INDUSTRIAL ANTIFOAM SOLUTIONS

MOMENTIVE®

SOLUTIONS FOR A SUSTAINABLE WORLD™

WHY USE ANTIFOAMS AND DEFOAMERS?

Foam forms when gas is dispersed in a liquid and stabilized, creating a mass of bubbles surrounded by thin liquid films. These films can be strong enough to trap large volumes of foam (Figure 1).

Although the science behind foam formation is complex, its effects on industrial operations are clear and costly. Uncontrolled foam can:

- Reduce equipment capacity
- Increase processing time and energy consumption
- Complicate filling, packaging, and transport
- Affect product quality and consistency

Foam commonly develops during blending, mixing, reflux and distillation, filtration, and filling. By using antifoams and defoamers, these challenges can be effectively managed, helping processes run more smoothly, efficiently, and reliably.

WHAT MAKES AN EFFECTIVE CHEMICAL DEFOAMING AGENT?

Foam can be controlled by adjusting process parameters or installing mechanical defoaming equipment. However, **chemical foam control agents have consistently proven to be the most versatile, effective, and economical solution,** delivering reliable performance across a wide range of applications and operating conditions.

A high-quality effective chemical defoaming agent should meet the following requirements:

- **Have a lower surface tension** than the liquid system for rapid foam collapse
- **Disperse easily** throughout the system for a quick, uniform action
- **Exhibit poor or low solubility** (controlled incompatibility) to maintain long-term effectiveness
- **Remain chemically inert** to avoid unwanted reactions
- **Leave no significant residue or odor,** protecting product integrity
- **Comply with all relevant regulations**, including FDA and USDA requirements where applicable
- **Offer Kosher and Halal certifications** when needed

Silicone-based foam control agents meet these standards exceptionally well. Their ability to deliver powerful foam suppression at **extremely low dose rates** makes them not only highly effective, but also a **cost-competitive choice** for a wide range of applications.

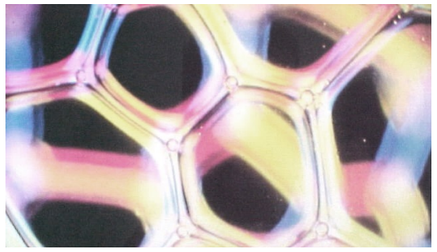


Figure 1: Image of a foam with oil droplets in it.

APPLICATIONS

*Metalworking fluids; Release agents; Lubricants; Antifreeze, engine coolants; De-icing, windshield cleaners.

MEASURING ANTIFOAM PERFORMANCE

The performance of antifoams is not easy to measure, since various factors, like the nature of the forming medium, the temperature or shear rate, among many others, have a strong impact and may be difficult to predict.

To ensure optimal performance, antifoam testing should replicate real-world application conditions as closely as possible. This includes factors such as mixing intensity, temperature, and system configuration.

SHAKE TEST
Quick and Common

The most widely used method is the shake test. In this test, the antifoam is added to a foaming medium in a sealed container, which is then shaken, either manually or, more reliably, using automated shaking equipment. After a defined time or number of shakes, the collapse time of the foam and the residual foam volume are measured. These results provide a clear basis for comparing different antifoam products.

RECIRCULATION TEST
For Demanding Conditions

The recirculation test offers a more rigorous evaluation. A cylindrical glass container is filled to about one-quarter of its volume with the foaming medium. A pump draws the liquid from the bottom and reinjects it from the top at a controlled speed, creating continuous circulation. This setup introduces significant air and shear stress, challenging the effectiveness of the antifoam. To simulate actual process environments, the liquid can also be heated. When a pump is started, the falling stream of liquid can quickly generate foam. Once the foam reaches the top of the container, an antifoam is added. As the foam collapses, both the time and the level at which the collapse occurs are monitored: this indicates the **knockdown ability** of the antifoam.

In a recirculating pumping rig the liquid is continually cycled, creating strong foam. This allows measurement of both **foam knockdown** (how effectively the antifoam destroys existing foam) and **persistence** (how long it prevents foam from reforming). The foam will eventually start to rise again; the longer this takes, the more persistent the antifoam.

PERFORMANCE OPTIONS TO MATCH YOUR NEEDS

Because foam control requirements vary across industries and processes, **Momentive offers a broad range of SAG™ and SagTex™ solutions** to match different performance and cost targets:

- **Basic silicone antifoams** offer highly cost-effective foam knockdown in applications where immediate foam suppression is the primary goal
- **High-performance silicone antifoams** are advanced formulations designed for extreme conditions, providing superior knockdown and extended persistence

Selecting the ideal antifoam is always a balance, matching performance capabilities with the specific cost and operating needs of each application.

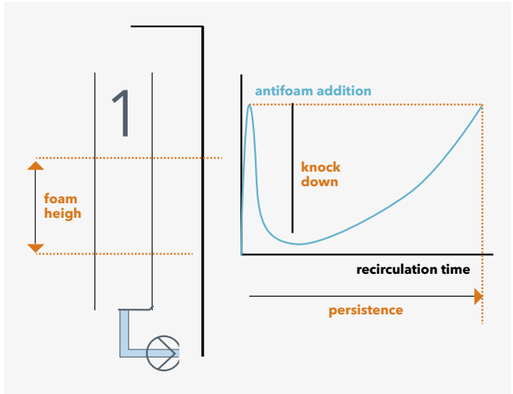
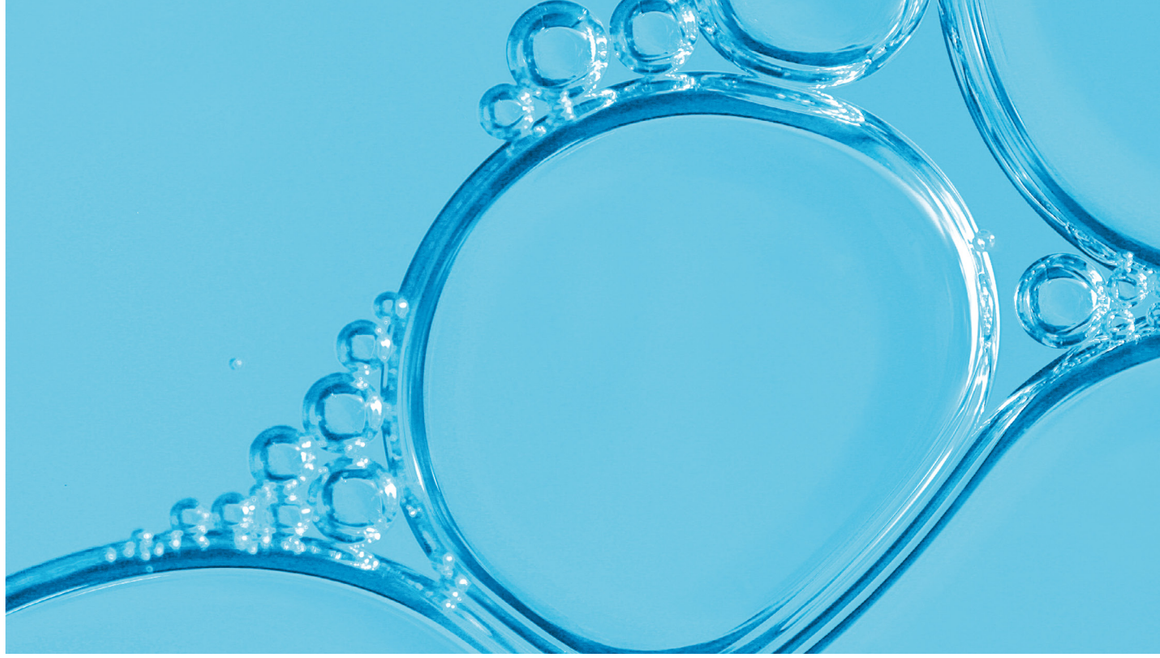


Figure 2: This setup measures two key parameters: **knockdown height,** which indicates the ability of defoamer to eliminate existing foam, and **persistence,** the time it takes for the foam to rebuild to its original height.



SILICONE ANTIFOAM SELECTION

Momentive's SAG™ and SagTex™ antifoams have proven especially effective across a wide range of applications. Selecting the appropriate type and quantity of silicone defoamer requires a careful, case-by-case evaluation. Therefore, it is recommended to test multiple antifoam formulations, including SAG™ and SagTex™ products within each system to determine the optimal type and concentration for the best performance.

Factor	Options
Chemical nature of the foam-forming agent	Aqueous / non-aqueous
Temperature	High / low
pH-value	High / neutral / low
Compatibility	Clear appearance / turbid formulation
Dosing accuracy	Concentration of antifoam
Processing equipment	Low shear / high shear
End use of product containing the antifoam	Food contact / sensitive to de-wetting Regulatory requirements / certificates

AQUEOUS ANTIFOAMS

Aqueous antifoams are specially formulated emulsions or concentrates designed for easy dilution in water-based or polar solvent systems. They are available in various concentrations to improve dosing accuracy and simplify handling.

The impact of proper dosing and handling is often underestimated when using chemical antifoams, yet these factors significantly influence their effectiveness and overall performance.

Concentrates	Water-dispersible systems of high active content, developed for formulators or processes requiring high dosing accuracy.
Emulsions	Ready-to-use, water-based products of various active contents, providing easy dispersibility for maximum defoaming efficiency.
Dosing	Silicone antifoams are typically effective at active levels between 10 and 100 ppm. This corresponds to 50 to 500 g of a 20% emulsion per metric ton of defoaming media, compared to only 10 to 100 g of a 100% active material. When dosing equipment is less precise or very low dose rates are sufficient, we recommend using antifoam emulsions with 10% or 20% active content. The larger dosing volume helps minimize errors from inaccurate dosing. Conversely, with precise dosing equipment, higher-concentration antifoam emulsions are preferred, as they require less storage space and provide better cost efficiency.
Handling	Compounds are used either undiluted or pre-dispersed in organic solvents for non-aqueous applications, but they require emulsification before use in aqueous systems. The viscosities of these compounds and concentrates typically range from 1,500 to 2,000,000 cSt, and handling such high viscosities demands suitable equipment. In contrast, aqueous emulsions usually have viscosities between 40 and 3,000 cSt, depending on their active content and formulation. This makes them much easier to handle and allows for dilution using simple stirring equipment. Generally, diluting emulsions before use does not enhance antifoam performance. However, in low-viscosity aqueous systems, a pre-diluted, low-viscosity antifoam emulsion can disperse more quickly throughout the foaming system and achieve faster foam knockdown than a more viscous emulsion. It is important to use pre-diluted antifoam emulsions shortly after dilution rather than storing them for extended periods. If storage of a diluted emulsion is necessary, stabilization with emulsifiers, thickeners, and preservatives is required to maintain product integrity.

NON-AQUEOUS ANTIFOAMS

COMPOUNDS

100% active fluid products and formulations of fluids containing special active ingredients that boost defoaming performance.

Non-aqueous antifoams can be considered for defoaming in non-water-based systems, such as organic solvents and mineral oils. They are 100% active materials and therefore introduce no water into these systems.

Non-aqueous antifoams can be selected from four categories:

- Polydimethylsiloxane (PDMS) fluids
- Silicone compounds
- Polyether-functional silicone fluid copolymers from our Silwet™ product portfolio
- Fluorosilicone fluids

In many cases, diluting the silicone compound in a suitable organic solvent is advisable. This reduces the actives content for a more accurate dosing and lowers viscosity for easier handling. These grades can also be used by formulators to manufacture their own antifoam emulsions.

POLYDIMETHYLSILOXANE (PDMS) FLUIDS AND SILICONE COMPOUNDS

Some foaming issues can be addressed using high-viscosity PDMS fluids, such as Element14™ PDMS 12.5K and Element14™ PDMS 60K silicone fluids. When higher defoaming performance is required, silicone compounds often provide better results.

POLYETHER FUNCTIONAL SILICONE FLUIDS

In some applications, PDMS fluids are either too incompatible, leading to separation, or too soluble in the foaming medium (e.g., toluene or diesel fuel), which may even stabilize foam. In such cases, polyether-functional silicone copolymers from our Silwet™ portfolio* can help.

*Our dedicated Silwet™ brochure provides a complete overview.

FLUOROSILICONE FLUIDS

In certain applications, fluorosilicone fluids are considered a last resort, as they can provide effective oil/gas separation and foam control in solvents like aromatic-rich, fluorinated, or chlorinated hydrocarbons, at extremely low dose levels. They can be used for foam control and degassing purposes in several applications, such as offshore oil wells and solvent distillation or recovery units.

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CUSTOMER SERVICE CENTERS

Worldwide
Email: commercial.services@momentive.com

North America
+1 800 295 2392 Toll free[1]

Latin America

Brazil
+55 11 5128 4222 Direct number

Mexico
+52 55 2169 7670 Direct number

Europe, Middle East, Africa & India (EMEAI)

Europe
+39 0875 758888 Direct number

India, Middle East & Africa
+91 44 71212207 Direct number[2]

Asia Pacific (APAC)

China
800 820 0202 Toll free
+86 21 3860 4928 Direct number

Japan
Sales-JP.Silicones@momentive.com

South Korea
+82 2 3495 2141 Direct number

South East Asia, Australia & New Zealand
+60 3 8309 8088 Direct number[3]

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Know more about Momentive's foam control solution.