



## Consumer Solutions

# Emulsify Silicone Antifoams for Improved Performance in Water-based Pulp Processes

## Silicone Polyether (SPE) Performance Modifiers for Pulp Manufacturing

### Features and Benefits

- Stability improvement for formulating emulsions
- Food contact status as specified in the food regulatory profile
- Palm-oil-free formulation
- Antifoam performance enhancement

Because antifoam compounds cannot be used directly in water-based foaming systems, control of emulsification is key to obtain optimum performance and stability and avoid deposition.

Surfactant selection is critical for good emulsification. Typically, organic surfactant combinations boosted with siloxylated polyethers (SPEs) provide the least expensive option. However, for robust emulsification for both direct and inversion phase processes, all-silicone packages are well-known in the market and may be a better choice. Using an option that includes three SPE

performance modifiers, emulsions can be formulated without heating or cooling, resulting in a faster emulsification process that can balance the total cost.

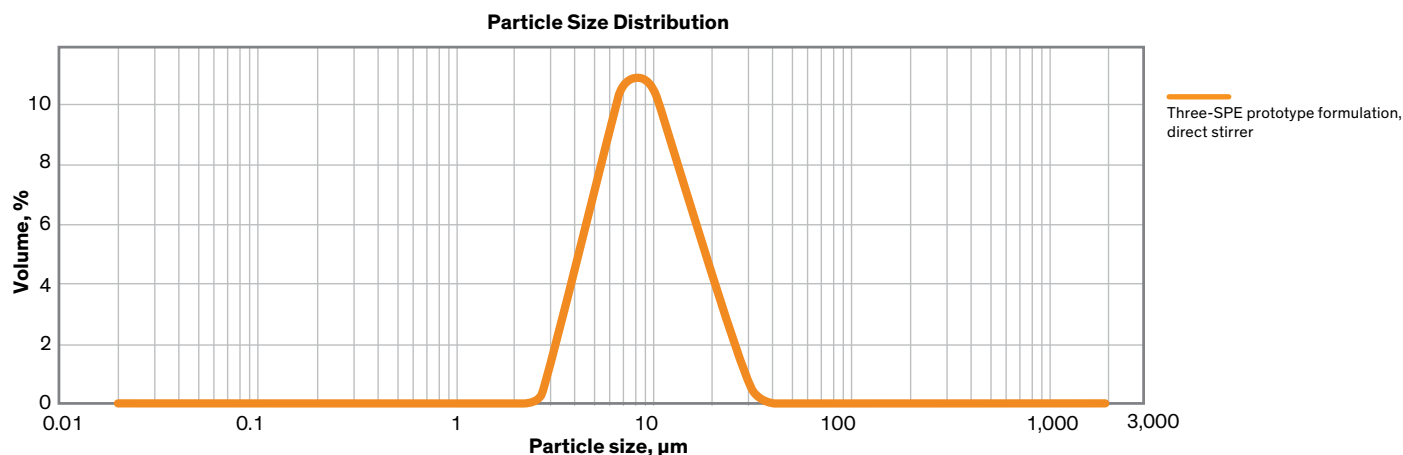
The prototype formulation described below, which provides good stability and robustness, provides a 20% active emulsion using an inversion phase process. It features an all-silicone package with three SPE performance modifiers. Based on this process, the formulation should have a good particle size distribution with an average around 10 microns (Figure 1).

### Prototype Formulation

Ingredient	Weight %
<b>Antifoam</b>	
DOWSIL™ antifoam compound	17.0
<b>Siloxylated Polyethers</b>	
DOWSIL™ FZ-2104 Fluid (can be solid @ RT but liquid @ <30°C)	1.5
DOWSIL™ FZ-2108 Fluid	3.0
DOWSIL™ FZ-5609 Fluid	1.5
<b>Thickeners</b>	
Xanthan gum	0.94
EHEC (ethylhydroxyethylcellulose)	0.31
Preservatives	0.1
Water (in several portions)	75.65

**Note:** The formulation and procedure are provided as a starting point for development work. Optimization will be required based on the raw materials selected, processing equipment, the desired particle size and performance. Ratio between the three SPEs can be optimized according to the antifoam compound selected.

**Figure 1.** Particle size distribution of prototype formulation containing three SPE performance modifiers.



## Procedure

### Inversion phase process

1. Add the antifoam compound to the kettle.
2. While stirring, add the SPEs.
3. After agitation, add the thickener solution (45.65% water + thickeners + biocide) in three steps and stir until homogeneous.
4. Finally, with stirring, add the remaining water (30%).

### Direct emulsification process

1. Add the thickener solution (45.65% water + thickeners + biocide) to the kettle.
2. Premix the antifoam compound and SPEs before adding to the kettle.
3. Add the remaining water (30%) in three steps.

## Performance Modifier Options

In addition to this 100% SPE package, Dow offers organic surfactant stability boosters. DOWSIL™ OFX-5247 Fluid is recommended for direct processes; DOWSIL™ 5290 Performance Modifier is suggested for inversion phase processes. Use levels of 5 to 10% SPE versus compound weight concentration are recommended. These boosters have proven stability benefits and also can improve knockdown, persistence or drainage.

## FDA 21 CFR 176.210 and BfR XXXVI Compliant Performance Modifiers from Dow

	Optimum knockdown	Optimum persistence	Optimum drainage	Optimum stability
DOWSIL™ 5290 Performance Modifier	X	X	X	X
DOWSIL™ OFX-5573 Fluid	X	X	X	X
DOWSIL™ OFX-5247 Fluid	X	X		X
DOWSIL™ FZ-2104 Fluid				X
DOWSIL™ FZ-2108 Fluid				X
DOWSIL™ FZ-5609 Fluid				X
DOWSIL™ OFX-5329 Fluid	X	X		X
DOWSIL™ 5604 Additive				X

## Learn More

Dow offers an extensive line of efficient, high-quality products to meet defoaming challenges in pulp and paper processing – including silicone polyether (SPE) performance modifiers that enhance the stability, knockdown, persistence and drainage of antifoam emulsions. For expert pulp emulsification assistance and product selection guidance, please contact your Dow representative.

Whether you need industry-leading innovation or greater cost efficiency, Dow can help. Solutions by Dow are dedicated to meeting your needs for specialty materials, collaborative problem-solving and innovation support. Learn how we can help you at [consumer.dow.com](http://consumer.dow.com).

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