POLYURETHANE ADDITIVES FOR FLEXIBLE POLYETHER AND POLYESTER FOAM

SILICONE SURFACTANTS
CATALYSTS
PERFORMANCE ADDITIVES

MIDDLE EAST
AFRICA

EVONIK
Leading Beyond Chemistry

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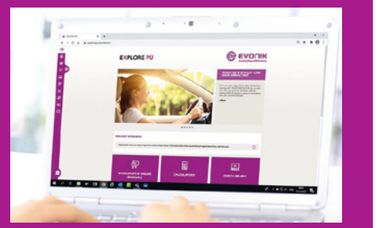
EXPLORE PU – FAST ONLINE SERVICES AND SUPPORT WHENEVER YOU NEED IT!

EXPLORE PU takes our online service offering to the next level; a more personalized experience, with fast access to support from our polyurethane experts, wherever you are in the world.

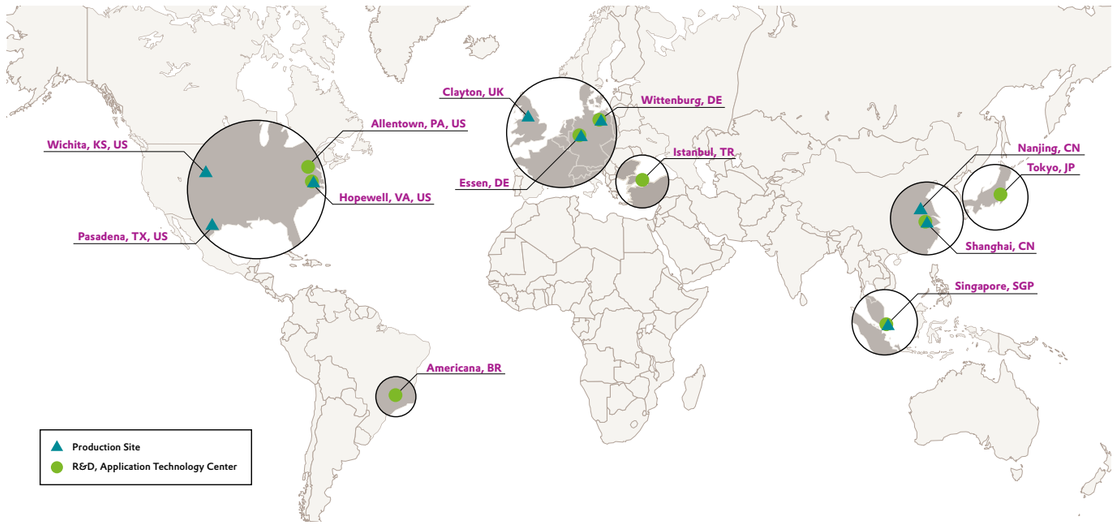


EVONIK – YOUR POLYURETHANE ADDITIVES PARTNER FOR ALL COMFORT FOAM APPLICATIONS

By working in close partnership with the comfort industry, we stay abreast of the latest trends and issues impacting the global market, helping us to meet changing market demands and provide optimized products with the lowest possible VOC emissions.

Over several decades, we have developed a large variety of different specialized products that generate ‘value’ for our customers, including emission optimized catalysts and low cyclic containing silicone surfactants.

WE ARE WHERE YOU ARE



SILICONE SURFACTANTS FOR CONVENTIONAL POLYETHER BLOCK FOAM

All our surfactants are VOC optimized; as a result, the cyclic siloxane (D4, D5 and D6) content is <0.1 wt % in total. For many grades (marked as "ultra-low cyclics"), we have further improved our processes and reduced the total D4, D5 and D6 content down to <0.03 wt %, helping formulators to meet latest cyclic siloxane emission targets, whilst producing high quality foam.

CONVENTIONAL SILICONE SURFACTANTS

Due to their tailored properties, conventional silicone surfactants are suitable for a broad range of different polyether foam grades. However, they are not recommended for FR (flame retardant) foam grades because they require a higher dosage of flame retardants, or the foam might not even pass FR test.

TEGOSTAB®	KEY FEATURES	STABILIZER POTENCY	DENSITY RANGE	NUCLEATION EFFICIENCY	PROCESSING LATITUDE	ULTRA-LOW CYCLICS[1]	CO_2 PROCESSING	SENSITIVE TO HYDROLYSIS
B 8002	Very broad processing latitude for high density foams with low stabilization requirements	◦	H	•	•••			✓
B 8291	Wide processing latitude & medium to low potency for a broad range of formulations	•	M	••	•••	✓	✓	
BF 2370	Outstanding processing latitude to produce very open foam with fine cell structure. Can be used in an extensive variety of foams including Viscoelastic and Hypersoft foams.	••	L-H	•••	•••		✓	✓
BF 2470	Improved gas yield and excellent density distribution	••	L-M	••	••	✓		

L = Low
M = Medium
H = High

◦ = Low performance or narrow processing latitude
• = Medium performance or medium processing latitude
•• = High performance or wide processing latitude
••• = Very High performance or very wide processing latitude

[1] D4, D5 and D6 content < 0.03 wt % (in total)

UNIVERSAL SILICONE SURFACTANTS

Universal silicone surfactants combine high activity with medium FR properties. They are suitable to produce foams with FR requirements like Cal. TB 117 and MVSS 302. Many foam manufacturers also use these silicone surfactants for their conventional foam grades.

TEGOSTAB®	KEY FEATURES	STABILIZING POTENCY	DENSITY RANGE	NUCLEATION EFFICIENCY	PROCESSING LATITUDE	ULTRA-LOW CYCLICS[1]	CO_2 PROCESSING	SENSITIVE TO HYDROLYSIS
B 8110	High potency stabilizer for foams produced with physical blowing agents	•••	L-M	••	•	✓		
B 8115 NEW	Medium activity surfactant combined with medium processing latitude	••	L-M	••	••	✓		
B 8160	Broad processing latitude and fine cell structure for medium density foams	••	L-M	•••	•••	✓	✓	
B 8228	High potency for medium density foams	•••	L-M	••	••	✓		
B 8244	Combination of high potency and good cell opening. Suitable for formulations with hydrophilic / EO-rich polyol	•••	L-M	••	•••	✓		✓
B 8255	Strong nucleation support, fine cell structure and high potency for CO_2 foams	•••	L-M	•••	••	✓	✓	
B 8271 NEW	High activity surfactant for improved recovery after compression (compression set)	•••	L-M	••	••	✓	✓	
B 8272 NEW	Medium activity surfactant combined with broad processing latitude and suitable for CO_2	••	M-H	••	•••	✓	✓	
B 8955	For sealant foams	N/A	M	••	••	✓	N/A	

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•• = High performance or wide processing latitude
••• = Very High performance or very wide processing latitude

✓ = suitable
N/A = not applicable
[1] D4, D5 and D6 content < 0.03 wt % (in total)

FLAME RETARDANT SILICONE SURFACTANTS

Flame retardant silicone surfactants are particularly well-suited for the production of flame retardant foam grades as they enhance the efficiency of the flame retardants by minimizing their contribution to the flammability of the foam. They are essential in Crib 5 formulations.

TEGOSTAB®	KEY FEATURES	STABILIZING POTENCY	DENSITY RANGE	NUCLEATION EFFICIENCY	PROCESSING LATITUDE	ULTRA-LOW CYCLICS (1)	CO_2 PROCESSING	SENSITIVE TO HYDROLYSIS	FR PERFORMANCE
B 8155	Excellent flammability test performance combined with broad processing latitude	••	L-H	••	•••	✓	✓		•••
B 8232	Medium potency combined with broad processing latitude for various FR formulations	•	M-H	••	•••	✓			••
B 8239	Excellent flammability test performance, fine and regular cell structure	•••	L-M	•••	••	✓	✓		•••
B 8239 F	Premium FR surfactant for automotive / flame lamination application	•••	L-M	•••	••	✓	✓		•••

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••• = Very High performance or very wide processing latitude

✓ = suitable
(1) D4, D5 and D6 content < 0.03 wt % (in total)

SILICONE SURFACTANTS FOR HIGH RESILIENCE SLABSTOCK FOAM

Our surfactants for high resilience (HR) foams are specifically designed to cover all of a formulators needs for different cell regulating and stabilizing potencies. Additionally, all products listed below are phathalate free and provide very open foam.

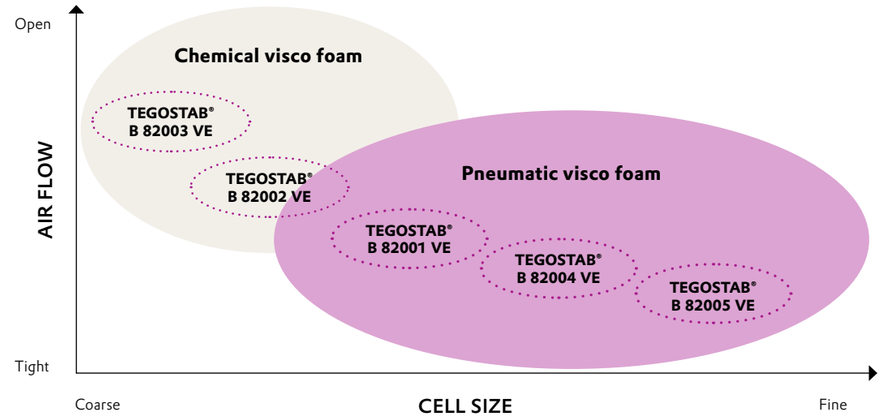
TEGOSTAB®	ACTIVITY	PROCESSING LATITUDE	POLYMERPOLYOL	MDI	TDI	LOW VOC
B 8681	•	•••	SAN/PHD/PIPA	••	•••	
B 8716 LF 2	•	•••	SAN/PHD/PIPA	••	•••	✓
B 8707 LF2	••	••	SAN/PIPA	•••	•••	✓
B 8773 LF2	••	•••	SAN/PHD/PIPA	••	•••	✓

• = Medium performance or medium processing latitude
•• = High performance or wide processing latitude
••• = Very High performance or very wide processing latitude

MDI VISCOELASTIC SURFACTANTS

The TEGOSTAB® B 8200X products are a range of silicone surfactants that are dedicated and qualified for use in MDI viscoelastic foam grades.

We have tailored the performance of these surfactants to suit the intended foam chemistry, e.g. TEGOSTAB® B 82003 VE is ideal for chemical viscoelastic foams as it provides open cell structures, whereas TEGOSTAB® B 82005 VE is well suited to the production of pneumatic viscoelastic foams with very fine and tight cell structures, while avoiding foam shrinkage. Additionally, all the surfactants in this range have an ultra-low cyclic siloxane content, enabling formulators to meet latest cyclic siloxane emission targets whilst producing high quality foam.



To learn more about our latest product portfolio for viscoelastic foams check out our latest online guide on Explore PU.

CATALYSTS

Evonik is the undisputed global leader of polyurethane additives, offering the broadest range of catalysts to the flexible foam industry.

TRADITIONAL CATALYSTS

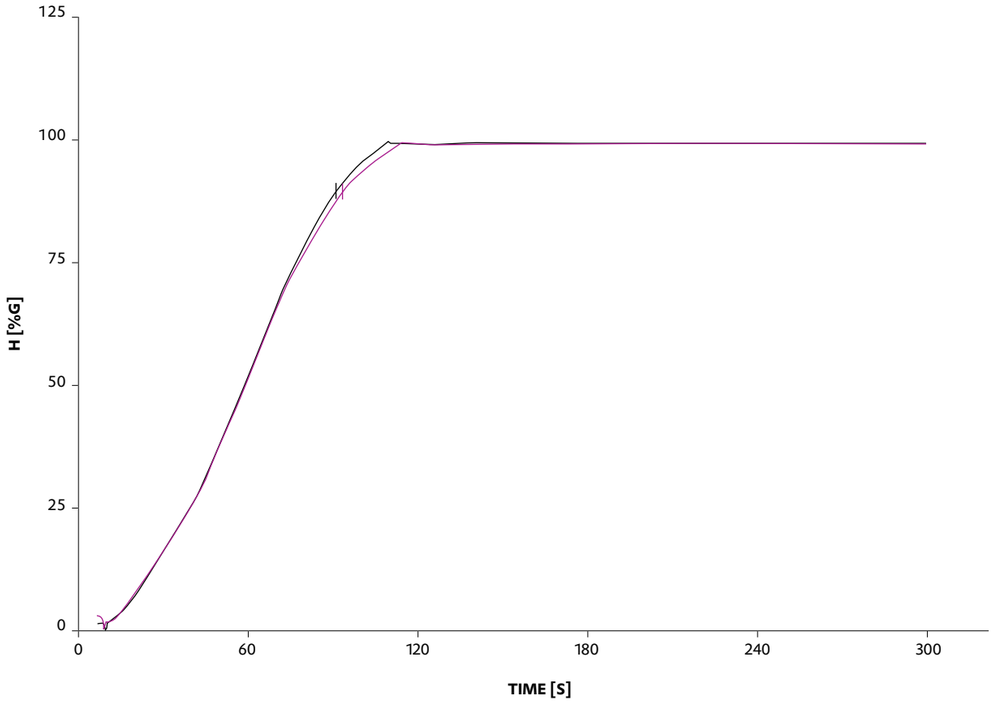
	DESCRIPTION
DABCO® 33 LV	Standard gel catalyst based on triethylenediamine in DPG
DABCO® BL 11	Standard blowing catalyst based on bis(2-dimethylaminoethyl)ether
DABCO® BL 13	Blowing catalyst. Diluted version of DABCO® BL 11
DABCO® DMEA	Moderately active blowing catalyst with broad processing latitude
DABCO® BLV	Standard balanced catalyst
TEGOAMIN® SMP	Well-balanced catalyst with broad processing latitude, especially for low densities, providing additional hardening effect
KOSMOS® 19.	Dibutyltindilaurate (DBTDL)
KOSMOS® T 9	Stannous octoate
KOSMOS® T 900 NEW	Alternative to stannous octoate, offering improved EH&S
KOSMOS® T 900 LV NEW	Alternative to stannous octate with comparable viscosity to KOSMOS® T 9
KOSMOS® 54	Co-catalyst for cold flow prevention in HR and visco foams

INTRODUCING KOSMOS® T 900

KOSMOS® T 900 is a tin catalyst for the manufacture of all types of polyurethane foam.

- Strong gel catalyst
- Alternative to industry standard catalysts such as KOSMOS® T 9
- Improved EH&S profile

KOSMOS® T 900 VS KOSMOS® T 9 FOAMING RISE PROFILE COMPARISON



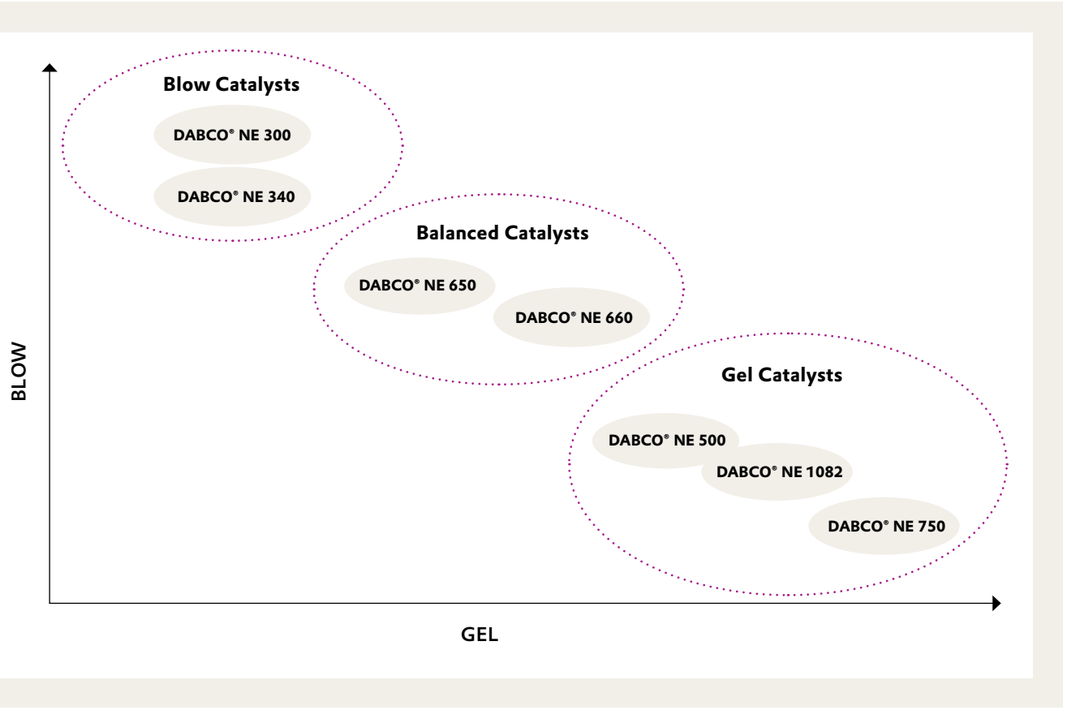
KOSMOS® T 900
KOSMOS® T 9

* T 900 10% higher use level vs. T 9 at density 25 kg/m³ conventional foam

EMISSION OPTIMIZED CATALYSTS

Our latest Negligible Emissions (NE) grades offer reduced emissions compared to traditional amines, resulting in lower exposure to VOC's for both workers and consumers.

	DESCRIPTION
DABCO® NE 300	Low emission reactive blowing catalyst
DABCO® NE 340 NEW	Low emission reactive blowing catalyst allows for precise dosage with all metering systems
DABCO® NE 500	Low emission reactive gel catalyst
DABCO® NE 1082	Low emission reactive gel catalyst
DABCO® NE 750 NEW	Low emission reactive gel catalyst with outstanding gel selectivity Recommended for viscoelastic and hyper soft foams
DABCO® NE 650	Low emission reactive balanced catalyst
DABCO® NE 660	Low emission reactive balanced catalyst
KOSMOS® EF	Emission optimized stannous catalyst



INTRODUCING DABCO® NE 750

- Extra low emission amine catalyst, with outstanding gel selectivity and a similar rise profile to DABCO® 33 LV
- Helps to fulfill both comfort industry labels (including LGA, OEKOTEX) and automotive OEM specifications (including VDA 278)
- Produces foams that can meet PVC staining tests
- Reduced tack free time of the foam
- Reduced odor
- Recommended for viscoelastic, low index and soft foam

PERFORMANCE ADDITIVES

Evonik's portfolio of Performance Additives can help formulators to improve processing and foam physical properties.

CROSSLINKERS AND CHAIN EXTENDERS

ORTEGOL® 720 NEW	Crosslinker for improved compression set properties of HR foams
DABCO® DEOA 85	Crosslinker for HR foam production
ORTEGOL® 204	Additive for cold flow prevention in HR and visco foams
ORTEGOL® G	Highly efficient crosslinker for flexible foams containing fillers
ORTEGOL® CXT	Additive to reduce splits in low index and filler formulations. Also enhances the elongation properties of the foam

ORTEGOL® HARDENERS

ORTEGOL® 2035	Hardening additive
ORTEGOL® HA 1	Hardening additive with broad processing latitude

ORTEGOL® SOFTENERS

ORTEGOL® FS 2	Softening additive to prevent splits in low index formulations
ORTEGOL® 310	Softening additive

ORTEGOL® EMULSIFIERS

ORTEGOL® EM	Emulsifier for formulations with incompatible components
ORTEGOL® NOP	Emulsifier for blends of natural oil-based polyols (NOP) and standard polyols
ORTEGOL® PE 40	Additive to stabilize dispersions of solid powder particles in polyol and emulsifier for incompatible polyol blends

ORTEGOL® TO IMPROVE COMPRESSION SET IN STANDARD FOAM APPLICATIONS

ORTEGOL® 700 NEW	Improving foam recovery after compression and reducing curing time before compression
ORTEGOL® 701	Improving foam recovery after compression. Suitable for automotive applications
ORTEGOL® 702 NEW	Improving foam recovery after compression and reducing curing time before compression. Provides excellent recovery in demanding applications

ORTEGOL® FOR ANTI-SCORCHING

ORTEGOL® AO 1	Antioxidant for scorch prevention
ORTEGOL® AO 7	Highly efficient antioxidant for scorch prevention, low VOC, also in high temparature automotive VOC tests

OTHER PROCESSING ADDITIVES

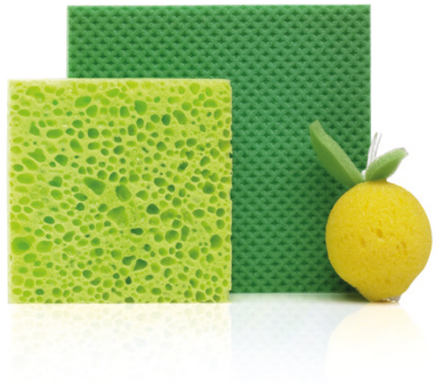
DABCO® BA 100	Acid-based blocking agent for delaying cream time to reduce or eliminate pinholes in foams
ORTEGOL® 500	Cell opening additive for technical flexible foams
ORTEGOL® AST	Antistatic additive
ORTEGOL® AST 2	Antistatic additive with reduced tendency for scorch
ORTEGOL® BS 1	Wetting agent for rebonded foam production to reduce binder level
ORTEGOL® CC 2	Cell coarsener for HR, visco and standard ether foams
ORTEGOL® HPH 1 **ORTEGOL® HPH 2**	Additives to enhance the wetting of foam by liquids, especially water
ORTEGOL® LA 2 **ORTEGOL® LA 3**	Aldehyde scavengers
ORTEGOL® VCO	Cell opener for viscoelastic foams

TEGOCOLOR® COLOR PASTES

TEGOCOLOR® BLACK HI **TEGOCOLOR® BLUE HI** **TEGOCOLOR® RED HI 2** **TEGOCOLOR® YELLOW 2**	• Coloring additives • Brilliant colors • Low VOC- and FOG-emanation • Phthalate- and BHT-free

ADDITIVES FOR POLYESTER POLYURETHANE FOAM

SURFACTANTS
CATALSYTS
PERFORMANCE ADDITIVES



SURFACTANTS

Silicone surfactants are strong stabilizers, which help produce fine and regular cell structures over a wide range of densities.

Organic surfactants are recommended for formulations that need to pass flammability tests or must be clickable.

All our surfactants are VOC optimized.

TEGOSTAB®	KEY FEATURES	DENSITY RANGE	FR FORMULATIONS	SEMI RIGID	LOW VOC
B 8300 CL	Silicone surfactant for standard foams with open and regular cell structure	M			✓
B 8301 CL	Silicone surfactant for high density foams with extremely open and regular cell structure	M-H			✓
B 8325	Silicone surfactant with high stabilizing efficiency for standard and semi rigid foams	L-M		✓	✓
B 8330	Silicone surfactant with high stabilizing efficiency for standard and semi rigid foams	L-M		✓	
B 8383	Silicone surfactant for low density FR foams with very uniform fine cell structure	L-M	✓		✓
B 8356	Organic surfactant for FR foams with improved die-cuttability. Recommended for automotive applications	M	✓		✓
B 8357	Organic surfactant for FR foams with improved emulsification (compared to TEGOSTAB® B 8356). Recommended for activator blends	M	✓		✓

L = Low M = Medium H = High ✓ = suitable

AMINE CATALYSTS

	DESCRIPTION
TEGOAMIN® E 5	Catalytic activity similar to dimethylbenzylamine (DB)
TEGOAMIN® E 10	Catalytic activity similar to morpholine
TEGOAMIN® E 12	Excellent surface curing properties
DABCO® NE 400	Emission optimized and low odor balanced amine catalyst
DABCO® 2039	Well balanced and low VOC amine with similar characteristics as morpholines and DB
DABCO® B 16	Excellent surface curing properties. Co-catalyst to DABCO® NCM
DABCO® NCM	Used as co-catalyst to promote the gel reaction and improve the die-cuttability

PERFORMANCE ADDITIVES

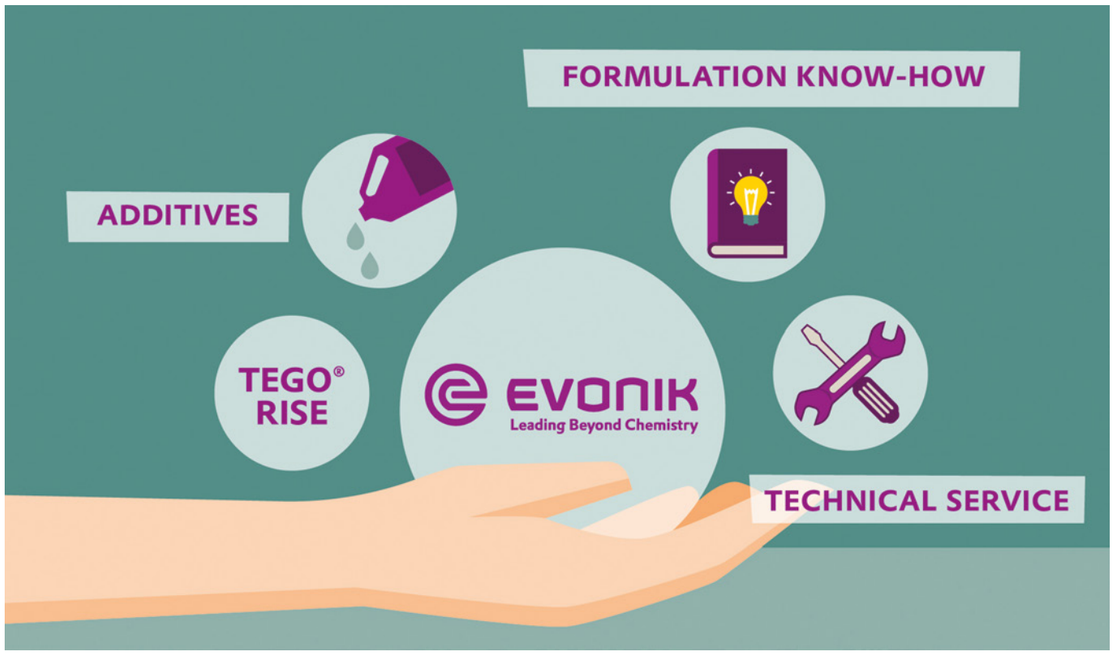
Evonik's portfolio of Performance Additives can help formulators to improve processing and foam physical properties.

PRODUCT	PROPERTIES
ORTEGOL®AO 2	Antioxidant optimized for ester foams, no textile staining
ORTEGOL® AO 7	High efficiency antioxidant with very low VOC contribution, no textile staining
TEGOSTAB® B 8315	Improves emulsification, minimizes the physical property spread
ORTEGOL® 515	Excellent emulsification properties with improved cell opening
ORTEGOL® 701	Improving foam recovery after compression. Suitable for automotive applications
ORTEGOL® CLA 2	Improving foam clickability

AT EVONIK WE GO BEYOND CHEMISTRY TO CREATE INNOVATIVE AND SUSTAINABLE SOLUTIONS FOR OUR CUSTOMERS

TEGO® RISE SOFTWARE: APPLICATION TECHNOLOGY KNOW-HOW AVAILABLE 24/ 7'

- New software tool from Evonik to improve block foam production by optimizing machine setting parameters
- TEGO® RISE helps to reduce production waste and costs
- High simulation quality based on advanced algorithms and experimental data
- TEGO® RISE is embedded into the comprehensive service offering for PU foam producers



EVONIK SUSTAINABLE SOLUTION AREAS

FIGHTING CLIMATE CHANGE

- Products with **reduced carbon footprint**
- **Reduced scrap rate** during foam production

DRIVING CIRCULARITY

- **PU recycling** concepts and processes
- High performance additives and robust processes designed for **recycling PU components**
- **Bio-based products**

SAFEGUARDING ECOSYSTEMS

- **Environmentally benign** PU production processes
- **Reduction of critical components** in PU production

ENSURING HEALTH & WELLBEING

- **Reduced emission** levels in PU foam
- **Increased performance**

Sustainability is taken seriously at Evonik; to learn more about the areas we are focusing on, take a look at our Corporate Sustainability Site.

EVONIK CONTINUES TO INVEST IN NEW SITES & EQUIPMENT, TO SUSTAINABLY DELIVER THE BEST SOLUTIONS AND SERVICES TO THE FLEXIBLE FOAM INDUSTRY

HOME OF POLYURETHANE, TÜRKIYE

- Lab and training center to work in collaboration with customers
- Small scale production, technical and digital services to support formulation development and optimization
- State of the art technical equipment to evaluate foam performance and run quality tests

TWO HIGH PRESSURE FOAMING MACHINES IN ESSEN, GERMANY

- One is dedicated to ester foam
- The second one is suitable for all other slab foam grades including conventional ether, CME, visco, HR, soft and CO_2 foam grades.
- Both machines are designed to help customers
  - develop new formulations
  - troubleshoot technical issues
  - transition smoothly to new materials or technologies from Evonik

OUR COMMITMENT

Evonik is committed to producing new additives that improve productivity, enhance performance and have a reduced impact on the environment and CO_2 footprint. We have strict quality management processes in place as well as many diversity initiatives.

Our products are backed by a global network of support services:

- Local sales & technical service personnel, with in-depth industry knowledge and understanding of your needs.
- Dedicated R&D centers of excellence.
- Analytical labs
- Worldwide manufacturing and warehouse capabilities.

We are the global leader in polyurethane additives offering you the broadest choice of catalysts and surfactants for your flexible slabstock foam applications.

From our TEGOSTAB®, DABCO®, TEGOAMIN®, KOSMOS® and ORTEGOL® brands you will find the right additives for your foam formulation.

SAFETY IS PARAMOUNT AT EVONIK

- Evonik is one of the safest chemical manufacturers globally.
- An industry leader environmental, health and safety (EH&S) performance.
- Every employee is required to understand and adhere to our global EH&S policy. It is a condition of employment.

To discuss your requirements for polyurethane additives for the comfort foam industry, or to learn more about regional product availability.
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08/2023

EVONIK
Leading Beyond Chemistry