Technical Data Sheet

DOWSIL™ 51 Additive

Water-dispersible, ultra-high-molecular-weight polydimethyl silicone dispersion that imparts slip and mar resistance

Features & Benefits

- Imparts slip and mar resistance

Composition

- Ultra-high-molecular-weight polydimethylsiloxane dispersion in paste form
- Supplied at 80 percent solids in water

Applications

DOWSIL™ 51 Additive reduces coefficient of friction, provides anti-blocking and improves mar resistance. DOWSIL™ 51 Additive has been successfully used in these industrial applications[1]:

- To reduce the coefficient of friction:
  - Ink:
    - Water-based flexographic ink at 0.05–0.1%
    - Solvent-based flexographic ink at 0.5–1.5%
    - Water-based gravure ink at 0.1–0.2%
    - Water-based lithographic ink at 0.1–0.2%
  - Coating:
    - Water-based overprint varnish at 0.5–1.0%
  - Paint:
    - Water-based paint at 0.5–1.0%
    - Solvent-based paint at less than 0.5%
- To provide anti blocking:
  - Ink:
    - Water-based flexographic ink at 0.1–0.2%
    - Water-based gravure ink at 0.1–0.2%

[1]All usage levels are weight percent based on the total formulation.

Applications (Cont.)

- To improve mar resistance:
  - Ink:
    - Water-based flexographic ink at 0.1–0.2% or as low as 0.05–0.1% or as high as 0.5–1.0%
    - Solvent-based flexographic ink at 0.5–1.5%
    - Water-based gravure ink at 0.05–0.2% or as high as 0.5–1.0%
    - Solvent-based gravure ink at 0.05–0.1%
    - Water-based lithographic ink at 0.1–0.2%
  - Coating:
    - Water-based overprint varnish at 0.1–0.2% or as high as 0.5–1.0%
    - Water-based industrial coating at 0.05–0.1%

Typical Properties

Specification Writers: These values are not intended for use in preparing specifications.

Property	Unit	Result
Nonvolatile Content	percent	77–82
Solvent		Water
Functionality		Silanol
Specific Gravity at 25°C (77°F)		0.980
Flash Point, Closed Cup	°C (°F)	> 101 (> 214)
Viscosity at 25°C (77°F)	cst	200,000–700,000

Description

DOWSIL™ 51 Additive improves mar resistance and slip in water-borne systems or solvent-borne systems containing polar solvents; provides water resistance in water-borne systems; also imparts leveling, wetting and gloss.

How to Use

DOWSIL™ 51 Additive is effective at low concentrations. The amount required depends on type of formulation, the solvent it contains, resin system and total system solids. DOWSIL™ 51 Additive is generally effective at concentrations ranging from 0.05 to 3.0 weight percent, based upon total formulation. This additive can be added during the grind, let down or be post-added. Characteristics may vary when used with different systems and formulations. DOWSIL™ 51 Additive is compatible with acrylic, alkyd, epoxy, nitrocellulose, polyesters, polyurethane and vinyl systems. Thorough preproduction testing is necessary to ensure expected performance.

Results of Waterbased Flexographic Ink Study

This data is based on a laboratory study. The control in both of these studies consisted of the formulation with no additives added.

In Formulation 1, DOWSIL™ 51 Additive decreased the static and kinetic coefficient of friction 19.9 percent and 15.4 percent over the control, respectively. While reducing the coefficient of friction, DOWSIL™ 51 Additive did not cause addition foaming.

Results Of Waterbased Flexographic Ink Study (Cont.)

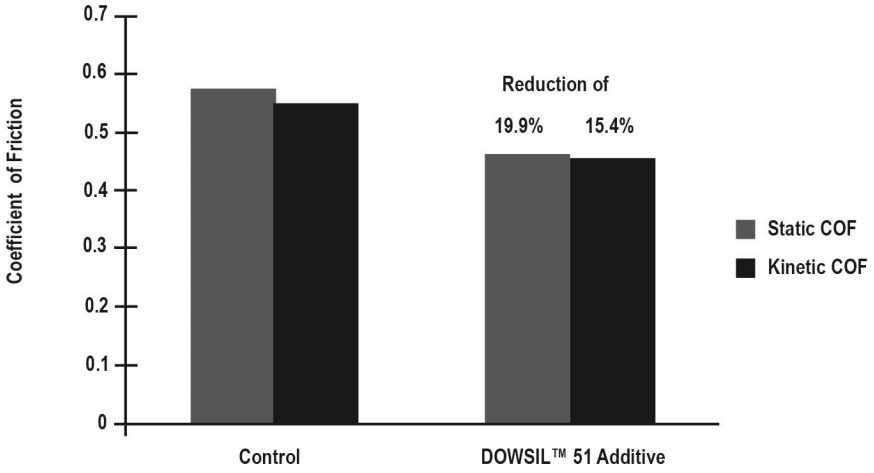

Figure 1: Coefficient of Friction Performance in Formulation 1.

In Formulation 2, DOWSIL™ 51 Additive provide a 23 percent increase in 60° gloss retention after dry mar testing over the control.

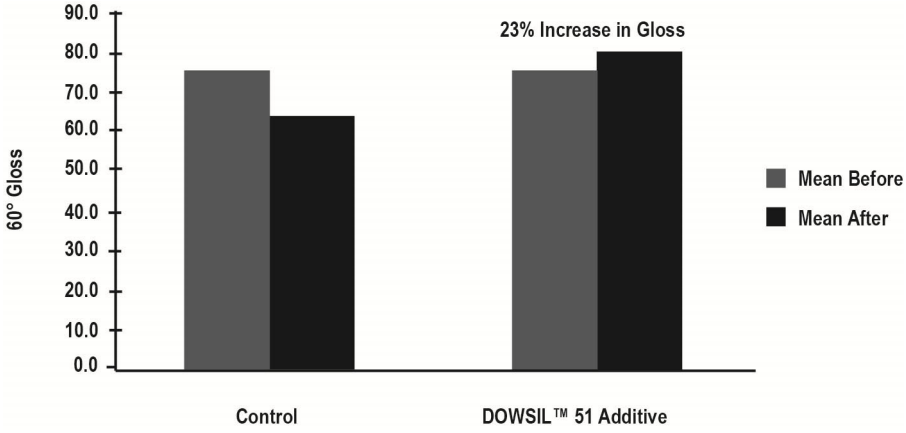

Figure 2: 60° Gloss Before and After Dry-Mar Testing with Formulation 2.

Along with providing mar resistance, 99 percent of Formulation 2, containing DOWSIL™ 51 Additive, remained on the film after the adhesion tape test, which is a 12.9 percent improvement over the adhesion of the control.

DOWSIL™ 51 Additive did not affect the recoatibility of Formulation 2. Five minutes after a coat of white ink was applied over Formulation 2, containing DOWSIL™ 51 Additive, 100 percent of the white ink remained adhered to Formulation 2. After 30 minutes, 97.5 percent of the white ink remained adhered. Both of these results are improvements over the recoatibility with the control.

Test Conditions

Formulations

DOWSIL™ 51 Additive was tested in two water-based flexographic inks at 0.5weight percent, based on actives. Formulation 1 consisted of a non-film-forming, styrene-acrylic resin for paper and paperboard and Formulation 2 consisted of a soft-film-forming acrylic polymer for various films. DOWSIL™ 51 Additive was post-added at 1200 rpm.

Formulation 1		**Formulation 2**	
Ingredient	Percent	Ingredient	Percent
Joncryl 87	45.5	Joncryl ECO 2124	52.1
Flexiverse Diarylide Yellow Dispersant	52.9	Flexiverse Calcium Lithol Dispersion	45.6
Water	1.6	Water	2.3

Drawdowns

Formulation 1 – On a NWH Lenetta chart using a #6 wire wound rod.
Formulation 2 – On a Mobil 90 BSR One film using a 360 Quad analog handproofer.

Coefficient of Friction

Using a Monitor Slip and Friction, Model 32-06, the sample was pulled across an uncoated NWH Lenetta chart using a four-pound weight at a rate of 6 inches per minute.

Dry Mar

Using the Sutherland Rub Tester, the sample was rubbed against an uncoated Mobil 90 BSR One film for 100 double rubs using the four-pound test block. 60° gloss was measured before and after the marring. The higher the percent retention, the more effective an additive is in protecting the coating/ink.

Recoatability/Adhesion

Recoatibility was tested by allowing the drawdown to dry for 30 minutes, then coating a newly formulated ink on top. This newly formulated ink was the same formulation as Formulation 2 with white pigment. The new formulation was allowed to dry for 5 minutes before the adhesion test was performed.

Handling Precautions

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE SAFETY DATA SHEET IS AVAILABLE ON THE DOW WEBSITE AT DOW.COM, OR FROM YOUR DOW SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CUSTOMER SERVICE.

Usable Life and Storage

When stored above 0°C (32°F), DOWSIL™ 51 Additive has a shelf life of 18 months from date of manufacture. Refer to product packaging for “Use By” date.

Packaging Information

DOWSIL™ 51 Additive is available in 4 oz (113 g) samples, 35 lb (15.8 kg) pails and 386 lb (175.0 kg) drums.

Limitations

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

Health and Environmental Information

To support customers in their product safety needs, Dow has an extensive Product Stewardship organization and a team of product safety and regulatory compliance specialists available in each area.

For further information, please see our website, dow.com or consult your local Dow representative.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal 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, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

Product Stewardship

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.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

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