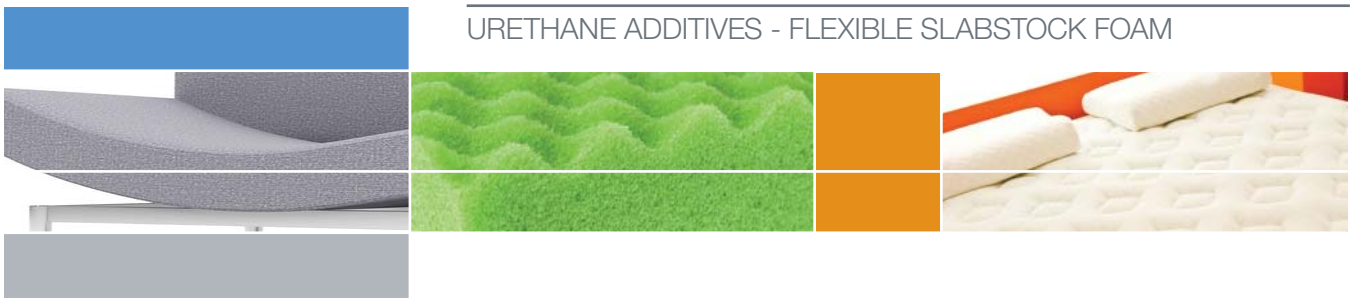
GEOLITE* Modifier 210

URETHANE ADDITIVES - FLEXIBLE SLABSTOCK FOAM



Geolite Modifier 210 is a stabilizing additive whose technology can offer ways to fully eliminate or dramatically reduce the use of auxiliary blowing agents (ABAs) in many grades of conventional slabstock foam.

Like our earlier Geolite products, this technology is based on the principle of lowering the hardness of foam by reducing isocyanate index. This permits the use of higher water and lower blowing agent levels to achieve desired foam hardness.

The use of Geolite Modifier 210 can facilitate the production of numerous foam grades at very low indices (down to about 85), while maintaining acceptable physical properties and processing latitude. The addition of Geolite Modifier 210, or its sister product Geolite Modifier 205, is necessary for the production of such low-index foams.

Relative to Geolite Modifier 205, foams made using Geolite Modifier 210 should reduce more ABA, be softer, possess improved "hand", and exhibit compression set improvements over other additives and technologies used to reduce consumption of ABAs. Geolite Modifier 210 also allows the manufacture of foams possessing greater air flow. Therefore, it may offer greater processing latitude, depending on foaming equipment. A consequence of this may be the need for slightly higher concentrations of tin catalyst.

Key Features and Typical Benefits

- uses existing urethane raw materials
- provides stability for use at isocyanate index as low as 85
- yields softer foam over previous Geolite products, giving improved processing
- often eliminates all ABAs
- good properties in most grades, comparable to conventional foam
- excellent processability of all currently available soft foam technologies
- useful with varied processing technologies, including mechanical cooling
- plant operational in one to two days
- can reduce amine and tin catalyst levels

Typical Physical Properties	
Physical Form	Liquid
Specific Gravity at 25°C	1.115
Weight per Gallon at 25°C (77°F), lb (kg)	9.27 (4.20)
Viscosity at 25°C (77°F), cSt	78
Freezing Point, °C (°F)	< -35 (-31)
Vapor Pressure at 20°C (68°F), mm Hg	> 1
Coefficient of Expansion at 55°C (130°F), per °C	0.00071
Flash Point °C (°F)	47 (116)
Boiling Point, °C (°F)	> 100 (212)
Solubility in Water at 20°C (68°F)	Complete
Water Content, % by wt	22.4
TDI/Geolite Modifier 210 Ratio	2.84/1
Hydroxyl Number (with water), mg KOH/g	1835

Typical data are average data and actual results may vary.
Typical data shall not be used as product specifications.

Foam Properties

Using Geolite Modifier 210 with low-index, high-water formulations typically yields foam with improved physical properties – near those obtained in conventional, lower water, ABA-based systems. In certain cases, with mechanical cooling processes, for example, this technology can lead to foams with vastly improved physical properties, including compression sets. Moreover, this technology helps enable the production of soft, ABA-free foams of manydensities. Soft foams with densities ranging from less than 1.05 pcf (17 kg/m^3) to greater than 2.5 pcf (40 kg/m^3) have been produced using Geolite Modifier 210.

Several performance test formulated grades using this Geolite Modifier 210 technology are shown in the following table.

Table 1: Performance in Slabstock Foams

Density, pcf	1	1	1.25	1.25	1.25	1.25	1.5	1.5	1.5	1.5	1.8	1.8	1.8	1.8
IFD, 25%	15	20	15	20	25	30	15	20	25	30	15	20	25	30
GM-210, pphp	3.5	3.6	2.4	2.5	2.6	2.7	1.7	1.9	2.0	2.1	1.1	1.3	1.5	1.6
Index	85.0	93.0	85.0	93.0	99.0	105.0	85.0	93.0	99.0	105.0	85.0	93.0	99.0	105.0
$MeCl_2$, pphp	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water, total, pphp	6.65	6.30	5.12	4.92	4.76	4.63	4.17	4.03	3.92	3.83	3.41	3.31	3.24	3.18
% ABA Reduction	100	100	100	100	100	100	100	100	100	100	100	100	100	100

The base case is a $MeCl_2$-blown foam (Momentive Performance Materials formulas).

All formulations calculated on same basis: do not include effect of amine, tin, surfactant and other additives.

Processing Considerations

The formulated grades of foam using Geolite technology have been shown to exhibit higher reaction exotherms than conventional formulations since higher water concentrations are required. This concern must be addressed prior to the adoption of this technology. Lower index formulations serve to reduce this high exotherm, but higher than normal exotherms should be expected.

Geolite Modifier 210 virtually eliminates the emission of ABAs, and, when used with low-index formulations, TDI emissions into the plant environment may be greatly reduced.

Geolite Modifier 210 contains 22.4 percent water. This must be taken into account when calculating a foam formulation. It is recommended that Geolite modifier 210 be kept in polyethylene or stainless steel tanks, kept above 50°F and pumped through heat-traced lines when possible.

Example Formulations

The following are some example formulations utilizing Geolite Modifier 210:

Foam Grade (pcf/25% IFD, lb) European Grade (kg/m^3/25% IFD, N/323 cm^2)	**1.0/15 16.0/67**	**1.2/20 19.2/89**	**1.6/22 25.6/98**
Polyol, 3000 Molecular Weight	100	100	100
Water, total	6.6	5.14	3.7
Stannous Octoate, T-9	0.24	0.23	0.26
Niax Catalyst A-133	0.06	0.1	0.17
Niax Silicone L-620	1.2	1.2	1.2
Geolite Modifier 210	3.5	2.7	1.7
Index	85	93	95

Product formulations are included as illustrative examples only. Momentive makes no representation or warranty of any kind with respect to any such formulations, including, without limitation, concerning the efficacy or safety of any product manufactured using such formulations.

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