



Effective removal of foams generated during fermentation: Technology that contributes to environmental conservation through the widespread use of biofuels

SANYO
PRODUCT
TOPICS

We are surrounded by a variety of foams that are useful in our daily lives, but in some cases the generation of foams becomes a problem in product manufacturing.

In this issue, we will introduce a technology that effectively eliminates foams and improves productivity in the fermentation of bioethanol, an alternative to gasoline fuel.

Foam is a general term for gas surrounded by a liquid film

Foams are used in various applications in everyday life, such as detergents and carbonated drinks. What we call “foam” is a general term for gas surrounded by a liquid film. There are various types of liquid that form films and internal gases, but they all have the same basic structure.

A foam bursts spontaneously over time because gravity causes the liquid that forms the foam’s film to flow downward, causing the film to thin; if water is bubbled, the foam disappears almost instantly. However, soymilk and beer foam well because they contain highly surface-active substances, such as glycosides and proteins, which are arranged on the surface of the foam to stabilize the film and prevent it from rupturing. For this reason, when a long-lasting foam is desired, such as in shampoo, the film is stabilized by adding surfactants or similar substances.

Defoamer penetrates the film and expands to eliminate foams

Although foam has many uses in our daily lives, its generation can negatively affect product quality and reduce efficiency during production, for example, in manufacturing facilities. For example, if a foam remains in plastic products or paints, it can lead to poor appearance or quality. In addition, products such as paints, paper pulp, and resin rubber require aggressive agitation during manufacturing so a large amount of foam may

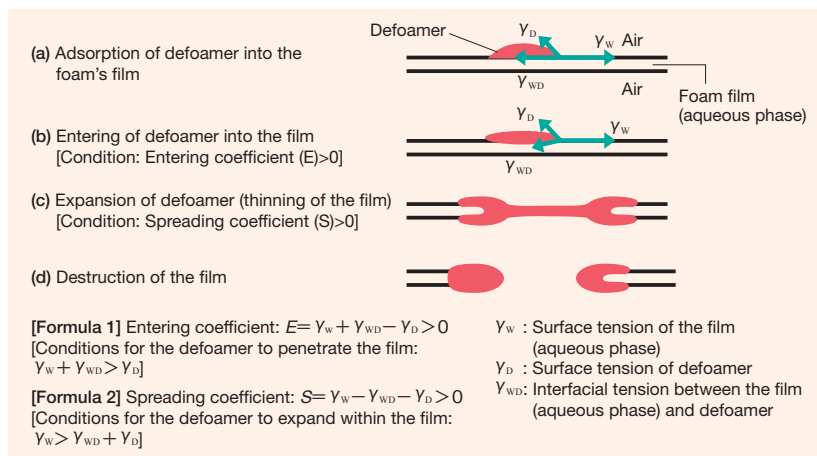
cause overflow and operations may have to be halted if the foam cannot be eliminated. Defoamers are used to reduce the generation of these foams. There are three main types of defoamers: mineral oil based, polyether based, and silicone based, and they each largely consist of oil-based components. The fact that washing greasy hands with soap does not easily produce foam is a simple demonstration that oil has the power to eliminate foam. On the surface of a foam, surfactants are arranged in regular rows with hydrophobic groups on the surface that are not easily mixed with water. Defoamers have a mixture of hydrophobic and hydrophilic parts, which are easily mixed with water, allowing them to penetrate the hydrophobic surface of foams. A foam’s film usually becomes resilient and resistant to fracture by maintaining a certain thickness. However, as a defoamer enters the film it expands, resulting in thinning and rupture.

This is the mechanism by which defoamers eliminate foam, even in small amounts. Therefore, in order to effectively eliminate foams, diffusivity is needed to allow it to spread throughout the material in small amounts. Of course, it is also important that the ingredients do not impair the function of the final product. All of these factors are taken into account when developing defoamers.

Defoamer is essential for the production of bioethanol, an alternative fuel to gasoline

SAN NOPCO is a company that has been working on defoamer since its establishment in 1966. Defoamers are used in a wide range of fields. In fact, even for paint applications alone, there are differences among manufacturers and products in terms of raw materials used, manufacturing and use conditions, as well as the product quality required. To optimally eliminate

■ Mechanism of action of a defoamer (schematic diagram)





Fermenter for bioethanol production

foams, defoamers that are specific for each material and environment are used. SAN NOPCO has the technical capability to meet these detailed needs and has had a strong share in the domestic paint and paper pulp fields for many years, with the advantage of customizing products for each customer.

SAN NOPCO, who had long wanted to utilize this technological capability in the environmental field, focused on developing a defoamer in the fermentation of bioethanol, which has been attracting attention as an alternative fuel to gasoline. Having succeeded with this development, the company is now supplying defoamer for bioethanol production in Brazil, where the use of biofuel is advanced.

However, there were many obstacles to success. As sugarcane is the raw material used for bioethanol production in Brazil, carbon dioxide is generated during fermentation, resulting in a large amount of foam. Naturally, this foam must be eliminated in order to mass-produce bioethanol as an industrial product. However, as sugarcane contains carbohydrates, the foam film that is generated becomes highly viscous, stabilizing the foam and making it more difficult to rupture. In order to solve this problem, SAN NOPCO visited the site several times to conduct tests. It took several years of trial and error to optimize the defoamer according to the different manufacturing conditions of each producer, such as impurities and fermentation temperatures. Currently, the only fuels available for automobiles in Brazil are pure ethanol or gasoline containing ethanol, not pure gasoline. It can be said that the defoamer developed by SAN NOPCO has greatly contributed to this progress.

Technology that contributes greatly to global environmental conservation and Sustainable Development Goals

SAN NOPCO is constantly developing new defoamers for the fermentation industry to accommodate changes in the customers' materials and facilities. We are also conducting surveys in areas where biofuels are expected to be widely used in order to explore needs outside of Brazil. Meanwhile, in terms of defoamers as a whole, the company is also working on activities to spread more environmentally friendly products around the world using its technology for making defoamers from vegetable oils. SAN NOPCO's defoamer is a technology that contributes widely to the world in terms of the environment in addition to Sustainable Development Goal 7, "Ensure access to affordable, reliable, sustainable, and modern energy for all," Goal 9, "Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation," and Goal 13 "Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy." We will continue to contribute to environmental conservation around the world with technologies that encourage carbon neutrality.



■ Defoamer used in the fermentation of bioethanol

Product	NOPTAM 300EZ
Composition	Polyether-based defoamer
Appearance	Colorless to pale yellow
Viscosity	500 mPa·s (25°C)

Please contact our sales department when handling our products. Read the "Safety Data Sheet" (SDS) in advance. It is the responsibility of the user to determine the suitability and safety of the product for their intended use.