

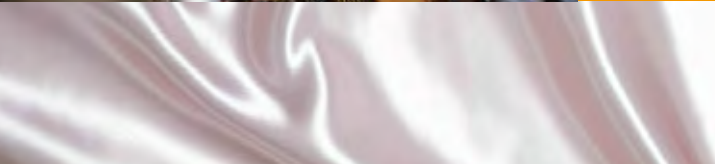
# Defoaming Agents

Outstanding defoaming effect  
even when used in small amounts.

**Shin-Etsu**  
Shin-Etsu Silicone



Silicone defoamers are available in many forms including fluids, fluid compounds, self-emulsifying formulas, emulsions and solvent-based formulas. All provide an outstanding defoaming effect when used in small amounts. Silicone defoamers also offer good resistance to heat and cold, are highly safe, and are chemically inert. They can be used with all types of foaming liquids, contributing to higher quality end products, improved process efficiency, and a better environment. Shin-Etsu Silicone offers an extensive product lineup to meet diverse needs in a variety of industrial fields.



# Silicone defoamers are available in many forms including silicone fluids, fluid compounds and emulsions. We offer a wide array of products for specific purposes.

## Product Types

| Type                     | Product name | Fast-acting | Long-lasting | Alkali Resistant | Heat Resistant | Stable when Diluted | Description  |
|--------------------------|--------------|-------------|--------------|------------------|----------------|---------------------|--|
| Emulsions                | KM-71        | ●           |              |                  |                |                     |  |
|                          | KM-72GS      |             |              |                  |                |                     | Food additive, Halal certification                                     |
|                          | KM-73        | ●           |              |                  |                |                     | General use  |
|                          | KM-73A       | ●           |              | ●                |                |                     | General use  |
|                          | KM-73E       |             | ●            | ●                |                |                     | General use  |
|                          | KM-75        |             | ●            |                  |                | ●                   |  |
|                          | KM-85        |             |              |                  |                |                     | Paintable  |
|                          | KM-89        |             | ●            | ●                | ●              |                     |  |
|                          | KM-90        |             |              |                  |                | ●                   | Dyeing processes   |
|                          | KM-98        | ●           | ●            | ●                | ●              | ●                   |  |
|                          | KM-7750      | ●           | ●            |                  |                | ●                   |  |
|                          | X-50-992     | ●           | ●            | ●                | ●              |                     | High temperature dyeing processes, Pulp manufacturing processes        |
| KM-7752                  |              | ●           | ●            | ●                | ●              | Paintable           |  |
| Self-emulsifying         | KS-530       |             |              | ●                |                |                     | General use  |
|                          | KS-531       |             |              |                  |                |                     | Paintable  |
|                          | KS-537       | ●           |              |                  |                | ●                   | Dyeing processes   |
|                          | KS-538       | ●           | ●            | ●                | ●              |                     |  |
|                          | KS-540       | ●           | ●            | ●                | ●              |                     | High resistance to alkalinity  |
| Silicone fluid compounds | KS-66        | ●           |              |                  | ●              |                     |  |
|                          | KS-69        |             | ●            |                  | ●              |                     | Food additive  |
|                          | X-50-1090B   | ●           | ●            |                  | ●              |                     | Organic resins, Paints, inks industry, Industrial use                  |
|                          | KS-7704S     | ●           |              |                  | ●              |                     | Organic resins, Paints, inks industry, Industrial use                  |
| Silicone fluids          | FA-630       |             | ●            | ●                | ●              |                     | Fluorosilicone-based   |
|                          | KF-96 (ADF)  |             |              |                  | ●              |                     | Food additive  |
|                          | KS-7708      |             |              |                  |                |                     | Deaerating agent for epoxy, polyester, polyurethane and acrylic resins |
| Solvent-based            | FA-600       |             | ●            | ●                | ●              |                     | Fluorosilicone-based   |
|                          | KS-602A      |             |              |                  | ●              |                     |  |
|                          | KS-7709      |             | ●            | ●                | ●              |                     | Fluorosilicone-based   |

(Not specified values)

## Selecting a product

### Selection 1 Select according to the foaming liquid

Generally, self-emulsifying products or emulsions should be used with water-based (aqueous solution) foaming liquids. For non-aqueous liquids, use silicone fluids, fluid compounds or solvent-based defoamers.

### Selection 2 Defoamers for food products

In food product manufacturing applications, be sure to use food product defoamers KS-72GS (emulsion), KF-96ADF (fluid), or KS-69 (fluid compounds).

\* Note that these products may not be approved for food product applications in all countries. For details, please contact Shin-Etsu.

### Selection 3 Defoamers for harsh environments

Self-emulsifying defoamers can be diluted with water (below 30°C) to produce uniform emulsions. They can be used in a wide temperature range

### Selection 4 Defoamers for wastewater treatment

and are highly stable in harsh conditions such as mechanical shear. These products also offer better resistance to acids and bases than do emulsion defoamers.

In wastewater treatment, to suppress foaming in the aeration tank, use emulsion defoamers KM-73, KM-73A or KM-75, which have little effect on activated sludge. These defoamers have very low BOD values, and do not increase the sludge load.

### Selection 5 If problems of cissing or oil spots occur:

In paints and synthetic resins, some defoamers cause problems of cissing or poor paintability and adhesion. If you experience such problems, consider switching to the self-emulsifying defoamers KS-531, or the emulsion defoamer KM-85. For high temperature foaming systems or to combat problems of oil spots, use the self-emulsifying defoamers KS-531 or KS-537, or the emulsion defoamers KM-90 or KM-98.

The following table will help you select a silicone defoamer.

|                                      | Silicone fluids | Silicone fluid compounds | Self-emulsifying | Emulsions | Solvent-based |
|--------------------------------------|-----------------|--------------------------|------------------|-----------|---------------|
| For aqueous foaming liquids          | ▲               |                          | ●                | ●         |               |
| For non-aqueous foaming liquids      | ●               | ●                        | ●                |           | ●             |
| For high temperature foaming liquids | ●               | ●                        | ●                | ▲         | ●             |
| Acid & base resistant                | ▲               | ▲                        | ●                | ▲         |               |
| Shear resistant                      | ●               | ●                        | ●                | ●         | ●             |

## Product Characteristics & General Properties

### Emulsion defoamers

Emulsion defoamers\*1 (O/W\*2) are produced by emulsifying a silicone fluid compound with a nonionic activator. They are easy to use, highly stable, and there are many products to choose from. They can be used for a variety of water based foaming liquids.

\*1: For emulsion defoamers, the diluent is water. \*2: Oil-in-water emulsion.

Viscosity guidelines: Low: up to 1,000 mPa·s, Medium: 1,000-3,000 mPa·s, High: 3,000 mPa·s and higher.

| Product name    | Appearance                       | Specific Gravity<br>25°C | Viscosity<br>mPa·s | Active Ingredients<br>% | Diluent |
|-----------------|----------------------------------|--------------------------|--------------------|-------------------------|---------|
| <b>KM-71</b>    | Creamy white liquid              | 1.03                     | Low                | 46                      | Water   |
| <b>KM-72GS</b>  | Creamy white liquid              | 1.00                     | Medium             | 38                      | Water   |
| <b>KM-73</b>    | Creamy white liquid              | 1.02                     | Low                | 19                      | Water   |
| <b>KM-73A</b>   | Creamy white liquid              | 1.02                     | Low                | 22.5                    | Water   |
| <b>KM-73E</b>   | Creamy white liquid              | 1.02                     | Low                | 15.5                    | Water   |
| <b>KM-75</b>    | Creamy white liquid              | 1.03                     | Medium             | 39                      | Water   |
| <b>KM-85</b>    | Creamy white liquid              | 1.01                     | Low                | 16                      | Water   |
| <b>KM-89</b>    | Creamy white liquid              | 1.02                     | High               | 34                      | Water   |
| <b>KM-90</b>    | Grayish white translucent liquid | 1.04                     | High               | 53                      | Water   |
| <b>KM-98</b>    | Creamy white liquid              | 1.02                     | Medium             | 34                      | Water   |
| <b>KM-7750</b>  | Creamy white liquid              | 1.01                     | Low                | 38                      | Water   |
| <b>X-50-992</b> | Creamy white liquid              | 1.02                     | Low                | 34                      | Water   |
| <b>KM-7752</b>  | Creamy white liquid              | 1.01                     | Medium             | 55                      | Water   |

\*KM-85 contains toluene.

(Not specified values)

### Self-emulsifying defoamers

Self-emulsifying defoamers contain 100% active ingredient, and consist of hydrophilic modified silicone fluids and fluid compounds. They can be used for aqueous or non-aqueous foaming liquids. These defoamers have unique properties, including good high-temperature stability, alkali resistance and acid resistance. Just add water to produce uniform emulsions.

| Product name  | Appearance                     | Specific Gravity<br>25°C | Viscosity<br>mPa·s | Active Ingredients<br>% | Diluent        |
|---------------|--------------------------------|--------------------------|--------------------|-------------------------|----------------|
| <b>KS-530</b> | Slightly yellow liquid         | 1.03                     | 7,000              | 100                     | Water, alcohol |
| <b>KS-531</b> | Pale yellowish white liquid    | 1.04                     | 1,800              | 100                     | Water, alcohol |
| <b>KS-537</b> | Pale yellowish white liquid    | 1.02                     | 600                | 100                     | Water, alcohol |
| <b>KS-538</b> | Pale yellowish white liquid    | 1.01                     | 8,000              | 100                     | Water, alcohol |
| <b>KS-540</b> | Light brown translucent liquid | 1.03                     | 8,000              | 100                     | Water, alcohol |

(Not specified values)

### Fluid compound defoamers

These defoamers are made by blending silicone fluid with fine powdered silica. They contain no emulsifiers and so do not disperse in water on their own. But they are 100% silicone resins, and thus offer the many useful, intrinsic properties of silicones.

| Product name      | Appearance                       | Specific Gravity<br>25°C | Viscosity<br>mPa·s | Active Ingredients<br>% | Diluent               |
|-------------------|----------------------------------|--------------------------|--------------------|-------------------------|-----------------------|
| <b>KS-66</b>      | Light gray translucent liquid    | 1.01                     | 300                | 100                     | Toluene, xylene, etc. |
| <b>KS-69</b>      | Light gray translucent liquid    | 1.01                     | 2,500              | 100                     | Toluene, xylene, etc. |
| <b>X-50-1090B</b> | Grayish white translucent liquid | 0.99                     | 800                | 100                     | Toluene, xylene, etc. |
| <b>KS-7704S</b>   | Grayish white translucent liquid | 0.99                     | 200                | 100                     | Toluene, xylene, etc. |

(Not specified values)

### Silicone fluid defoamers

Silicone fluid defoamers are 100% silicone fluid with no silica. These defoamers can be added with no negative effects to the characteristics of the end product. They are highly stable, making them suitable for a wide array of applications.

| Product name   | Appearance                     | Specific Gravity<br>25°C | Viscosity<br>mPa·s | Active Ingredients<br>% | Diluent               |
|----------------|--------------------------------|--------------------------|--------------------|-------------------------|-----------------------|
| <b>FA-630</b>  | Colorless transparent liquid   | 1.28                     | 2,000              | 100                     | MXHF, MIBK, etc.      |
| <b>KF-96</b>   | Colorless transparent liquid   | 0.97                     | 100 - 100,000      | 100                     | Toluene, xylene, etc. |
| <b>KS-7708</b> | Light brown translucent liquid | 0.99                     | 600                | 100                     | Toluene, xylene, etc. |

(Not specified values)

### Solvent-based defoamers

Solvent-based defoamers feature silicone fluid dissolved in isoparaffin or other solvent, and offer excellent dispersibility when used. They are suitable for defoaming in oil refining and drilling processes and defoaming of non-aqueous foaming liquids including solvents and lubricants.

| Product name   | Appearance                   | Specific Gravity<br>25°C | Viscosity<br>mPa·s | Active Ingredients<br>% | Solvent             | Diluent                            |
|----------------|------------------------------|--------------------------|--------------------|-------------------------|---------------------|------------------------------------|
| <b>FA-600</b>  | Colorless transparent liquid | 0.92                     | 10                 | 30                      | Methyl ethyl ketone | Acetone, methyl ethyl ketone, etc. |
| <b>KS-602A</b> | Colorless transparent liquid | 0.87                     | 1,700              | 50                      | Kerosene            | Industrial gasoline, etc.          |
| <b>KS-7709</b> | Colorless transparent liquid | 1.38                     | 2                  | 7.7                     | MXHF                | MXHF, MIBK, etc.                   |

(Not specified values)

## Instructions for Use

By making adjustments in the way silicone defoamers are used, depending on the qualities and form of the foam in the liquid being treated, silicone defoamers provide an outstanding defoaming effect.

### 1 Dilution

Except in special cases, silicone defoamers are added to foaming liquids in very small amounts (1-200 ppm). The defoamers should thus be diluted beforehand with water, solvent, or the liquid to be defoamed. This makes it easier to adjust the amount being added, improves dispersibility, and is more economical.

#### Silicone fluid & fluid compound defoamers

Silicone fluid & fluid compound defoamers can be diluted with solvent for greater dispersibility and convenience.

Solvent-based defoamers are already diluted with solvent to improve dispersibility, but they can be diluted further if concentration is still too high and dispersion is poor. Aromatics or aliphatic hydrocarbons are suitable solvents for dilution.

#### Self-emulsifying defoamers

Dilute self-emulsifying defoamers to a 5- to 10-fold dilution with water to produce uniform emulsions. Use water of 30°C or below. The user can dilute straight to the desired concentration, but a more stable emulsion can be obtained by adding the same amount of water gradually and stirring until the desired concentration is reached. Additionally, various thickeners can be used to prepare emulsions that can be stored for longer periods. The thickeners that can be used vary depending on the product and intended purpose. For details, talk to a Shin-Etsu representative. When using as a blend-in defoamer, first prepare a high concentration master batch before adding for best results.

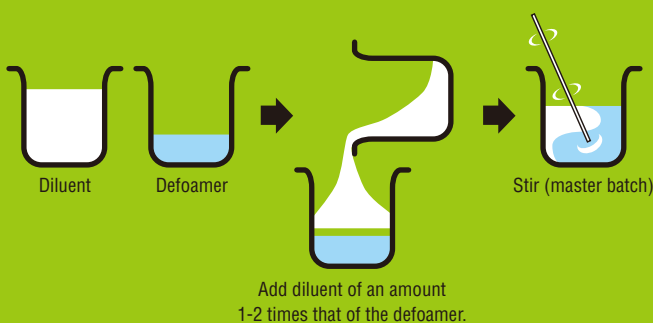
#### Emulsion defoamers

Most emulsion defoamers contain between 10% and 30% silicone. The amount of silicone added to the foaming system should be from 1 ppm to around 200 ppm; diluting with water in advance will improve dispersibility and effectiveness and be more economical.

These defoamers are typically diluted to a 2- to 10-fold dilution. If they are diluted further, there may be oil separation or other problems. Furthermore, the defoamer should be used as soon as possible after dilution. If the fluid layer separates during storage, stir slowly until uniform, and defoaming performance will not be affected.

#### Diluting with liquid from the foaming system

The master batch technique is particularly suitable when the user wants to avoid lowering the concentration or introducing foreign substances or impurities.



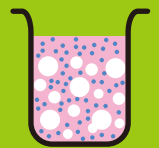
### 2 Amount to add

In determining the optimal amount to add, a good method is to first add defoamer such that the active ingredient is around 50 ppm (0.005%), observe the defoaming effects, and add more as appropriate.

### 3 Addition methods

#### Adding defoamer in advance to the foaming liquid

Foam is controlled by adding defoamer in advance to a liquid which may exhibit foaming. This method is effective for controlling foam in closed containers and equipment.



#### Continuous drip

If the foaming liquid is being replaced or is flowing, the defoamer will be consumed with the foaming liquid. In such cases, adding defoamer in a continuous drip is effective.



#### Spray application

The spray method is effective when a lot of foam is generated in a short time, or the user wants to temporarily eliminate foam that has developed. Diluted defoamer is sprayed directly on the foam by air gun or spray apparatus. Foam is broken up as the defoamer hits it, and defoamer is dispersed in the liquid; this combined effect makes it possible to eliminate large amounts of foam in a short time. The spray gun should have a nozzle with a somewhat large aperture. If it is too small, the defoamer will exit as a fine mist and not be as effective.



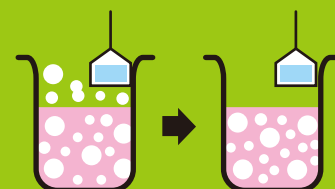
#### Application to the container

This method is effective when the user wants to prevent foam from growing beyond a certain amount. Apply silicone fluid defoamer, oil compound defoamer or emulsion defoamer as a "band" around the inside of the container of foaming liquid. The foam will be broken up when it reaches this band of defoamer.



#### Placing a container of defoamer inside the foaming tank

Place a container filled with defoamer inside the foaming tank. As the foam level rises and reaches the container, it comes in contact with the defoamer and is broken up. This method is not suitable for cases in which foam develops rapidly, but is effective for keeping mild foaming from growing beyond a certain amount.



## Packaging

| Type                     | Product name | Packaging |                  |                     |           |       |       |       |       |
|--------------------------|--------------|-----------|------------------|---------------------|-----------|-------|-------|-------|-------|
|                          |              | 1 L cans  | 1 L paper carton | 1 L plastic bottles | 18 L cans |       |       |       |       |
|                          |              | 1 kg      | 1 kg             | 1 kg                | 14 kg     | 15 kg | 16 kg | 17 kg | 18 kg |
| Emulsions                | KM-71        |           |                  | ●                   |           |       | ●     |       |       |
|                          | KM-72GS      |           | ●                |                     |           |       |       |       | ●     |
|                          | KM-73        |           |                  | ●                   |           |       | ●     |       |       |
|                          | KM-73A       |           |                  | ●                   |           |       | ●     |       |       |
|                          | KM-73E       |           |                  | ●                   |           |       |       | ●     |       |
|                          | KM-75        |           |                  | ●                   |           |       | ●     |       |       |
|                          | KM-85        | ●         |                  |                     |           |       | ●     |       |       |
|                          | KM-89        |           |                  | ●                   |           | ●     |       |       |       |
|                          | KM-90        |           |                  | ●                   |           |       | ●     |       |       |
|                          | KM-98        |           |                  | ●                   |           |       | ●     |       |       |
|                          | KM-7750      |           |                  | ●                   |           |       | ●     |       |       |
|                          | X-50-992     |           |                  | ●                   |           |       | ●     |       |       |
|                          | KM-7752      |           |                  | ●                   |           |       | ●     |       |       |
| Self-emulsifying         | KS-530       |           |                  | ●                   |           |       | ●     |       |       |
|                          | KS-531       |           |                  | ●                   |           |       | ●     |       |       |
|                          | KS-537       |           |                  | ●                   |           |       | ●     |       |       |
|                          | KS-538       |           |                  | ●                   |           |       | ●     |       |       |
|                          | KS-540       |           |                  | ●                   |           |       | ●     |       |       |
| Silicone fluid compounds | KS-66        | ●         |                  |                     |           |       |       |       | ●     |
|                          | KS-69        | ●         |                  |                     |           |       |       |       | ●     |
|                          | X-50-1090B   |           |                  | ●                   |           |       | ●     |       |       |
|                          | KS-7704S     | ●         |                  |                     |           |       |       |       | ●     |
| Silicone fluid           | FA-630       | ●         |                  |                     |           |       |       |       |       |
|                          | KF-96        | ●         |                  |                     |           |       | ●     |       | ●     |
|                          | KS-7708      | ●         |                  |                     |           |       | ●     |       |       |
| Solvent-based            | FA-600       | ●         |                  |                     |           | ●     |       |       |       |
|                          | KS-602A      | ●         |                  |                     |           |       |       |       |       |
|                          | KS-7709      | ●         |                  |                     |           |       |       |       | ●     |

## Storage & Handling Precautions

### Product quality, storage, and handling

1. Certain fluid compound, self-emulsifying, emulsion, and solvent-based defoamers may exhibit separation of the fluid layer and precipitation during storage, but this does not affect the products' defoaming performance. Before use, be sure to shake or stir until evenly mixed.
2. After first opening silicone defoamers, be sure to seal tightly and store in a cool dark place, and use the product quickly. Emulsion defoamers should be stored at temperatures between 1°C and 25°C. Products may freeze at temperatures below 0°C, but heating with warm water and slowly stirring will return the product to its original state.
3. Use soon after first opening.

### Safety & Hygiene

1. When using these products, take care to prevent contact with the skin and mucous membranes. In case of contact, wash immediately with soap and water, then flush thoroughly with running water.
2. When handling products that contain solvent, provide ventilation and take care to avoid breathing solvent vapors.
3. Please read the Safety Data Sheet (SDS) before use. SDS can be obtained from our Sales Department.

### UN Classifications

| Classification            | UN No.  | Products   |
|---------------------------|---------|--|
| Flammable Liquids/Class 3 | UN 1866 | FA-600, KM-85, KS-602A, KS-7709  |
| Not applicable            | —       | KM-71, KM-72GS, KM-89, KF-96 (100-100,000cs), KM-73, KM-73A, KM-73E, KM-90, KM-98, KM-7750, X-50-992, KS-7708, KM-7752, KS-530, KS-531, KS-537, KS-538, KS-540, KS-66, KS-69, X-50-1090B, KS-7704S, FA-630 |

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(JCQA-0004 JCQA-E-0002)

**Naoetsu Plant** ISO 9001 ISO 14001  
(JCQA-0018 JCQA-E-0064)

**Takefu Plant** ISO 9001 ISO 14001  
(JQA-0479 JQA-EM0298)