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PRODUCT SELECTION GUIDE

Hyperdispersants for Plastics

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Hyperdispersants and Coupling Agents for Thermoplastics and Thermosets

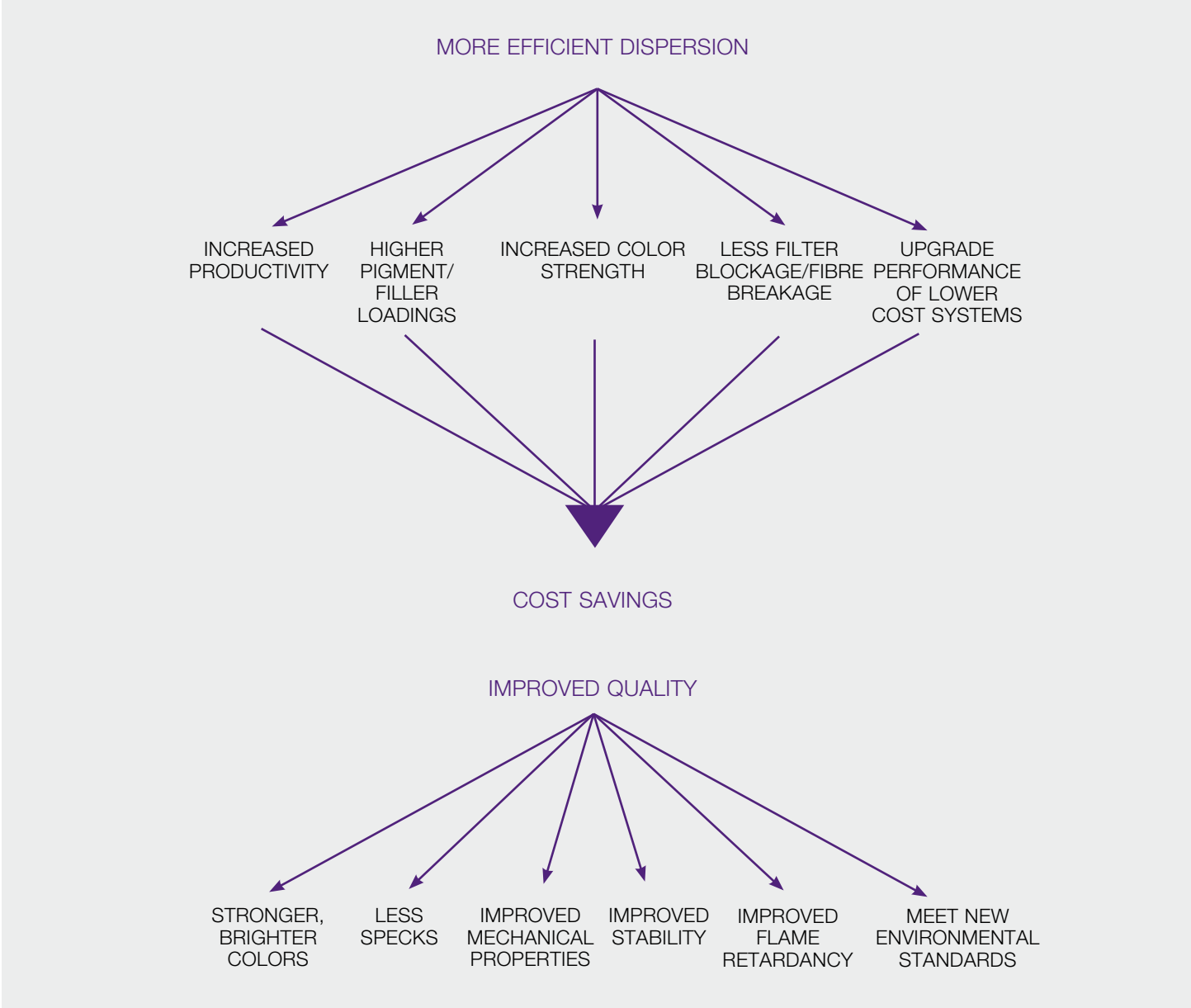
Introduction

Solplus® and Solsperse® hyperdispersants and coupling agents have been developed to meet the needs of the plastic industry, for both thermoplastic and thermoset polymers, as well as polyurethanes. Ircosperse™ dispersants can also be used in certain plastics applications, such as plasticizer dispersions.

Thermoplastic Masterbatch and Compounding

Benefits

Solplus DP310 and Solsperse 21000 hyperdispersants are recommended for the dispersion of pigments and fillers in thermoplastic masterbatch and compound applications. They can be used in a wide variety of thermoplastic polymers including polyethylene, polystyrene, ABS, polypropylene and PVC.



Plasticizer and Polyol Dispersions

The recommended Solplus hyperdispersant for the production of plasticizer and polyol dispersions is dependent upon the pigment:

Solplus K500 - Inorganic pigments and fillers
Solplus K200 - Organic pigment (phthalate free dispersions)
Solplus K210 - Organic pigments (phthalate based dispersions)
Solplus R700 - Organic pigments (polyether polyols)

Benefits

In both phthalate and non-phthalate plasticizer systems and in polyether and polyester polyols for conversion to polyurethanes, Solplus hyperdispersants improve dispersion of:

- Organic and inorganic pigments
- Fillers
- Flame retardants
- Stabilizers
- Blowing agents

As a result, manufacturers achieve:

- Higher solids loadings/increased pigment concentration
- Reduced viscosities (more Newtonian rheology)
- Improved color strength development
- Better dispersion of color in finished polymer
- Cost reductions (increased productivity and fewer passes on the mill)

Coupling Agents in Thermoplastic Compounding and Cable Applications

Solplus C800 and Solplus C825 hyperdispersants are the recommended agents for coupling with a variety of fillers in thermoplastic compounding and cable production.

These novel coupling agents for filled polymers offer:

- Improved mechanical properties (tensile strengths, elongation to break, etc.)
- More cost-effectiveness than maleinised polymers and silanes
- Effectiveness on wide range of fillers and flame retardants and for many polymer types – suitable for peroxide catalysed processing
- Surface treatment of fillers (including calcium carbonate) – no evolution of alcohols or toxic byproducts during processing

Thermoset/Composite Applications

Engineered specifically for composites fillers and resins – and based on proprietary polymer chemistry – Solplus additives offer major process advantages to the thermoset industry, including the combination of dispersing/wetting and anti-settling benefits in single additives.

From being 100% active and solvent free, Solplus hyperdispersants also help to reduce environmental impact from the styrene content levels that characterize most unsaturated polyester based systems.

Solplus dispersants have been developed to improve dispersion of fillers, flame retardants and reinforcements (fibers) in thermoset systems, as well as for organic and inorganic pigments in gel coats.

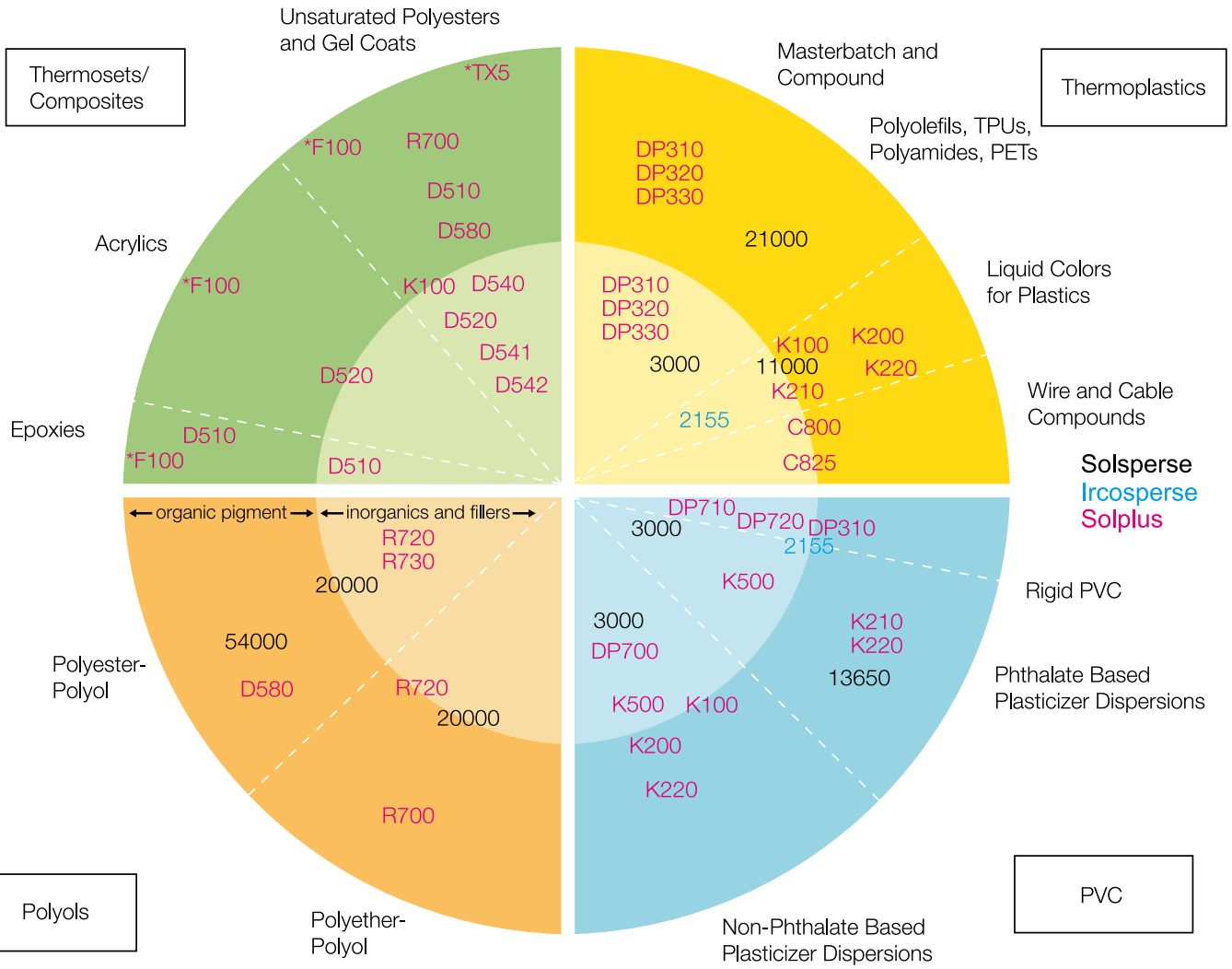
Benefits

- Higher filler/flame retardant loadings
- Decreased viscosities
- Anti-settling
- Improved stability
- Improved color to white compatibility
- Improved processing

Hyperdispersants and Coupling Agents for Thermoplastics and Thermosets

Influence of Media Compatibility on Product Selection

For a Solsperse or Solplus hyperdispersant to be effective in specific applications, it must be compatible with the media in which the solid is being dispersed AND have an affinity with the surface of the material itself. These are the main criteria used in product selection. The main grades offered for a range of plastics applications are mapped out below:



* Solplus F100 is an air-release agent that is designed for rapid air-release and effective wetting in thermoset systems. Solplus TX5 is a thixotropic additive which can be used in conjunction with fume silica to allow significant reduction of fume silica loading and hence reduction in cost.

With certain organic pigment dispersions it may be advantageous to include the use of a Solsperse synergist in combination with the polymeric Solplus or Solsperse hyperdispersant.

Formulating Guidelines
Dosage – Plastic Applications

Masterbatch/Compound

To determine the optimum dosage for masterbatch or compound applications, a “ladder series” should be carried out. Please refer to SOLSPERSE TECHNOLOGY & BENEFITS and the relevant TECHNICAL LITERATURE.

Plasticizers and gel coats

For plasticizer and polyester gel coat applications, it has been established that the theoretical dosage level of the appropriate Solplus or Solsperse hyperdispersant in a pigment dispersion equates to 2 mg of Solplus or Solsperse polymeric hyperdispersants/square meter of pigment surface area.

This can be expressed as % Agent On the Weight of Pigment (% AOWP).

$$\%\ \text{AOWP} = \frac{\text{pigment surface area } (m^2/g)}{5}$$

Thermoset Composites

For thermoset composite applications, testing has confirmed a loading of between 0.5% and 2% of the appropriate Solplus hyperdispersant on the weight of filler is effective.

Minor adjustments may, however, be required depending on the specific grade of filler used.

Filler Coupling in Thermoplastic Compounds

The recommended dosage level of Solplus C800 to use is calculated as follows:

1.2 x surface area of filler (m^2/g)
= weight in grams (g) of Solplus C800 required per kg of filler

Please refer to Lubrizol technical contacts for more details.

Method of Use/Order of Addition – Plastic Applications

Masterbatch/Compound

1. Charge polymer to pre-blending equipment.
2. Add Solplus or Solsperse agent and blend thoroughly with the polymer to coat the surface of the polymer.
3. Add pigments, fillers, processing aids and other essential ingredients and continue pre-blending.
4. Process the resultant blend in normal manner (extrusion, internal mixer, 2-roll mill, etc.).

It is essential to follow this order of addition carefully since it allows for maximum distribution of the Solplus or Solsperse additive and produces intimate contact between the hyperdispersant and the polymer. This intimate contact gives the best results.

Plasticizers, Gel Coats and Thermoset Composites

1. Dissolve the appropriate Solsperse or Solplus Hyperdispersant in the millbase plasticizer or resin.
2. If required, add a synergist and distribute evenly with stirring (note: the synergist is virtually insoluble).
3. Add the pigment or filler in stages and disperse in normal manner.

Hyperdispersants and Coupling Agents for Thermoplastics and Thermosets - Product List

PRODUCT	PHYSICAL DESCRIPTION	PACKAGE SIZE* (kg)	% ACTIVE CONTENT	SOLVENT/ CARRIER	SUITABLE APPLICATION(S)	SHELF LIFE
Solplus C800	Colorless liquid	P25/P200	100	-	Filler coupling in thermoplastic compounds	2 Years
Solplus C825	White powder	D20/D180	50	Silica	Filler coupling in thermoplastic compounds	2 Years
Solplus DP310**	Coarse powder	P30	100	-	Masterbatch/compound	5 Years
Solplus DP320	White powder	P30	100	-	Masterbatch/compounding	5 Years
Solplus DP330	White powder	P30	100	-	Masterbatch/compounding	5 Years
Solplus DP700	Brown liquid	D20, D180, I750	100	-	Plasticizers	5 years
Solplus DP710	Cream powder	B25	100	-	Rigid PVC	2 years
Solplus DP720	White powder	B25	100	-	Rigid PVC	2 years
Solplus D510	Yellow viscous liquid	D20/D180	100	-	Thermoset composites, pigmented gel coats	2 Years
Solplus D520	Straw colored viscous liquid	P25/P200	100	-	Thermoset composites	2 Years
Solplus D540	Pale amber to brown viscous liquid	P20/P200	100	-	Thermoset composites	2 Years
Solplus D541	Amber liquid	D25, D180	100	-	Thermoset composites	2 years
Solplus D542	Pale amber liquid	D20, D180	50	MPA: methoxy propanol	Thermoset composites	2 years
Solplus D580	Amber to brown viscous liquid	D20/D180	100	-	Thermoset composites	2 Years
Solplus F100	Pale yellow liquid	D20, D180	100	-	Thermoset composites	1 year
Solplus K100	Light brown liquid	D20, D204	100	-	Plasticizers and liquid colors for plastics	1 year
Solplus K200*	Pale yellow to brown viscous liquid	D20/D180	50	DOA (Dioctyladipate)	Plasticizers and liquid colors for plastics	2 Years
Solplus K210	Pale yellow to brown viscous liquid	D20/D180	50	DINP (Diisononyl-phthalate)	Plasticizers and liquid colors for plastics	2 Years
Solplus K220	Amber to brown viscous liquid	D20/D180/I940	100	-	Plasticizer and liquid colors for TP and PVC	2 Years
Solplus K500	Pale yellow to brown viscous liquid	D20/D180/I900	100	-	Plasticizers	5 Years
Solplus R700	Yellow viscous liquid	D20/D180	100	-	Polyether or polyester polyols	2 Years
Solplus R720	Amber liquid	D25/D190/I1000	100	-	Polyether or polyester polyol	2 Years
Solplus R730	Pale yellow to amber viscous liquid	D25/D180/I1000	100	-	Polyether or polyester polyol	2 Years
Solsperse 3000**	Waxy paste/viscous liquid	D20/D170	100	-	Plasticizers	5 Years
Solsperse 5000	Blue powder	B15	100	-	SYNERGIST	10 Years
Solsperse 11000**	Amber liquid	D20/D180	50	Mineral oil	Plasticizers and liquid colors for plastics	2 Years
Solsperse 12000	Blue powder	B25	100	-	SYNERGIST	10 Years
Solsperse 13650	Amber liquid	D20/D150	50	Diundecyl-phthalate	Plasticizers	2 Years
Solsperse 20000	Amber liquid	D25/D190/I1000	100	-	Polyether or polyester polyols	5 Years
Solsperse 21000**	Waxy paste/viscous liquid	D20/D170	100	-	MBX/compound	5 Years
Solsperse 22000	Yellow powder	B20	100	-	SYNERGIST	10 Years

KEY: Packaging: B = box, D = drum, I = IBC, P = plastic drum

* FDA Registered

** EU food approval – some limitations apply, please consult your regional Lubrizol sales office.

Hyperdispersants and Coupling Agents for Thermoplastics and Thermosets - Technical Literature

For further information on the benefits of using Solplus and Solsperse additives including methods of use and example formulations, please refer to the following pieces of technical literature.

DOCUMENT TITLE	APPLICATION
Solplus D510 for Pigment Dispersion in Polyester Gel Coat	Thermosets
Solplus D520 for Elevated Temperature Cured Polyester Resins	Thermosets
Solplus D520 for Filler Dispersion in Acrylic Resin	Thermosets
Solplus D510 for the Dispersion of Inorganic Pigments in Epoxy Resins	Thermosets
Solplus D510 for the Dispersion of Silica Sand in Epoxy Resins	Thermosets
Solplus D510 for Pigment Dispersion and Color Separation in Epoxy Resins	Thermosets
Solplus D510 for the Dispersion of Fillers in Epoxy Resins	Thermosets
Solplus D540 for Elevated Temperature Cured Polyester Resins	Thermosets
Solplus F100 for Air Release in Thermosets	Thermosets
Solplus R700 for the Dispersion of Pigments in Polyester Gel Coats	Thermosets
Solplus DP310 for Thermoplastic Masterbatch and Compound	Thermoplastics
Solplus DP320 and Solplus DP330 for Polyolefin Masterbatch	Thermoplastics
Solplus C800 - Coupling Agent for Calcium Carbonate Filled Polyolefins	Thermoplastics
Solplus C800 - Coupling Agent for Calcium Peroxy Cured EPDM Rubbers	Thermoplastics
Solplus C800 for Cabling Applications	Thermoplastics
Ircosperse Additives for Pigment Concentrates in Plastics	Thermoplastics
Modifying and Upgrading Mixed Polyolefin Waste Using Solplus C800 and Filler	Thermoplastics
Solplus K200 & K210 for the Dispersion of Organic Pigments and Carbon Black in Plasticizers	Plasticizer and Polyol Dispersions
Solplus R700 for the Dispersion of Pigments in Polyether and Polyester Polyols	Plasticizer and Polyol Dispersions
Solplus K500 for the Dispersion of Inorganic Pigments and Fillers in Plasticizers	Plasticizer and Polyol Dispersions

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