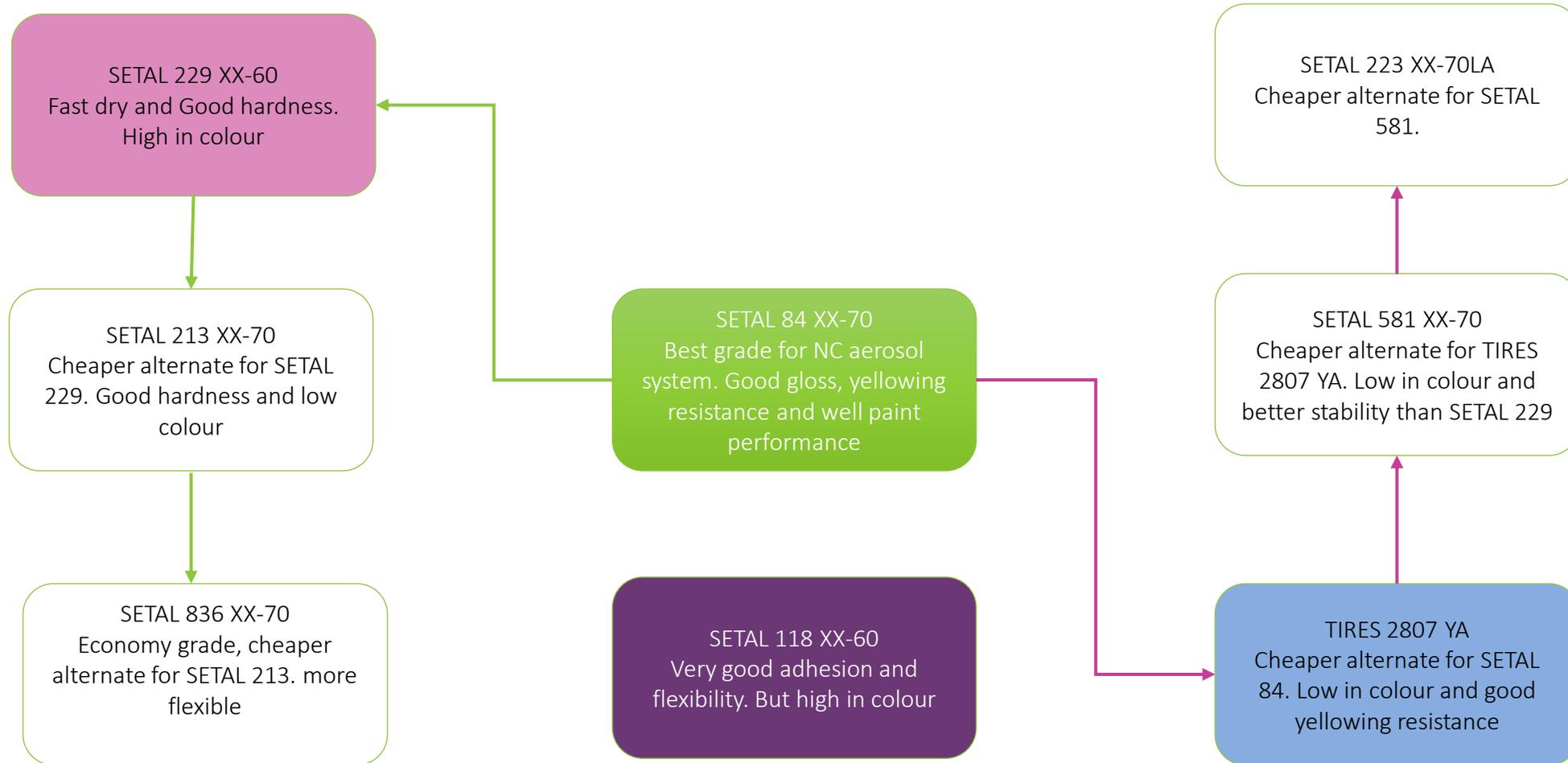
## Water based Aerosol paints

- Very few VOC free aerosol paints are available at present. This is due to the necessity of having a volatile propellant in the can which will add a significant amounts of volatile organic compounds into the aerosol paint.
- Without propellants paint cannot be sprayed from an aerosol can.
- In the case of water based aerosol paints, the resins are usually incompatible with most of the common propellants used, including DME. DME is a polar, water compatible solvent, but also a very strong diluent. It will attack many common binders in a water-based solvent system.
- In order to prevent shelf life issues, the concentration of binders has to be kept low. The low concentration of binder restricts the amount of paint components (pigments, additives etc.) that can be added, and the resulting film formed may be of poor quality and low gloss.
- Components (dispersion agents, binders, etc.) should be carefully chosen to have a good affinity with DME & improve the quality of the final formulated paint system.

# Solvent borne Binders for aerosols

| Product                | Type                 | Special properties and use  | Tg/°C | Compatibility with Di-Methyl Ether |
|------------------------|----------------------|---|-------|------------------------------------|
| SETAL 84 XX-70         | SOA                  | NC based aerosol, Clear and pigmented nitrocellulose lacquers.  | N/A   | Yes                                |
| VIACRYL SC 121/60X     | TPA                  | Acrylic based aerosol. Good adhesion on metal & non ferrous metals. Good flexible   | 35    | Yes                                |
| SETALUX 1261 VX-51     | TPA                  | Acrylic based aerosol. Fast dry and good weather resistance. General purpose  | 50    | Yes                                |
| TIRES EXP 4245         | TPA                  | <b>Acrylic based aerosol. Economy grade TPA, fast dry and good adhesion on plastics, woods &amp; concrete</b>             | 57    | Yes                                |
| SETALUX 2127 XX-60     | TPA                  | Acrylic based aerosol. Very good adhesion on various metals especially galvanized surface, high hardness & DPU resistance | 60    | Yes                                |
| VIACRYL SC 200/40X     | Epoxy modified TPA   | Epoxy modified with good adhesion on precious metal/glass.  | 66    | Yes                                |
| VIACRYL VSC 6324/46BAC | TPA                  | <b>Very fast dry, good gasoline resistance &amp; durability. Can be for 2K</b>  | 73    | Yes                                |
| SETALUX XCS 1516 TS-45 | CPO modified acrylic | Excellent adhesion to many metals and plastics and even to untreated PP.  | 80    | Yes                                |

# SB solutions for aerosol paint (NC system)



# SB solutions – TPA as 1K air dry application



# Compatibility with Aerosol Propellant

|                                  |  |
|----------------------------------|--|
| Setalux 2127 XX-60               | 30.0   |
| Additol XL 123N (levelling)      | 0.10   |
| BYK 052N (defoamer)              | 0.20   |
| Butyl acetate                    | 17.40  |
| IBA                              | 7.00   |
| Toluene                          | 24.30  |
| Xylene                           | 10.50  |
| MIBK                             | 10.50  |
| <b>Total</b>                     | <b>100.00</b>                                |
| <b><u>Compatibility</u></b>      |  |
| N- Hexane                        | Clear, no turbid or hazy appearance observed |
| LPG Gas ( test at customer site) | Clear, no turbid or hazy appearance observed |
| Spray out film                   | Smooth/ glossy                               |

# Solvent based System – based on SETAL 84 XX-70



STARTING POINT FORMULATION

## SETAL 84 XX-70

Description : nitro-cellulose based white topcoat for vehicle refinishing  
 Reference : VR; REC 00066

|  | Weight  | Function              | Supplier                  |
|--|---------|-----------------------|---------------------------|
| Setal 84 XX-70                                       | 42.0    |                       |                           |
| Kronos 2310  | 95.0    | pigment               | Kronos International Inc. |
| Nuosperse FA 601                                     | 2.0     | wetting agent         | Condea Servo              |
| Xylene   | 25.0    |                       |                           |
| <i>Grind in a pearl-mill till &lt; 5 µm and add:</i> |         |                       |                           |
| Setal 84 XX-70                                       | 124.0   |                       |                           |
| Nitro-cellulose solution, 25% non-volatiles          | 380.0   | nitro-cellulose ½ sec | Hagedorn AG               |
| 385 parts H 24, 35%                                  |         |                       |                           |
| 240 parts toluene                                    |         |                       |                           |
| 120 parts xylene                                     |         |                       |                           |
| 140 parts ethyl acetate                              |         |                       |                           |
| 90 parts butyl acetate                               |         |                       |                           |
| 25 parts ethanol                                     |         |                       |                           |
| Laropal K 80 (50% in butyl acetate)                  | 13.0    | ketone resin          | BASF AG                   |
| Resamin HF 480                                       | 25.5    | plasticizer           |                           |
| Addbond LTW  | 8.5     | adhesive resin        | Tego                      |
| Baysilon PL (2% in toluene)                          | 4.0     | levelling agent       | Borchers GmbH             |
| BYK 306  | 1.0     | substrate wetting     | BYK Chemie GmbH           |
| Butanol  | 15.0    |                       |                           |
| Toluene  | 85.0    |                       |                           |
| Butyl acetate  | 63.0    |                       |                           |
| Xylene   | 85.0    |                       |                           |
| Solvesso 100   | 32.0    |                       |                           |
| Thinner till application viscosity                   | 1 000.0 |                       |                           |
|  | .....   |                       |                           |

### Thinner

|                        |             |
|------------------------|-------------|
| Toluene                | : 400       |
| Xylene                 | : 200       |
| Butyl acetate          | : 200       |
| Methyl isobutyl ketone | : 100       |
| Ethyl acetate          | : 50        |
| Butanol                | : <u>50</u> |
|                        | 1000        |

### Ratio solid binders

|              |      |
|--------------|------|
| Setal 84     | : 50 |
| NC           | : 45 |
| Addbond LTW  | : 2  |
| Laropal K 80 | : 3  |

### Application

|                 |                               |
|-----------------|-------------------------------|
| Spray viscosity | : 14 - 16 seconds DIN 4, 23°C |
| Spray pressure  | : 300 - 400 kPa               |
| Drying schedule | : at ambient temperature      |

### Parameters

|                                 |            |
|---------------------------------|------------|
| Non volatiles (without thinner) | : 35%      |
| Pigment : Binder ratio          | : 45 : 100 |

# Solvent based System – based on SETALUX 2127 XX-60

|   |               |
|---|---------------|
| Setalux 2127 XX-60                        | 20.60         |
| Additol XL 6577                           | 0.50          |
| Pegasol 100                               | 3.00          |
| Sylsia 350                                | 0.60          |
| Tiona 595                                 | 8.00          |
| <i>HSD until fineness &lt; 20 microns</i> |               |
| Black pigment paste (FW-2V)               | 0.40          |
| BYK 306                                   | 0.20          |
| BYK 052                                   | 0.05          |
| BAC:Xyl:PMA(30:40:30)                     | 66.65         |
| <b>Total</b>                              | <b>100.00</b> |
| Adhesion on tin plate                     | Gt 0*         |
| Recoat with 2K PU Clear                   | Gt 0*         |



\* Remarks: Gt =0 excellent, 5 = poor

# Water borne binders for aerosols

| Product                 | Type  | Special properties and use  | Compatibility with Propane/Butane | Compatibility with Di-Methyl Ether |
|-------------------------|---|---|-----------------------------------|------------------------------------|
| VIACRYL® VSC 6279w/45WA | Copolymer emulsion based on styrene and acrylic acid esters. Free of organic cosolvents | Excellent compatibility with alkyd resin emulsions. High shear stability. Very quick set- and through drying. Excellent non yellowing properties and outdoor durability.  | No                                | Yes                                |
| RESYDROL® AY 466w/45WA  | Oxidatively drying acrylic modified alkyd resin as aqueous emulsion                     | Rapid initial and through-drying. High gloss. Excellent water and weather resistance. Good storage and drying stability. Free from organic amines. Sole binder for waterborne industrial topcoats   | No                                | Yes                                |
| RESYDROL AY 6150w/45WA  | Air-drying, acrylic modified alkyd resin emulsion                                       | quick drying, high gloss and corrosion protection, good adhesion on various substrates and very good re-coatability at any time. Can also be used as sole binder or in combination with dispersions for the formulation of wood stains, primers and paints. | No                                | Yes                                |
| RESYDROL VAY 6096w/39WA | Short-oil, oxidatively drying, acrylic modified alkyd resin as aqueous emulsion         | very quick drying, high film hardness, good gloss in decorative top coats , high water resistance and outdoor durability  | No                                | Yes                                |
| RESYDROL AX 6267w/43WA  | Epoxy-acrylic-hybrid system as aqueous emulsion   | Extremely fast physical initial and good oxidative through drying, excellent adhesion to various substrates, high water and corrosion resistance  | No                                | Yes                                |
| DAOTAN® TW 6442/42WA    | Polyurethane dispersion modified with drying fatty acids                                | Very fast set and through drying. Very high gloss in decorative top coats together with high film hardness and good water and weather resistance. Free of organic amines.   | No                                | Yes                                |
| DAOTAN TW 6439/30WA     | Aqueous aliphatic polyurethane dispersion, polyester based                              | Extremely fast physical drying, clear and crack free films at ambient temperature without co-solvents. Very good mechanical properties (elasticity) and adhesion an various plastic substrates.   | No                                | Yes                                |

\*This list of materials is not exhaustive

# Orientating formulation – Water based System - – based on RESYDROL® AY 6150w/45WA



STARTING POINT FORMULATION

## RESYDROL® AY 6150w/45WA

### Thinner

Deionized water : 80  
Isopropanol : 20  
100

REC20058: water borne industrial aerosol topcoat, RAL 3000

|  | Weight | Function                | Supplier      |
|--|--------|-------------------------|---------------|
| <b>Topcoat</b>   |        |                         |               |
| RESYDROL AY 6150w/45WA   | 67.80  | alkyd emulsion          | <i>allnex</i> |
| Ammonia 25 % in water  | 0.70   |                         |               |
| ADDITOL VXW 4940 N (1:1 in demin. water)                       | 1.70   | combination drier       | <i>allnex</i> |
| Solvent Naphtha 80-120   | 2.50   |                         |               |
| Shellsol T   | 1.70   |                         |               |
| <i>Mix and then add:</i>                                       |        |                         |               |
| Paliogen Red L 3880 HD   | 4.20   | pigment                 | BASF          |
| Sicotrans Red L 2915 D   | 0.70   | pigment                 | BASF          |
| Kronos 2059  | 0.30   | pigment                 | Kronos        |
| Nuodex Web Cobalt 8  | 0.25   | drier                   | Huntsman      |
| ADDITOL XL 270   | 0.40   | wetting & anti-settling | <i>allnex</i> |
| ADDITOL XL 297   | 0.40   | anti-skin additive      | <i>allnex</i> |
| ADDITOL VXL 4930 N   | 0.50   | leveling additive       | <i>allnex</i> |
| BYK-023  | 0.50   | defoamer                | BYK           |
| Deionized water  | 10.20  |                         |               |
| <i>Disperse 60 min on a pearl mill, then add while mixing:</i> |        |                         |               |
| Deionized water  | 7.85   |                         |               |
| BYK-023  | 0.30   | defoamer                | BYK           |
| <b>Total</b>   | 100.00 |                         |               |

### Application

Paint dilution : 100 g paint + 20 g thinner  
Paint viscosity : 14 – 16 seconds (DIN EN ISO 2431 - 4mm, 23°C)  
Propellant : Dimethyl ether (ratio to determine)

### Parameters calculated

Solids content by weight : approx. 37 %  
Solids content by volume : approx. 33 %  
Pigment / binder ratio : approx. 0.2 / 1  
Pigment Volume Concentration : approx. 10 %  
VOC content : approx. 165 g/l (excluding water)  
: approx. 70 g/l (including water)

### Parameters measured

Viscosity : 30 – 80 seconds (DIN EN ISO 2431 - 4mm, 23°C)  
pH : 8.8 – 9.2 (correct with ammonia, 25 % in water)  
Flash point : not flammable (DIN 51758)  
Tack free time : approx. 60 minutes (approx. 152 µm wet film thickness, room temperature)

# Additives for Aerosol applications

| Product            | Technology          | Special properties and use  |
|--------------------|---------------------|---|
| ADDITOL® XL 122    | For SB systems      | Silicone based slip & Leveling Additive.  |
| ADDITOL XL 123 N   | For SB systems      | Silicone based slip, leveling & foam control Additive..   |
| MODAFLOW® EPSILON  | For SB systems      | Air release Additive & flow. For SB   |
| ADDITOL VXL 4930 N | For SB & WB systems | Silicone based slip & substrate wetting Additive.   |
| ADDITOL XW 6580    | For SB & WB systems | Special silicone modified surface energy control Additive.  |
| ADDITOL XL 270     | For SB & WB systems | Wetting, dispersing & anti settling / sagging.  |
| ADDITOL XL 255 N   | For SB & WB systems | Highly effective wetting & dispersing Additive for all pigments & fillers. Strong viscosity reduction |
| ADDITOL XL 204     | For SB & WB systems | Anti floating Additive, Silicone based  |
| ADDITOL dry CF 100 | For SB & WB systems | Cobalt free primary drier.  |
| ADDITOL VXW 6208   | For WB systems      | Dispersing Additive for all pigments – non ionic  |
| ADDITOL VXW 4973   | For WB systems      | Foam control Additive, mineral oil based.   |
| ADDITOL XW 6584    | For WB systems      | Foam control Additive, silicone based.  |



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