



NEW SILICONE ADDITIVES FOR ENHANCED DURABILITY WATERBORNE WOOD COATINGS

**Solve compatibility issues when using
slip and mar, anti-blocking and foam
control additives**

PRESENTERS



Bertrand
Lenoble

Principal Technical Service &
Development Scientist



Lidaris
San Miguel Rivera

Technical Service &
Development Scientist



Stéphane
van Oycke

Technical Service &
Development Scientist



NEW SILICONE ADDITIVES FOR ENHANCED DURABILITY WATERBORNE WOOD COATINGS

**Solve compatibility issues when using
slip and mar, anti-blocking and foam
control additives**

AGENDA

- Background
- Product description & positioning
 - DOWSIL™ 211S Additive for slip and mar resistance
 - DOWSIL™ 402LS Additive for blocking ability
 - DOWSIL™ 107F Additive for foam control
- Conclusions
- Questions & answers



THIS IS DOW



2019 NET SALES

\$43B



EMPLOYEES

~36,500



MANUFACTURING SITES

109 sites



GLOBAL REACH

31 countries

in which Dow manufactures products

DOW COATINGS

2019 NET SALES

\$3.5B

EMPLOYEES

2,500

MANUFACTURING SITES

29

GLOBAL REACH

>30 countries

in which Dow has facilities



Global leaders in acrylic binders and water-borne additives



Broad portfolio of chemistries with high value innovation pipeline



8 R&D locations



Largest global silicones player with 75+ years of industry leadership

FUN SILICONE FACT: THE ORIGINS OF SILLY PUTTY

Did you know?

**Silly putty
was invented by accident**

**... and then became
a world popular toy**





DOW

®

DOWSIL™ 211S Additive

Slip and mar resistance additive
with improved compatibility

DOWSIL™ 211S ADDITIVE – FEATURES AND BENEFITS

- Novel Si technology to deliver high molecular weight silicone into waterborne systems
- Modified surfactants combination provides uniform particle size distribution and emulsion stability
- Low viscosity emulsion with high active content
- Typical addition levels starts at 0.1%

Improved compatibility with various organic emulsions. **Lower tendency to cause craters**

Slip enhancement to improve coating quality

Abrasion resistance to protect coating surface from abrasion during producing and using

High dilution stability by various solvents



PERFORMANCE IN WATERBORNE WOOD COATINGS

Testing formulation:

Component	Weight %	Function
ROSHIELD™ 3311 Emulsion	70.0	Binder
DOWSIL™ 106F Additive	0.2	Antifoam
DOWANOL™ DPM Glycol Ether	3.0	Coalescent
DOWANOL™ DPnB Glycol Ether	3.0	Coalescent
DOWSIL™ 501W Additive	0.5	Wetting agent
ACRYSOL™ RM-8W Rheology Modifier	0.8	Thickener
Water	22.0 (adj.)	Diluent
Slip Additive*	0.3 - 1.0	Slip Additive
Total	100	

*Comments: the dosage and type of slip additive are chosen according to testing requirement.

Protocol:

- Load binder into a container, disperse under 1000RPM, drop antifoam into binder. 2500RPM dispersion for 10 mins.
- Pre-mix coalescent, wetting agent, thickener and water.
- Drop the pre-mixed solution into binder with 1000RPM dispersing. Then 2000RPM dispersion for 5 mins.
- Add slip additive according to desired dosage, 1500RPM dispersion for 5 mins afterwards.

Application:

- Paint applied on 2 types of panels
- Draw down on Leneta chart with No. 6 wirebar for gloss, CoF, mar and anti-blocking testing.
 - Spray on wood panel where base coat has been applied and sanded.

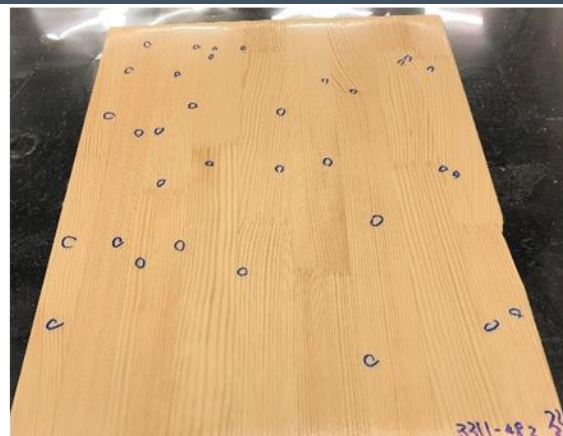


HIGH COMPATIBILITY IN WATERBORNE WOOD COATINGS

Additive dosage: 1%. Clear coating based on ROSHIELD™ 3311 Emulsion.
Benchmarking with another 2 gum emulsions



Existing - 1
45 craters



Market benchmark - 1
33 craters



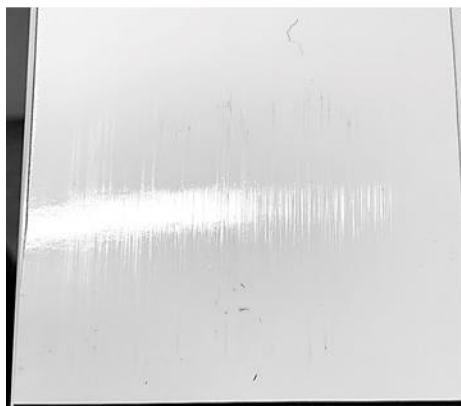
DOWSIL™ 211S Additive
2 craters

DOWSIL™ 211S Additive high compatibility, even at high dosage.
High quality of coatings and more flexibility of formulation design.



DEMONSTRATION OF ABRASION RESISTANCE IMPROVEMENT

0.3% dosage, clear coating based on ROSHIELD™ 3311 Emulsion, test after 7 days drying
Gloss retention and damage description after 6000 cycles abrasion
Benchmarking with gum emulsion

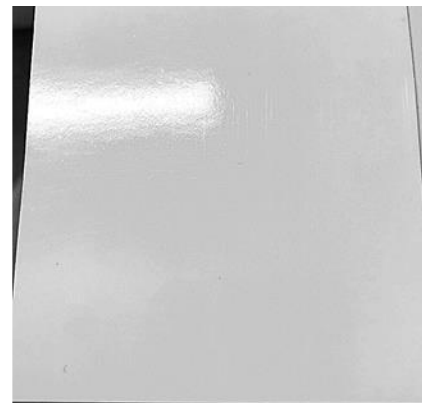
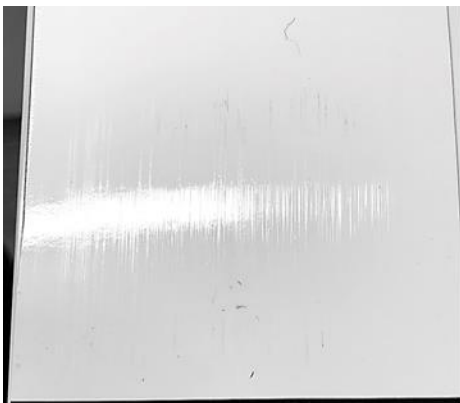


Control	Existing - 1	Market benchmark - 1	DOWSIL™ 211S Additive
Gloss retention: 43%	Gloss retention: 89.2%	Gloss retention: 75.7%	Gloss retention: 91.5%
Heavy damaged	Very slightly damaged	Very slightly damaged	Very slightly damaged



DEMONSTRATION OF SUPERIOR ABRASION RESISTANCE PERFORMANCE

0.3% dosage, clear coating based on ROSHIELD™ 3311 Emulsion, test after 7 days drying
Gloss retention and damage description after 6000 cycles abrasion
Benchmarking with silicone emulsion

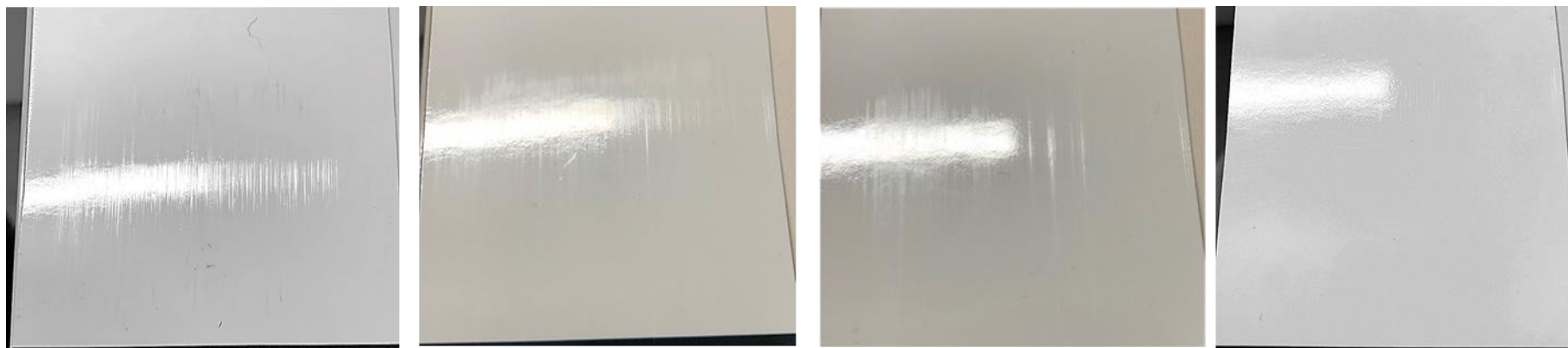


Control	Market benchmark - 2	DOWSIL™ 211S Additive
Gloss retention: 43%	Gloss retention: 56.9%	Gloss retention: 91.5%
Heavy damaged	Moderate to heavy damaged	Very slightly damaged



DEMONSTRATION OF SUPERIOR ABRASION RESISTANCE PERFORMANCE

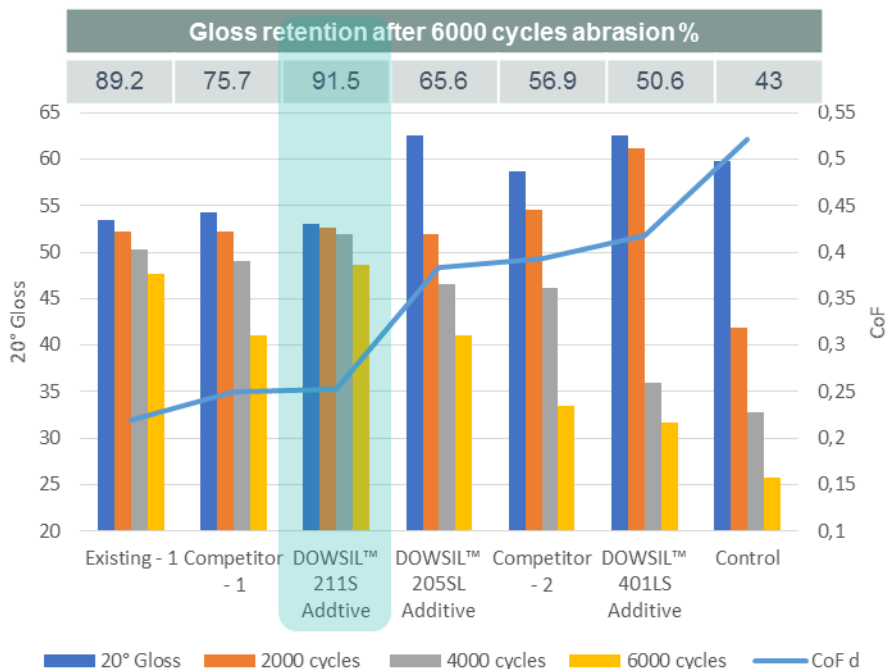
0.3% dosage, clear coating based on ROSHIELD™ 3311 Emulsion, test after 7 days drying
Gloss retention and damage description after 6000 cycles abrasion
Benchmarking with silicone polyether



Control	DOWSIL™ 401LS Additive	DOWSIL™ 205SL Additive	DOWSIL™ 211S Additive
Gloss retention: 43%	Gloss retention: 50.6%	Gloss retention: 65.6%	Gloss retention: 91.5%
Heavy damaged	Moderate to heavy damaged	Moderate damaged	Very slightly damaged



PERFORMANCE OVERVIEW OF DOWSIL™ 211S ADDITIVE IN WATERBORNE WOOD COATING



DOWSIL™ 211S enables gloss retention in use

	Gum emulsion		
	Existing - 1	Market benchmark - 1	DOWSIL™ 211S Additive
Compatibility	+	+	+++
Impact to gloss	+	+	+
Slip enhancement	+++	+++	+++
Abrasion resistance	+++	+++	+++

	Silicone emulsion	Silicone polyether	
	Market benchmark -2	DOWSIL™ 205SL Additive	DOWSIL™ 401LS Additive
Compatibility	+++	+++	+++
Impact to gloss	++	+++	+++
Slip enhancement	+	++	+
Abrasion resistance	+	++	+



*The graphic representations are presented here for illustrative purposes only and should not be construed as product specifications.



DOWSIL™ 402LS Additive

High compatibility multifunctional
additive for wood coating

DOWSIL™ 402LS ADDITIVE – TYPICAL PROPERTIES AND BENEFITS

DOWSIL™ 402 LS Additive is a silicone polyether based additive that has multi-functional benefits

Test	Unit	Result
Appearance		Clear to hazy liquid
Viscosity at 25 °C (77 °F)	mm ² /s	300-500
Specific gravity at 25 °C (77 °F)		1.036
Active content	%	100



Improved flow and leveling and no negative effect in gloss



Early block resistance and good compatibility with waterborne acrylics



Effective at low addition level, BTX free, and solventless**



Wood and Industrial metal, Architectural, Inks and OPV, Pigmented and Clear formulations



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** DOWSIL™ 402 LS is solvent free, being manufactured without added solvent.

PERFORMANCE IN WATERBORNE WOOD COATINGS

Testing formulation:

Component	Weight %	Function
ROSHIELD™ 3188 Acrylic Emulsion	78.2	Binder
DOWSIL™ 107F Additive	0.5	Antifoam
DOWANOL™ PnB Glycol Ether	1.8	Coalescent
DOWANOL™ DPM Glycol Ether	1.9	Coalescent
DOWANOL™ DPnB Glycol Ether	1.2	Coalescent
RHOPLEX™ WP-1 Plasticiser	1.2	Plasticizer
ACRYSOL™ RM-8W Rheology Modifier	0.3	Thickener
Surfactant	0.3	Wetting
Water	14.5	Diluent
Leveling Additive*	0.1	Leveling/Slip Add.
Total	100	

Process:

- Load binder into a container, disperse under 400RPM, add antifoam into binder and mix for 10 mins.
- Pre-mix coalescent, plasticizer, and water and add slowly to binder. Mix at 500RPM for 10 minutes.
- Add surfactant, water, and thickener and mix for 30 minutes.
- Add leveling/slip additive according to desired dosage, mixed at 2500RPM with speed mixer for 2 minutes.

Application:

- Draw down on Leneta chart with No. 6 drawdown bar for compatibility (visual defects ranking), gloss, and anti-blocking testing at r.t and 50 °C (122 °F).

*Comments: Dosage and type of leveling/slip additive are chosen according to testing requirement.



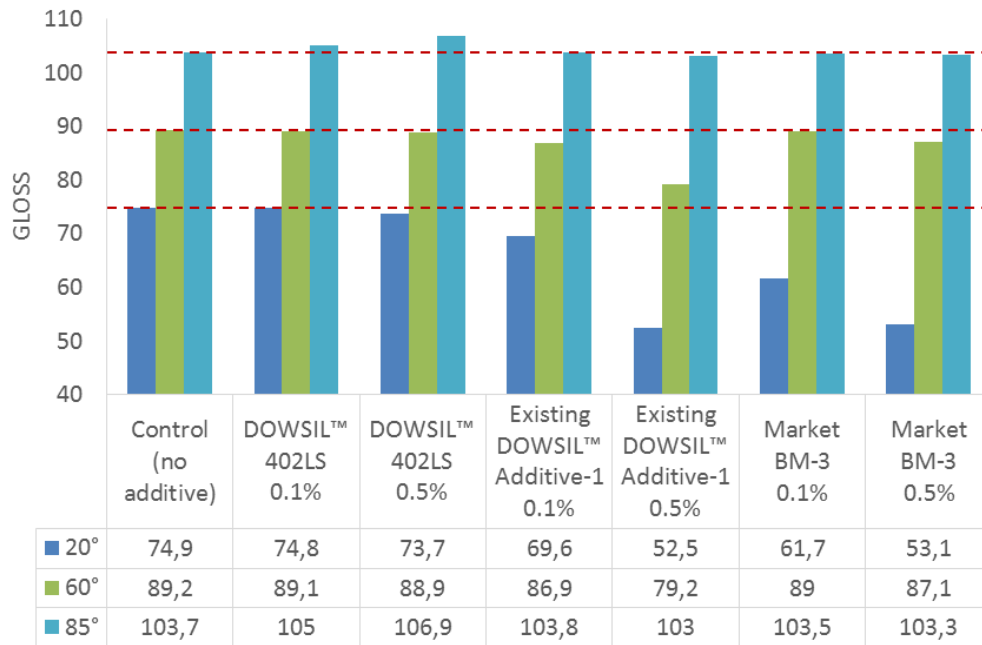
COATING COMPATIBILITY – DRIED FILM (GLOSS)

Additive dosage: 0.1 and 0.5%. Clear WB wood coating based on ROSHIELD™ 3188 Acrylic Emulsion.
Existing DOWSIL™ Additive-1: Silicone gum dispersion; Market BM-3: Polyether siloxane polymer

DOWSIL™ 402LS Additive shows good wet and dry film compatibility and gloss

Both Existing DOWSIL™ Additive-1 and Market Benchmark-3 show haziness in the dry film

The Market Benchmark-3 shows the lower gloss level relative to the other additives and control sample



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ANTI-BLOCKING PERFORMANCE

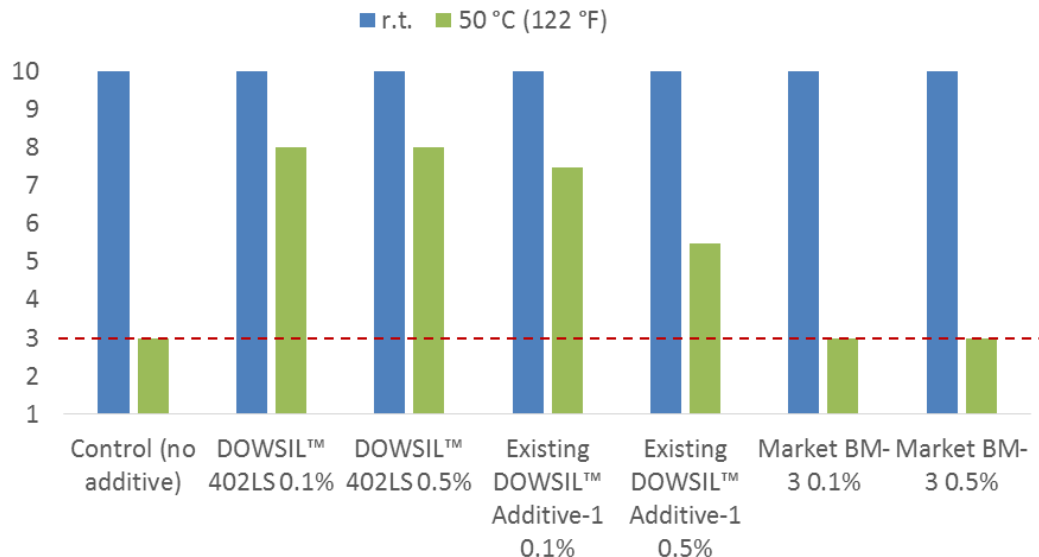
Additive dosage: 0.1 and 0.5%. Clear WB wood coating based on ROSHIELD™ 3188 Acrylic Emulsion. Existing DOWSIL™ Additive-1: Silicone gum dispersion; Market BM-3: Polyether siloxane polymer

DOWSIL™ 402LS Additive shows good antiblocking performance at 50 °C

Both Market Benchmark-3 and the control pain (no additive) show poor hot antiblocking behavior

Blocking Test Reference Scale

10, no tack, perfect	5, moderate tack, fair
8, slight tack, very good	3, 5-25% seal, poor
7, slight tack, good	2, 25-50% seal, poor
5, moderate tack, fair	0, complete seal, very poor



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DOWSIL™ 107F Additive

Improved compatibility antifoam
for waterborne coatings

TYPICAL PROPERTIES

DOWSIL™ 107F Additive

Silicone antifoam compound with silica, 100% active

Test	Unit	DOWSIL™ 107F
		Appearance
Viscosity at 25 °C (77 °F)	mPa	300-500
Specific gravity at 25 °C (77 °F)		1.02
Active content	%	100

Favorable EHS Profile:

- No SVHC
- Low VOC and SVOC (1 wt%)
- Low Residual SiH level <2,5 ppm
- Can be used for formulating EU ecolabel compliant indoor and outdoor paints and varnishes (2014/312/EU)



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CLEAR WOOD COATING

Selected Guide Formulations

- **Formulation 1 - ROSHIELD™ 3188ER Emulsion**

ROSHIELD™ 3188ER Emulsion is a self-crosslinking acrylic copolymer designed for use in factory-applied, waterborne, interior wood coatings.

- **Formulation 2 - PRIMAL™ IW-3311 Emulsion**

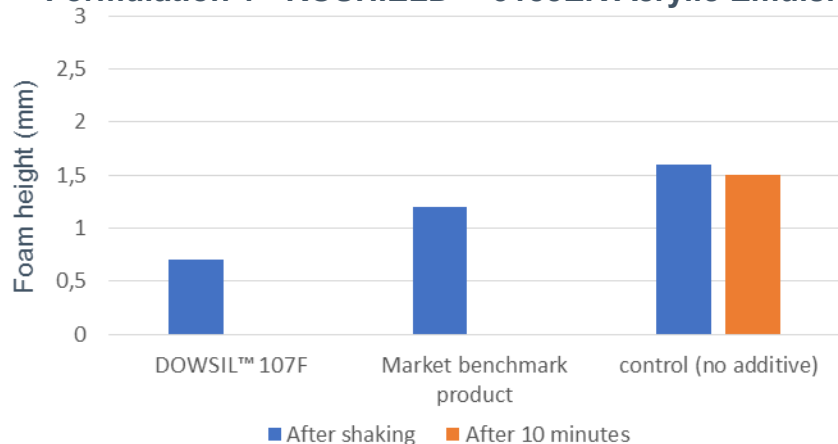
- PRIMAL™ IW-3311 Emulsion is a one component acrylic technology designed for clear wood coatings.
- Designed for use in factory- applied, water-borne, interior wood lacquers like furniture or parquet finishes.



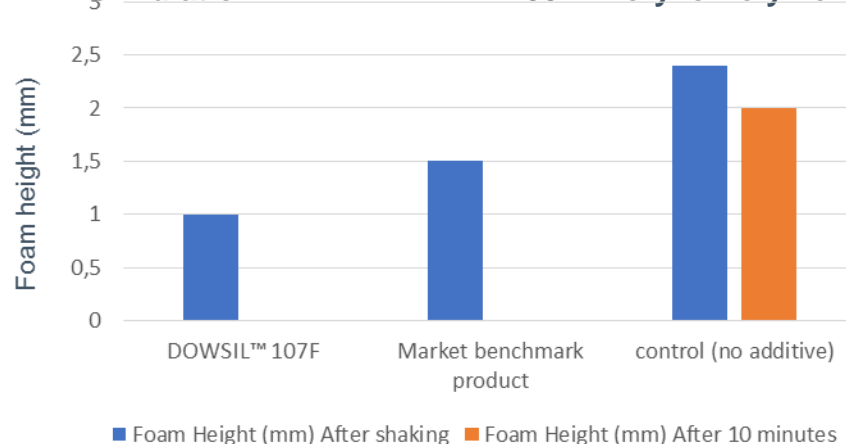
DEFOAMER EFFICACY – FOAM HEIGHT

DOWSIL™ 107F Additive shows better initial defoaming than the market benchmark product.

Formulation 1 - ROSHIELD™ 3188ER Acrylic Emulsion



Formulation 2 - PRIMAL™ IW-3311 Acrylic Polymer



Additive loading level: 0.2% TFW

TFW = total formulation weight

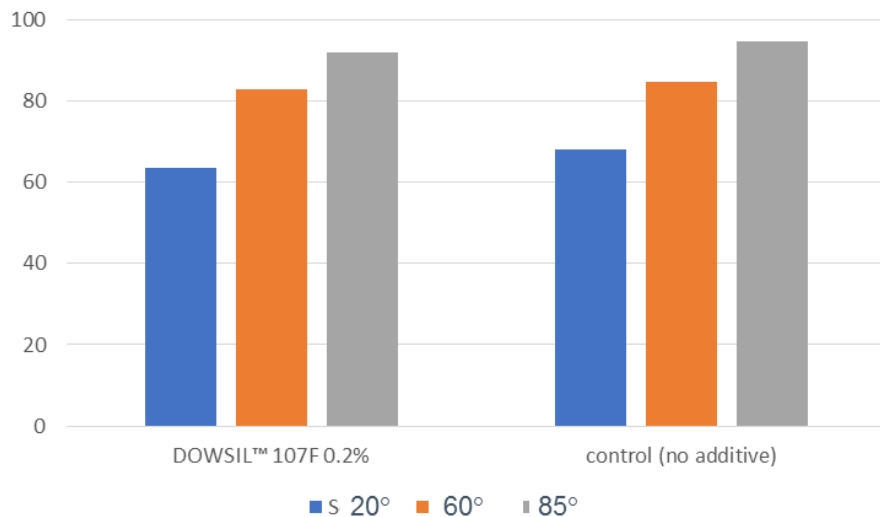


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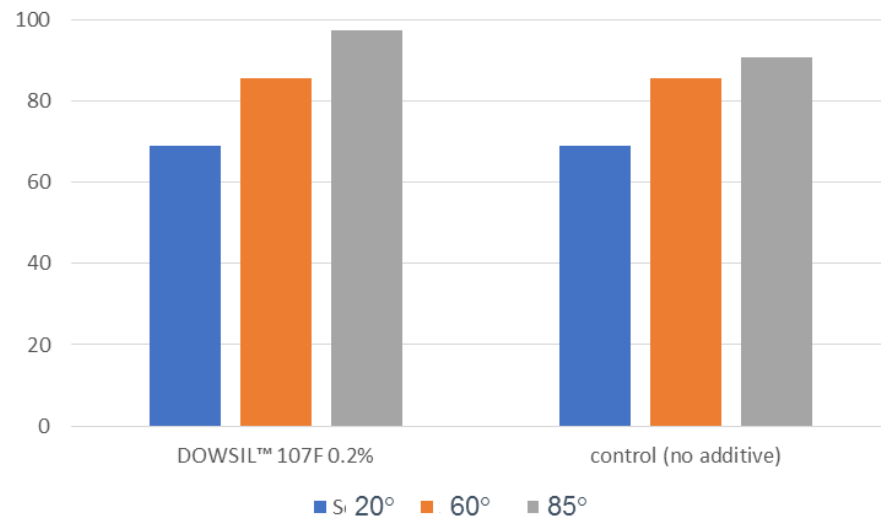
COATING COMPATIBILITY

DOWSIL™ 107F Additive shows no negative impact on gloss or surface defects.

Formulation 1 - ROSHIELD™ 3188ER Acrylic Emulsion



Formulation 2 - PRIMAL™ IW-3311 Acrylic Polymer



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WE MAKE COATINGS WORK BETTER – THREE NEW PRODUCT LAUNCHES!

DOWSIL™ 211S Additive



Novel slip and mar resistant additive with improved compatibility in waterborne coatings

DOWSIL™ 402LS Additive



A multifunctional additive with high compatibility bringing slip, anti-blocking, levelling benefits to waterborne coating

DOWSIL™ 107F Additive



New generation foam control agent with improved compatibility & optimal performance for waterborne coatings



DOWSIL™

Silicone coating
additives by



Learn more and order samples:



www.dow.com/coatings



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Customer Service:

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na.info@dow.com

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latam.info@dow.com

Europe:
europe.info@dow.com

India:
info.india@dow.com

South Korea:
korea.info@dow.com

Japan:
japan.info@dow.com

China:
china.info@dow.com

South East Asia & Pacific:
aanz.info@dow.com

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