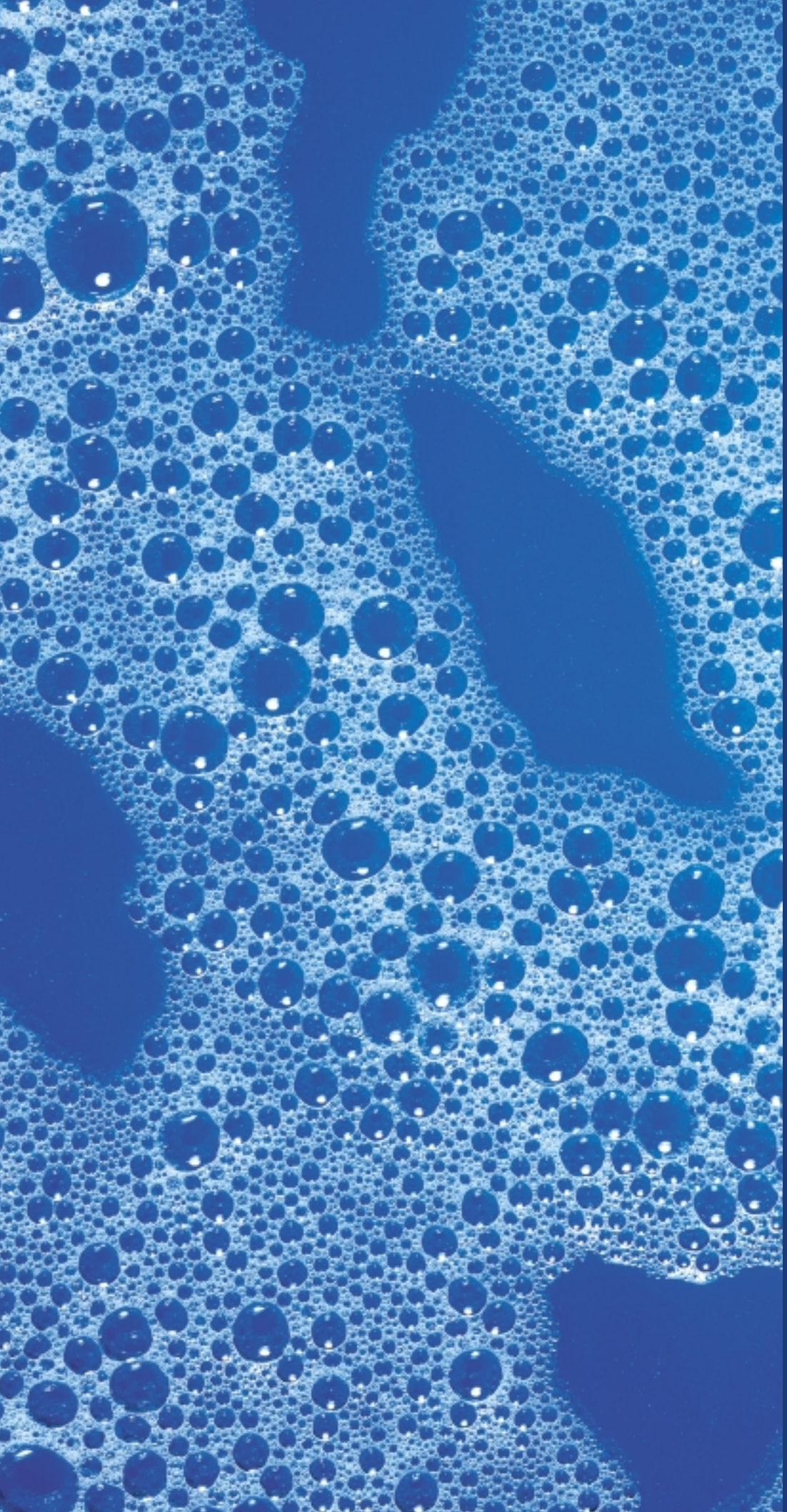


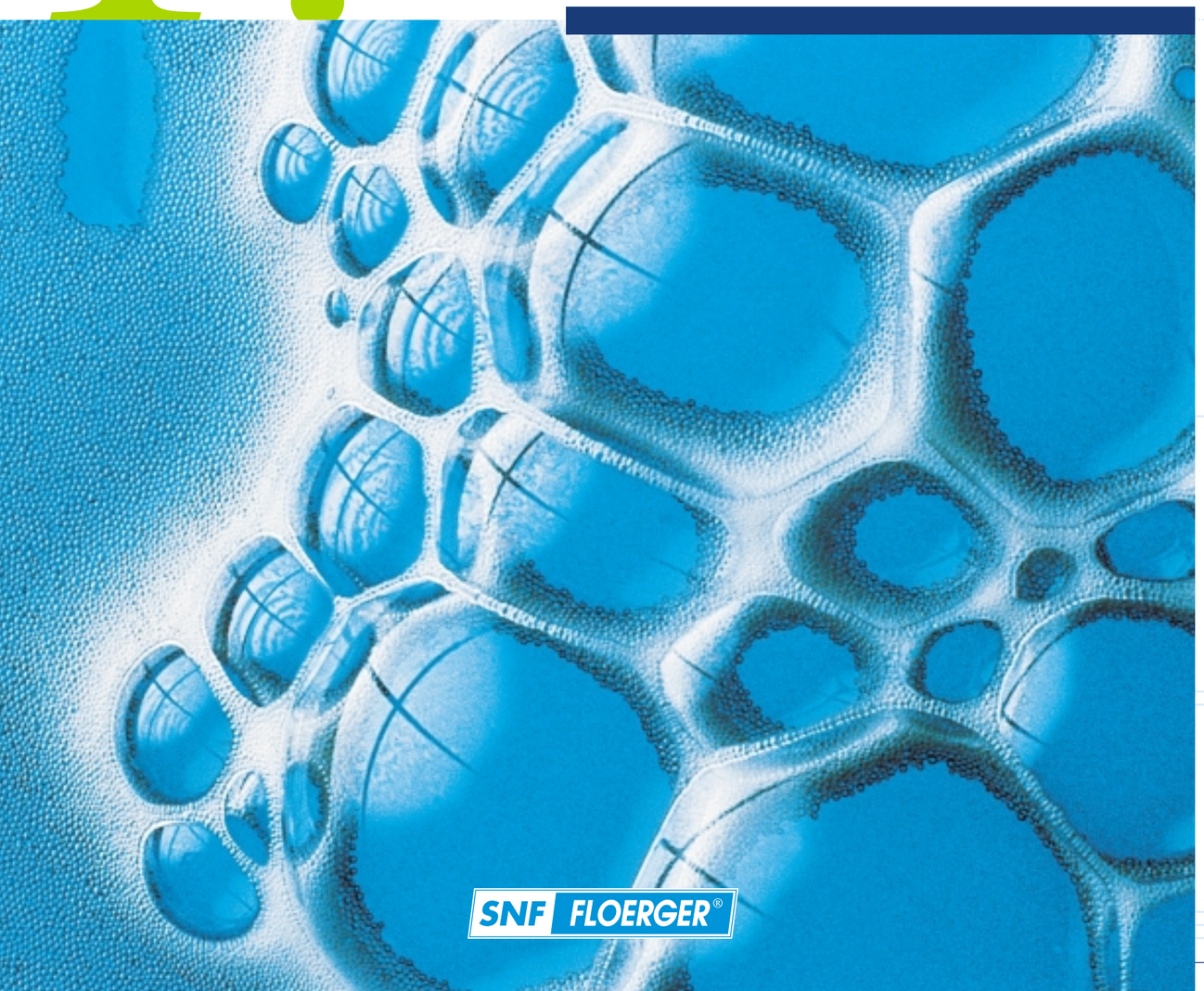
FLOFOAM™
Defoamer

SNF FLOERGER®

Why Foam could be so inconvenient ?

A light foam is generally not problematic in most applications however heavy foaming can often lead to various processing problems. These problems range from inaccurate readings from control and measuring equipment such as temperature, level and density controllers to poor mixing of reactants in chemical reaction vessels and products hanging in the foam, all too often leading to losses in production. Finally the presence of foaming can give a bad image of the way a process is operated in the eyes of a customer. The presence of foam in discharged effluent can cause complaints from local people and authorities even if the foam is harmless to people and the environment.

1.



How do silicone defoamers work ?

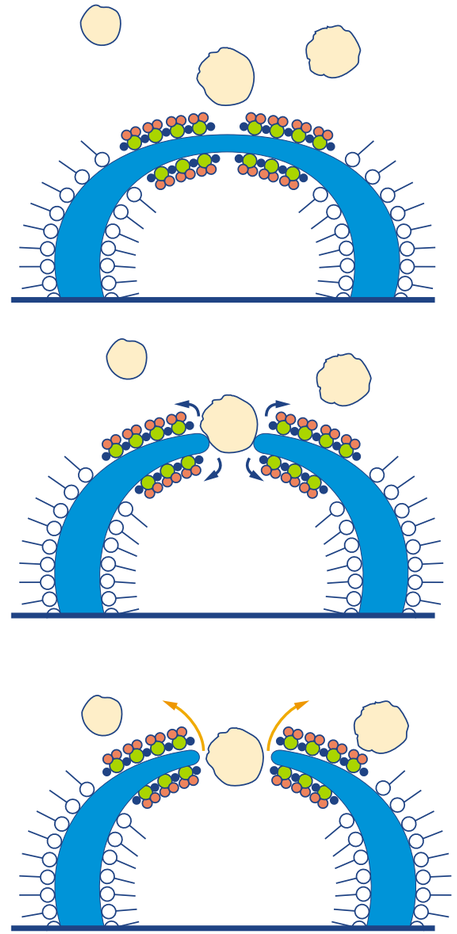
Foam is a gas dispersion in a liquid or solid continuous phase. Foam is created by the surfactants which are at the air/liquid interface. Therefore air bubbles occur and are stabilised by the surfactants.

Today, silicone antifoams are the best solution to a foaming problem thanks to a very competitive ratio of cost/efficiency.
Based on a silicone oil and silica particles, FLOFOAM™ products work following the outlined principles :

2.

Foam destabilisation mecanism

- Silica particle
- Surfactant molecule
- Polydimethylsiloxane



1 In spreading over the foam, the silicone active ingredient displaces surfactant molecules and thins out the lamellae, leading to destabilisation and collapse.

2 Silica particles transported by the siloxanes onto the foam lamelle have an additional destabilizing effect on the foam.

3 The foam bubble bursts and the entrapped air escapes.

3.

Silicone antifoams

Today silicone antifoams remain the best solution to foaming problems because they give better efficiency/cost compared to organic antifoams. Silicone based products meet perfectly the three crucial requirements to make an effective antifoam :

- **Low surface tension (approximately 21 mN/m)**
- **Insoluble in the foaming medium**
- **Good spreading coefficient**

Silicone antifoams have other interesting properties :

- They are highly efficient and are therefore often more economical to use than organic defoamers.
- They control almost all types of foam encountered in any effluent.
- They are chemically inert and therefore resistant to chemical attack.
- They are thermostable.
- They make for safe operating conditions.
- As they do not produce any undesirable degradation products, they are environmentally compatible.

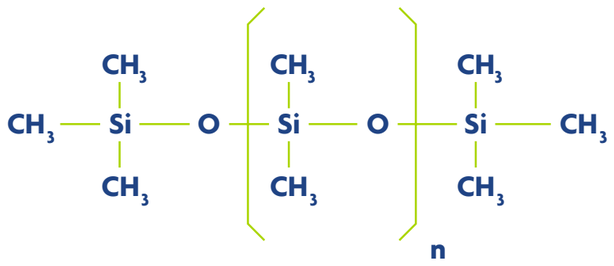
Si-O

A silicone oil named polydimethylsiloxane (PDMS) and silica particles are the two major ingredients of a silicone antifoam agent.

Silicone antifoam can be compound (100% active content), emulsion (variable active content) or powder.

The SNF Floerger range of antifoam agents are in emulsion form. FLOFOAM™ products are of the oil-in-water type, and therefore suitable for easy dispersion in aqueous media. Thanks to their relatively low viscosity they are easy to pump.

Polydimethylsiloxane



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Polydimethylsiloxane

How do we assess antifoam efficiency ?

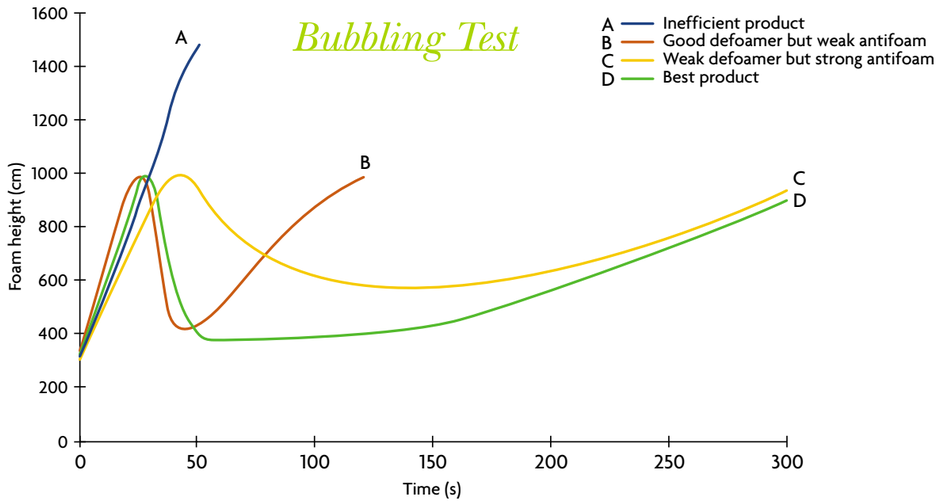
Quality of an antifoam is given by two main characteristics :

- **Knockdown ability or shock effect** : Meaning the speed to destroy an existing foam.
- **Persistence or durability** : Meaning the efficiency over time.

4

These two parameters can be assessed by several tests.
The main test is the bubbling method. A graduated column with a glass frit in the bottom is required. Foaming water is poured in the column and air at constant flowrate is introduced through the glass frit in the column. Foam is generated by the air and starts to travel up the column. At a determined level of foam, antifoam is injected. By this method several antifoaming agents can be tested.
A graph reporting foam height vs time is very helpful to establish the knockdown ability and the persistence for each product.
The selected antifoam is the product with the best compromise between shock effect and durability.

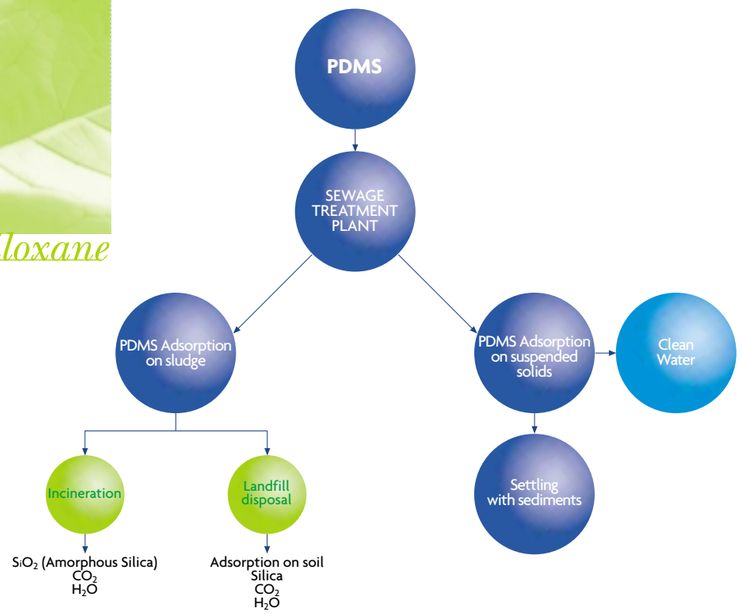
Bubbling Test



5. Environmental performance

Silicone antifoams are essentially composed of polydimethylsiloxane (PDMS) and silica.
Silica is a natural element which can be found in sand.
PDMS is a strictly inert compound. Studies have proved that PDMS does not interfere with any other compound in a sewage plant. Because of its insolubility in water, PDMS has a low COD and BOD*.
It does not undergo any chemical reaction in the treatment process. PDMS has a very high ability to adsorb on sludge and therefore most of the injected PDMS is attached to the sludge. Later sludge is disposed to land and abiotic degradation of the PDMS occurs. Carbon dioxide, water and silicon dioxide are the only three products generated in this reaction.
Any remaining small amount of PDMS (analytical detection limit) tends to bind to solid particles suspended in the process water phase.
These solid particles settle and PDMS is again subject to abiotic degradation as previously mentioned.

Fate of Polydimethylsiloxane



* **COD** : Chemical Oxygen Demand
BOD : Biological Oxygen Demand

6. Products

Dosage and dilution

SNF Floerger antifoam agents have to be used undiluted for maximum efficiency. Experimental plant trial is the best way to determine the optimal dosage of the appropriate antifoam, however a preliminary test in the lab often indicates suitable products. Generally optimal antifoam dosage is between 10 and 1000 ppm according to the application and to the stability of the foam.
FLOFOAM™ products can be diluted in water to obtain a better dispersibility in the foaming medium, but efficiency of the antifoam will be affected.
In case of dilution we recommend not to exceed a dilution ratio of 1:10. The diluted product must be used immediately.

Shear stability

Efficiency of a silicone antifoam is based on the particles size. Therefore shear forces and turbulence have a considerable influence on the efficiency of silicone defoamers.
This rule particularly applies to products already in dispersed form, such as emulsions. Particles will be split by shear forces or turbulence and the antifoam efficiency is reduced compared to the initial unsheared products.

Pumps

Silicone emulsion must be pumped with care. We recommend the use of low shear gear pumps as these are able to meter even small amounts very accurately.
As mentioned previously turbulence can damage the product. So the flowrate should be kept relatively low (<1m/s).

Storage

We recommend you store the SNF Floerger antifoam at room temperature. Product stability is affected by high temperature (higher than 30°C) and frost, therefore temperature fluctuations must be avoided.
After opening antifoam containers or drums the lid must be replaced and tightly closed in order to prevent any micro-organism contamination.

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