



ANTIFOAMS AND DEFOAMERS FOR FOOD PROCESSING



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MÜNZING CREATING ADDITIVE VALUE

Since its inception in 1830, MÜNZING has been helping its customers perfect their products by creating specialty additives that are precisely right for them. Headquartered in Abstatt, Germany, our manufacturing plants in North America and Germany have broad synthesis and formulation capabilities to best serve our global customer base.

MÜNZING's additives have achieved worldwide recognition for their performance, quality and technical innovation. We are a technology driven organization with an extensive staff of highly experienced R&D and technical service personnel in Europe, America and Asia. If you have a specific challenge, we have the technical expertise and laboratory capabilities to craft a unique solution.

MÜNZING's mission is CREATING ADDITIVE VALUE by solving our customers' formulation problems with the best solutions at great value.



About MAGRABAR®

The MAGRABAR® brand is MÜNZING's portfolio of specialty additives designed for the food industry. Our antifoams, defoamers and release agents are developed to improve yield, pumping, mixing, plant hygiene and product quality. We offer both liquid and powder products in a range of materials.

As consumer preferences have shifted to more clean label foods, the MAGRABAR® product line has evolved, too. We are proud to offer products that are suitable for use in identity-preserved, Non-GMO, preservative-free and organic food processing. This includes Non-GMO Project Verified products and organic products certified by QAI.

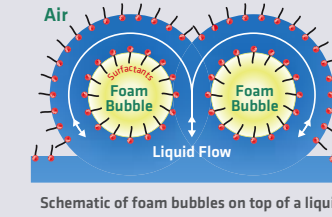
FOOD SAFETY

MÜNZING's MAGRABAR® product line for the food industry is manufactured at our facility in Morton Grove, Illinois. This site is dedicated to producing products that are allergen free, free from animal-derived ingredients and certified Kosher Pareve and Halal.

Morton Grove is a Global Food Safety Initiative (GFSI)-certified facility, operating under food GMPs and a HACCP-based food safety plan audited to the SQF Food Safety Code by NSF. MAGRABAR® products have been manufactured at this location since 1983 and it continues to showcase MÜNZING's high standards for quality and safety.

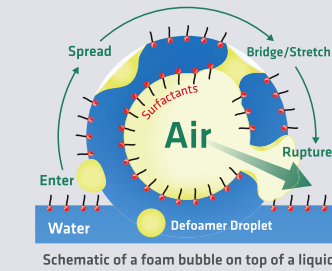


HOW DEFOAMERS WORK



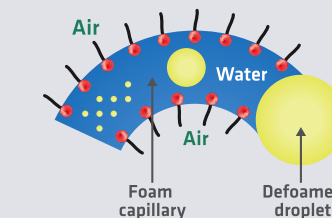
Foam Stabilization Mechanisms

- » Foam is naturally unstable
- » Bubbles must rise to the surface to break
- » Drainage of the liquid surrounding the foam bubbles leads to rupture
- » Stability of foam comes from surfactants that hinder drainage



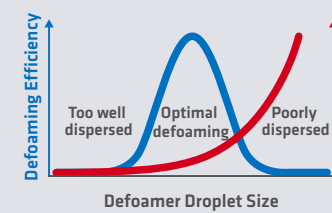
Defoamer Mode of Action

- » Defoamers exist as droplets in the liquid and act to destabilize foam by:
 - Entering the foam bubble surface
 - Spreading along that surface and thinning the liquid layer by forcing drainage
 - Bridging the liquid layer to rupture the bubble
- » The defoaming process is governed by surface and interfacial tensions
- » The surface tension of the defoamer droplets must be lower than that of the liquid



Defoamer Droplet Size

- » The defoamer droplets need to be the right size
- » If the defoamer droplets are too small, there is an insufficient amount to produce an overall impact
- » Defoamer droplets that are too large will result in poor compatibility
- » More defoamer droplets of the optimal size will increase the rate of foam breakdown




MAGRABAR® Product Features

- » Exceptional initial and long-lasting defoaming
- » High performance across a range of industries and applications
- » Products derived from a range of materials and formulations to provide choice in determining best cost in use for each application

Additive Value Since 1830

<p>1830 Foundation of MÜNZING by Friedrich Michael Münzing, first producer of sulfuric acid in Germany</p>	<p>1960 Start of joint venture with DIAMOND SHAMROCK ("NOPCO") for the production and distribution of additives for paints, paper, adhesives and other industries</p>	<p>2000 Expansion to North America, acquisition of ULTRA ADDITIVES, Bloomfield (NJ), USA, today MÜNZING North America</p>	<p>2008 Acquisition of liquid defoamer business from HEXION SPECIALTY CHEMICALS, today AGITAN DF series</p>	<p>2010 Start of production in Taixing, China</p>	<p>2013 Acquisition of Magrabar, Morton Grove (IL), USA, manufacturer of additives for the food industry</p>	<p>2017 New Office in Mumbai, India</p>	<p>2019 Opening of new subsidiary in Curitiba/PR, Brazil</p>
<p>1947 Build up of a new factory; production and development of fatliquors for the leather industry and auxiliaries for the paper industry</p>	<p>1980 End of the joint venture with DIAMOND SHAMROCK, investment in new production facilities and a new research and development center</p>	<p>2005 Opening of Office and Technical Service Center in Shanghai, China</p>	<p>2009 Acquisition of L.P. BADER, Rottweil, Germany, producer of wax dispersions, today MÜNZING CHEMIE</p>	<p>2011 Acquisition of DEUREX Micro Technologies, Elsteraue, Germany, producer of micronized waxes, today MÜNZING Micro Technologies</p>	<p>2014 Opening the new technology and administration center in Abstatt, Germany</p>	<p>2018 Acquisition of Süddeutsche Emulsions-Chemie (SEC), Mannheim, Germany, producer of wax emulsions. Acquisition of wood processing additives ("FENTAK") from HEXION with subsidiaries in Malaysia and Australia</p>	

How will the product be used?	Antifoam Suppress foam in the final product	Defoamer Suppress foam during the processing of food	Release Agent NSF 3H	Lubricant NSF H1
What kind of delivery mechanism do I need?	Solid » Defoamer for a solid food to control foam » Defoamer active on a solid support	Liquid » Defoamer for liquid intermediate or end product » Defoamer to a liquid process where foam is occurring » Using a pump to dispense the defoamer		
Do I need special regulatory clearances?	Kosher or Halal All MAGRABAR® products are Kosher and Halal	Non-GMO For foods that are not derived from genetically modified organisms 	Organic » Defoamer for organic food » Three options for organic defoamers available	
Do I have any preferences for product chemistry?	Vegetable Oil VO	Mineral Oil MO	Silicone SI	Polyol PG
				Mono- and Diglycerides FG
Do I have any additional formulation requirements for the product?	Silica Free Products that do not contain any silica SA	100% Active/Preservative Free » Concentrated defoamer » All MAGRABAR® concentrates are free from microbiological preservatives		
Am I looking for a specific performance feature?	Persistent Foam Control » Product that will provide long-lasting defoaming performance » Choose a 100% concentrate defoamer	Fast Foam Knockdown » Good spreading of the defoamer that enables the foam to quickly dissipate » Choose an emulsion-based product	Air Release for High Viscosity » Need to remove air from highly viscous fluids » MAGRABAR® J-305 is highly effective	Dosage Control » Afraid of overusing defoamer because of cost/operator error » Choose an emulsion-based product

Decision Point

- Considering all of the above, I have found several different options:
- » Choose 2-3 products from different formulation types.
 - » If no product is suitable our R&D teams will support you to create a customized solution.
 - » For more information, please contact us at info@munzing.us.

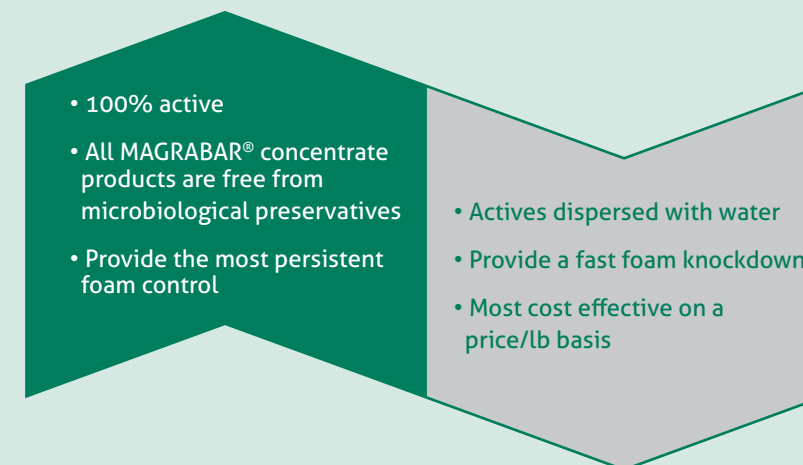
Defoamer Chemistry

- SI** **Silicone (polydimethylsiloxane)** has very low surface tension and is insoluble in all foods. These properties allow it to provide very efficient foam control in a wide range of applications. Its use is often restricted to ensure that no more than 10ppm of silicone is present in the finished food.
- VO** **Vegetable Oil** is insoluble in water-based foods and has a reasonably low surface tension. In many applications it is also able to match or exceed the performance of silicone chemistry and their use is not as restricted. Widely considered cleaner label as it is not synthetic.
- PG** **Polyol**, also called polyoxyalkylene technology, is a unique synthetic technology that is more resistant to oxidation than vegetable oil and provides improved foam control in select applications.
- FG** **Mono- and Diglycerides** act as a deaerator to help entrained air release faster from high viscosity fluids.
- MO** **Mineral Oil** has a slightly lower surface tension than vegetable oil and is less susceptible to oxidation.
- SA** **Silica Free** takes the clean label aspect a step further. This indicates the product is free from silicone and silica. Unfortunately, the products in this category do not provide strong foam control.

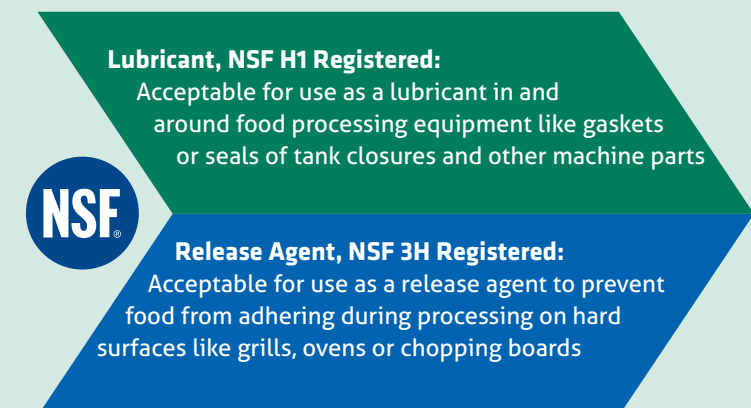
Organic Defined



Concentrates vs. Emulsions



Incidental Food Contact



LIQUID DEFOAMERS and ANTIFOAMS FOR FOOD APPLICATIONS







PRODUCT	FORMULATION TYPE	PERCENTAGE OF ACTIVE	PERCENTAGE OF RENEWABLE AND WATER CONTENT	ORGANIC	SILICONE CONTENT	FRUITS & VEGETABLES	PROTEIN	DAIRY	EGGS, MEAT & SEAFOOD	BEVERAGES, BROTHS & SOUPS	FERMENTATION	JAMS, JELLIES & SYRUPS	SWEETENERS	CLEAN IN PLACE & WASTE WATER TREATMENT
CERTIFIED ORGANIC LIQUID FOOD DEFOAMERS (95%)														
MAGRABAR® 4000	Vegetable Oil	100%			0%	VO	VO	VO	VO	VO	VO		VO	VO
MAGRABAR® 4010	Vegetable Oil	100%			0%	VO	VO	VO	VO	VO	VO		VO	VO
CERTIFIED MADE WITH ORGANIC LIQUID FOOD DEFOAMERS (70-95%) (WSDA Registered)														
MAGRABAR® 3001	Vegetable Oil	100%			0%	VO		VO	VO	VO	VO		VO	VO
MAGRABAR® 3202	Vegetable Oil	100%			0%	VO		VO	VO		VO		VO	
MAGRABAR® 3303	Vegetable Oil	100%			0%		VO	VO	VO				VO	
TRADITIONAL LIQUID FOOD DEFOAMERS														
MAGRABAR® PD-602	Vegetable Oil	100%			<1%	VO		VO	VO	VO	VO		VO	VO
MAGRABAR® PD-3500	Vegetable Oil	100%			0%		VO	VO	VO	VO	VO		VO	
MAGRABAR® SPI-244	Vegetable Oil Emulsion	40%			0%	VO	VO	VO		VO				VO
MAGRABAR® IP-661	Vegetable Oil	100%			<1%		VO		VO	VO				
MAGRABAR® IP-3500	Vegetable Oil	100%			0%		VO	VO	VO	VO	VO		VO	
MAGRABAR® J-305	Mono- and Diglycerides	100%			0%							FG SA		
MAGRABAR® J-305 IP	Mono- and Diglycerides	100%			0%							FG SA		
MAGRABAR® 10-SN	Silicone Emulsion	10%			10%	SI	SI	SI	SI		SI	SI	SI	SI
MAGRABAR® 20-SN	Silicone Emulsion	20%			20%	SI			SI	SI	SI	SI	SI	SI
MAGRABAR® 30-SN	Silicone Emulsion	30%			30%	SI					SI	SI	SI	SI
MAGRABAR® PD-1414	Polyol	100%			<1%						PG			
MAGRABAR® PD-3663	Polyol	100%			0%	PG	PG							
MAGRABAR® PD-650	Mineral Oil Emulsion	40%			0%	MO	MO	MO						MO
MAGRABAR® PD-655	Mineral Oil Emulsion	60%			0%	MO	MO	MO						MO





ABBREVIATION PROPERTIES

- Vegetable Oil
- Polyol
- Mineral Oil
- Non-GMO
- Organic Certified
- Food Grade Glycerides
- Silicone
- Silica Free
- Organic Compliant





Further MAGRABAR® products on Page 10– 11

POWDER DEFOAMERS and ANTIFOAMS FOR FOOD APPLICATIONS











PRODUCT	FORMULATION TYPE	PERCENTAGE OF ACTIVE	PERCENTAGE OF RENEWABLE AND WATER CONTENT	ORGANIC	SILICONE CONTENT	PROTEIN	DAIRY	BEVERAGES, BROTHS & SOUPS	POWDER MIXES	SWEETENERS
ORGANIC CERTIFIED POWDER FOOD DEFOAMERS (>95%)										
MAGRABAR® MD-3000 	Vegetable Oil on Solid Support	20%			0%	VO	VO	VO	VO	VO
MAGRABAR® MD-4438 	Vegetable Oil on Solid Support	15%			0%	VO	VO	VO	VO	VO

TRADITIONAL POWDER FOOD DEFOAMERS	FORMULATION TYPE	PERCENTAGE OF ACTIVE	PERCENTAGE OF RENEWABLE AND WATER CONTENT	ORGANIC	SILICONE CONTENT	PROTEIN	DAIRY	BEVERAGES, BROTHS & SOUPS	POWDER MIXES	SWEETENERS
MAGRABAR® MD-3500	Vegetable Oil on Solid Support	25%			0%	VO	VO	VO	VO	VO
MAGRABAR® MD-20-S FG	Silicone on Solid Support	20%			20%	SI	SI	SI	SI	SI
MAGRABAR® MD-20-S IP 	Silicone on Solid Support	20%			20%	SI	SI	SI	SI	SI

LIQUID RELEASE AGENTS

PRODUCT	FORMULATION TYPE	PERCENTAGE OF ACTIVE	PERCENTAGE OF RENEWABLE AND WATER CONTENT	ORGANIC	SILICONE CONTENT	FRUITS & VEGETABLES	BAKERY	INCIDENTAL FOOD CONTACT	POWDER MIXES	SWEETENERS
MAGRABAR® SE-1435N FG 	Silicone Emulsion	35%			35%	SI	SI	SI		
MAGRABAR® SE-1435N FG RTU 	Silicone Emulsion in a "ready-to-use" form	15%			15%	SI	SI	SI		

ABBREVIATION PROPERTIES

-  Vegetable Oil
-  Polyol
-  Mineral Oil
-  NSF International
-  Organic Certified
-  Food Grade Glycerides
-  Silicone
-  Silica Free
-  Organic Compliant
-  Non-GMO



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