

ADDITIVES WITH BROAD FOOD CONTACT COMPLIANCES

SURFYNOL® 355 surfactant

AIRASE® 5355 defoamer

AIRASE® 5655 defoamer

AIRASE® 4655 defoamer



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There is a growing market awareness regarding the safety of food and substances in contact with food, including packaging materials as well as cutlery, processing appliances, and containers. Chemical substances intended for use in applications and processes that come into contact with food must comply with certain regulations to ensure the safety of final products and prevent the release of substances in quantities which could endanger human health, change the composition or affect food odor, taste, or color.

This places additional requirements on formulators of food packaging materials to comply with food safety standards set by the various government bodies such as the US FDA, the Swiss Ordinance in Europe, and China GB in Asia. These regulations set direction and may require changes for individual producers in the value chain.

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EVONIK IS YOUR SOLUTION!

It is our first priority to help customers by providing solutions meeting those changing regulatory requirements without compromising product performance.

We have recently developed a new range of additives for waterbased systems, including inks, adhesives and OPVs. These products help formulators to get optimum product performance while being compliant with multiple standards.

SURFYNOL® 355 surfactant: a high-performing wetting agent for ink, adhesive and OPV applications.

AIRASE® 5355 defoamer: a siloxane-based defoamer for ink and OPV applications; suitable as a grind or letdown defoamer in systems requiring strong defoaming.

AIRASE® 5655 defoamer: a siloxane-based defoamer for inks and OPVs. It is a letdown defoamer for systems requiring good compatibility (e.g., low viscosity, crater-sensitive).

AIRASE® 4655 defoamer: an oil-based defoamer primarily targeted for adhesive end-use applications. It is also a recommended alternative to the siloxane-based AIRASE® 5355 and 5655 defoamers for use in inks and OPVs.

Food contact regulations often consist of a complex mix of regional and national legislations and/or recommendations; there is no global harmonized effort for these regulations.

Our solutions address today's industry challenges which are shared by many global companies that seek additives with the broad food contact compliances shown in **Table 1**.

These products not only have broad food contact compliances but they also provide key attributes shown in **Table 2** and is suitable for low VOC formulations per US and European regulations.

TABLE 1: Food Contact Compliances Information

		PIM 10/2011	BfR XIV	Swiss Ord. Annex 10 Part A	Nestlé Guidance Note
Wetting Agent	SURFYNOL® 355	Compliant	Compliant	Compliant	Compliant
Siloxane-Based Defoamers	AIRASE® 5355	Compliant	Compliant	Compliant	Compliant
	AIRASE® 5655	Compliant	Compliant	Compliant	Compliant
Oil-Based Defoamer	AIRASE® 4655	Compliant	Compliant	Compliant	Compliant

■ Compliant

TABLE 2: Product Chemistry Information

		CHEMISTRY		
		No added TMDD	No added Silicone/Siloxane	No added Mineral Oil
Wetting Agent	SURFYNOL® 355	Compliant	Compliant	Compliant
Siloxane-Based Defoamers	AIRASE® 5355	Compliant	Compliant	Compliant
	AIRASE® 5655	Compliant	Compliant	Compliant
Oil-Based Defoamer	AIRASE® 4655	Compliant	Compliant	Compliant

■ Compliant

FOOD CONTACT COMPLIANCES

FDA 21 CFR 173.340	FDA 21 CFR 175.105	FDA 21 CFR 175.300	FDA 21 CFR 175.320	FDA 21 CFR 176.170	FDA 21 CFR 176.180	FDA 21 CFR 176.200	FDA 21 CFR 176.210	Not on Japan Negative List	China GB 9685-2016



Performance Enhancement

TYPICAL WETTING CHALLENGES

The ability of a surfactant to reduce the surface tension of water is important because it enables the wetting of low-surface-energy substrates. In many processes, interfaces are rapidly generated and surfactants must quickly migrate to those interfaces in order to prevent film retraction and other surface defects. SURFYNOL® 355 surfactant lowers surface tension to address dynamic wetting problems of waterbased inks, OPVs, adhesives and coatings in general. **Figure A** demonstrates how SURFYNOL® 355 surfactant provides optimal wet-out of a litho-based ink without causing surface defects. In addition SURFYNOL® 355 surfactant maintains a lower foam profile than traditionally used foam stabilizing benchmarks, as demonstrated in **Figures B and C** for a pressure sensitive adhesive formulation. Traditionally used additives might provide the required performance; however, many global operating companies seek additives with broad food contact compliances, allowing them to sell their formulations globally.

FIGURE A: SURFYNOL® 355 surfactant eliminates surface defects in an OPV applied over offset ink

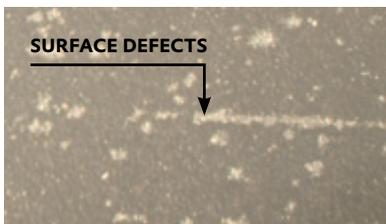
- The OPV film containing SURFYNOL® 355 surfactant shows very good wetting over the ink.



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BENCHMARK SURFACTANT D



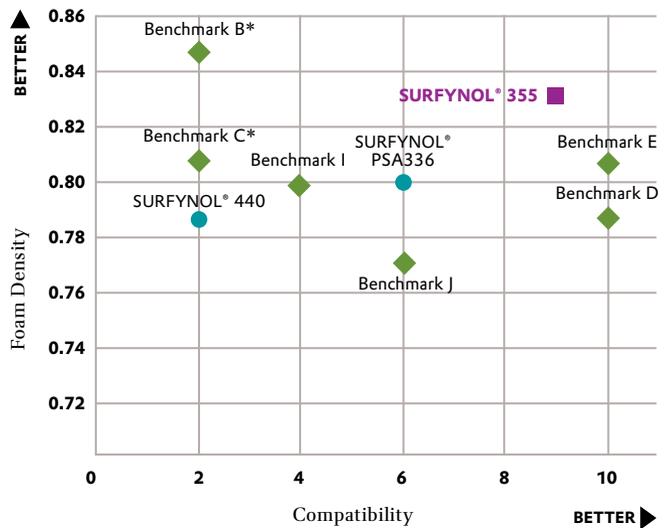
BENCHMARK SURFACTANT L



SURFYNOL® 355 SURFACTANT

FIGURE B: SURFYNOL® 355 surfactant offers the best balance of wetting and foam control in PSAs

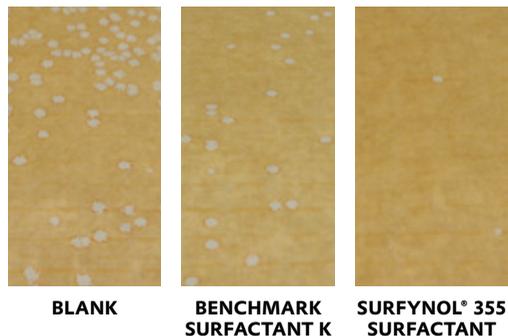
- SURFYNOL® 355 surfactant offers the strongest balance of wetting and foam control in PSAs.
- This PSA formulation is based on Flexcryl® 1625 and contains 1.14% SURFYNOL® 355 surfactant with 0.3% defoamer.
- The PSA samples were applied to PolySlik® 90 release liner (1-10 ranking, 10 = best). The waring blender was used to perform the foam density test (g/ml).



* Recommended by manufacturer for food contact applications

FIGURE C: SURFYNOL® 355 surfactant solves cratering issues in PSAs

PSA samples were applied on silicone release liner at 20 microns wet film thickness (WFT). The Waring blender was used to perform the foam density test. The PSA formulation contains 1% surfactant in combination with 0.2% defoamer.



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BENCHMARK SURFACTANT K

SURFYNOL® 355 SURFACTANT

FOAM CONTROL

Waterborne systems have a tendency to foam during manufacture, mixing and application. If foam is not minimized, the dry films will suffer from surface defects that reduce both the aesthetic and protective properties of the finished products.

It is key to remember that these new AIRASE® defoamers provide broad food contact compliances. Other standard defoamers could show similar performance but might not be suitable for food contact applications because of limited compliances.

The selection of the defoamer for a given formulation depends on finding a product with an optimal balance of defoaming effectiveness and final film appearance (compatibility). It can be incorporated into the grind or letdown, depending

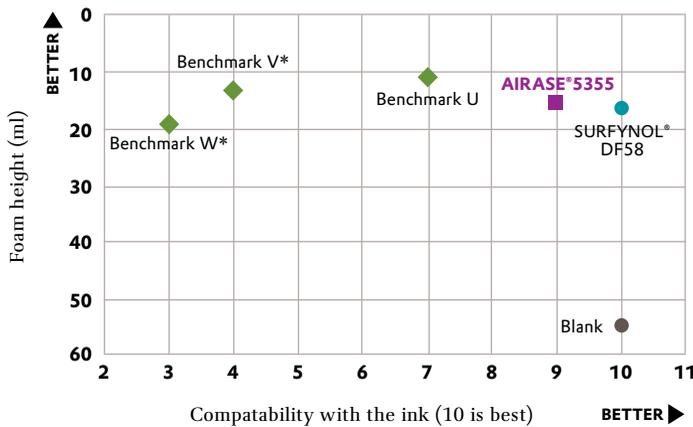
on the formulation requirement. In order to address this, a set of defoamers has been developed. It consists of three defoamers based on various chemistries as shown in **Table 3**.

Figure D demonstrates how the Airase® 5355 siloxane defoamer can be used as a grind defoamer to efficiently defoam a PB15:3 pigment paste while causing no surface defects in the applied ink film made from this paste.

Airase® 5355 defoamer can also be used in the letdown of an ink, as shown on **Figure E** when strong defoaming is needed. Airase® 5655 defoamer is able to provide the right balance of defoaming and compatibility in this system.

FIGURE D: AIRASE® 5355 defoamer is the best candidate to defoam the pigment paste and maintain good compatibility with the final ink.

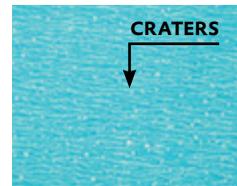
- Grind defoamers were tested at 0.5wt% in a PB15:3 pigment paste. A Waring blender foam test was performed on the paste and compatibility was tested by applying the ink on Leneta chart.
- Note that SURFYNOL® DF-58 Defoamer has more limited food contact compliances than AIRASE® 5355 defoamer.



* Recommended by manufacturer for food contact applications



**0.5% AIRASE® 5355
DEFOAMER**



**0.5% BENCHMARK
DEFOAMER V**

TABLE 3: Product Selector Guide by Application

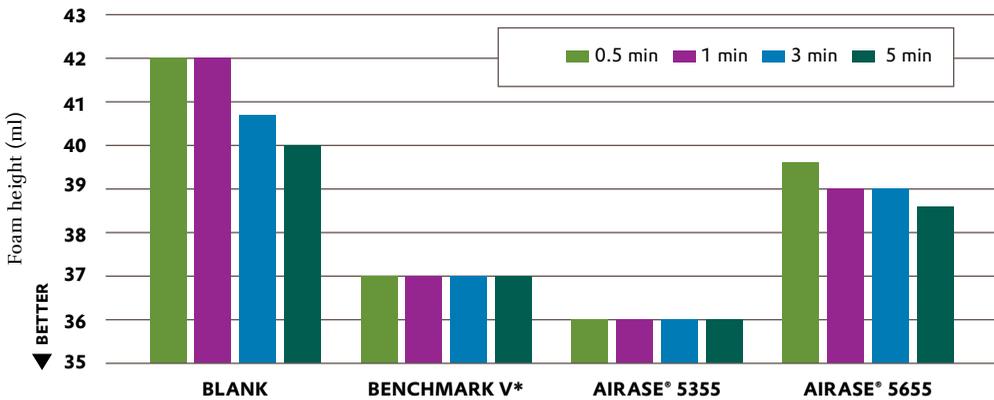
		APPLICATION			
		Ink Grind	Ink Letdown	Adhesive	OPV
Siloxane-Based Defoamers	AIRASE® 5355	First Recommendation	First Recommendation		First Recommendation
	AIRASE® 5655		First Recommendation		Second Recommendation
Oil-Based Defoamer	AIRASE® 4655	Second Recommendation	Second Recommendation	First Recommendation	Second Recommendation

■ First Recommendation ■ Second Recommendation

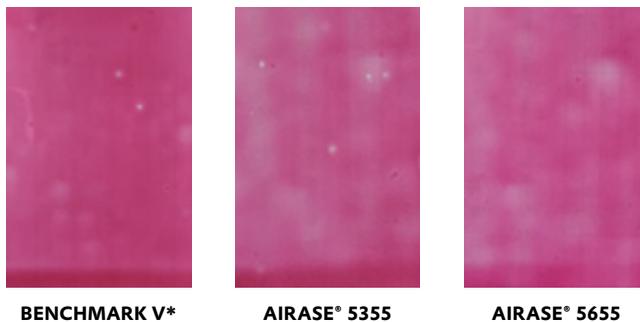
FIGURE E: AIRASE® 5355 & AIRASE® 5655 defoamers used as letdown defoamers for inks

- AIRASE® 5355 defoamer shows the strongest defoaming performance, while AIRASE® 5655 defoamer provides the best balance of foam control and compatibility.
- Benchmark V is an incompatible defoamer that can be replaced by post addition of 0.2% AIRASE® 5355 defoamer or AIRASE® 5655 defoamer.

FOAM HEIGHT OF PRINTING INK WITH 0.2% DEFOAMER



* Recommended by manufacturer for food contact applications

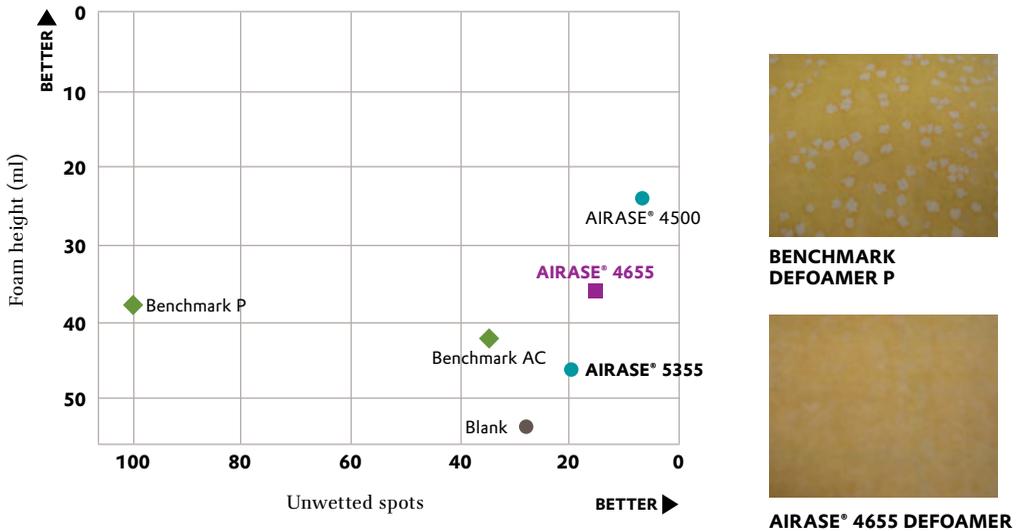


FOAM CONTROL

For applications where siloxane or mineral oil-based defoamers are not typically preferred, AIRASE® 4655 defoamer has been specifically designed and will provide strong defoaming. AIRASE® 4655 defoamer has been evaluated in a PSA formulation and demonstrated great defoaming strength while maintaining good wetting of the adhesive film on the low surface energy substrate. See **Figure F**.

FIGURE F: AIRASE® 4655 oil-based defoamer offers excellent compatibility in PSAs

- Defoamers were tested at 0.2 wt.% as supplied in combination with 1% SURFYNOL® 355 surfactant
- Note that AIRASE® 4500 defoamer has more limited food contact compliances than AIRASE® 4655 and AIRASE® 5355 defoamers





EVONIK CAN HELP!

Evonik is proud to offer four new additives with broad food contact compliances. One wetting agent, SURFYNOL® 355 surfactant, two siloxane-based defoamers, AIRASE® 5355 & 5655, and one non-mineral organic oil defoamer, AIRASE® 4655.

These newly developed additives have a broad utility and can be used in many water-based applications including inks, OPVs, adhesives and coatings in general.

Each of these products has different attributes, resulting in a portfolio of additives that can solve many formulation challenges. The products can be used on their own or in combination with one another.

Check out our NEW dedicated website to learn more about our recent product developments.

[evonik.com/food-contact-status](https://www.evonik.com/food-contact-status)



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