

NIAX* Catalyst EF-700

URETHANE ADDITIVES - FLEXIBLE SLABSTOCK FOAM



Our Niox EF-series catalysts are liquid, low odor tertiary amines designed to minimize or eliminate amine emissions from foam. The non-volatile nature of these amines is the result of molecular design and high molecular weight. As such these amines are not expected to adversely affect typical foam physical properties.

Niox Catalyst EF-700 is an effective blow amine that can be used to control cream time during manufacture of polyurethane flexible foams. The first application considered for this blow catalyst was in automotive seat molded foams where interior fogging and emissions must be minimized. This new amine catalyst also may be a candidate for consideration in flexible slabstock applications where it can substitute for conventional, volatile, blow amine when emissions need to be reduced.

Key Features and Typical Benefits

- designed to minimize or eliminate amine emissions in automobile interiors
- is easily metered in existing equipment
- required use level is only about 20% greater than for Niox catalyst A-1
- no expected adverse effect on typical foam physical properties

Typical Physical Properties of Catalyst EF-700

Form	liquid
Viscosity @ 20°C, cSt	
Flash Point, Pinsky-Martin Closed Cup (ASTM D), °C	99
Specific Gravity, 25°C	0.955
Freezing Point, °C	11

NIAX* Catalyst EF-700 in flexible slabstock foam

Performance of Niox Catalyst EF-700 Compared to Niox Catalyst A-133

We have compared Niox catalyst EF-700 with a standard blow amine used in the manufacture of flexible slabstock foams, Niox catalyst A-1. Most foamers use a more dilute version of Niox catalyst A-1, but for the sake of comparison we show how Niox catalyst EF-700 compares to this very potent catalyst. Results reported are based on the study performed. Actual results in application use may vary.

Table 1 below contains formulations and reaction parameters that describe the performance of Niox catalyst EF-700. Foams prepared in this comparative study were all water blown in order to more easily discern the comparison with Niox catalyst

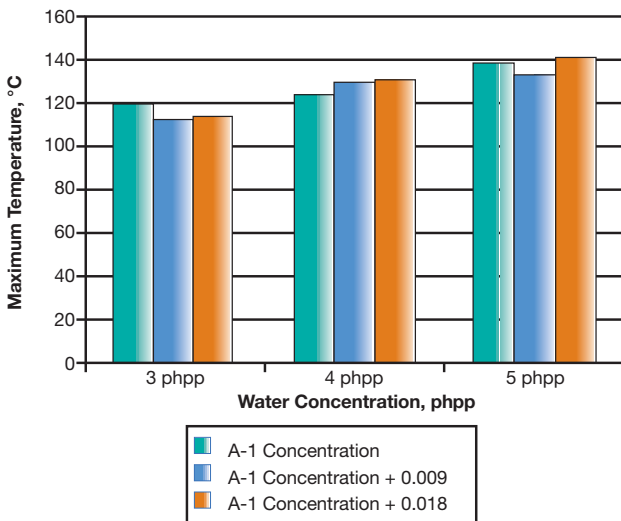
A-1. Standard mix procedures were used. Foams were made in 14" x 14" x 6" cake boxes. Height-of-rise was determined using sonar. Temperature was measured using a thin gauge, thermocouple inserted through the bottom of the cake box to a height of about two inches. Foams were made using 3, 4 and 5-phpp water. For each water level, Niox catalyst EF-700 is compared with Niox catalyst A-1 at two incrementally higher concentrations above that used for Niox catalyst A-1: (A-1 concentration + 0.009) and (A-1 concentration + 0.018). These incremental changes were chosen to enhance statistical evaluation.

Table 1: Comparison of Niox catalyst EF-700 and Niox catalyst A-1

3000MW Conventional Polyol	100	100	100	100	100	100	100	100	100
Water	3	3	3	4	4	4	5	5	5
Niox silicone L-635	1	1	1	1	1	1	1	1	1
Niox catalyst A-1	0.115			0.09			0.065		
Niox catalyst EF-700		0.124	0.133		0.099	0.108		0.076	0.083
Niox catalyst D-19	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225
TDI Index	108	108	108	108	108	108	108	108	108
80/20 TDI	40.70	40.70	40.70	51.14	51.14	51.14	61.58	61.58	61.58
Max Rise, cm	17.1	17.0	17.5	18.5	18.2	18.5	19.5	17.9	18.1
Settle @ 5 minutes, cm	0.21	0.45	0.12	0.16	0.36	0.18	0.02	0.23	0.15
Settling, %	1.2	2.7	0.7	0.9	2.0	1.0	0.1	1.3	0.8
Tmax, °C	119.8	111.6	113.5	124.1	129.3	131	138.8	132.8	141.4
Blow Time (sec)	98.5	118.5	107.1	87.7	107.6	88.5	83	102.4	86.7
~Air Flow, CFM	3.0	7.6	2.8	2.8	7.0	6.1	3.7	7.0	6.5

Figure 1 depicts differences between maximum temperatures obtained in the 12" x 12" x 4" cake box. In each case the foams made with Niox catalyst EF-700 achieved at least the same exotherm, except in the case of 3-phpp water. It can be extrapolated that an increase in catalyst concentration of about 20% would have resulted in about equivalent maximum temperature.

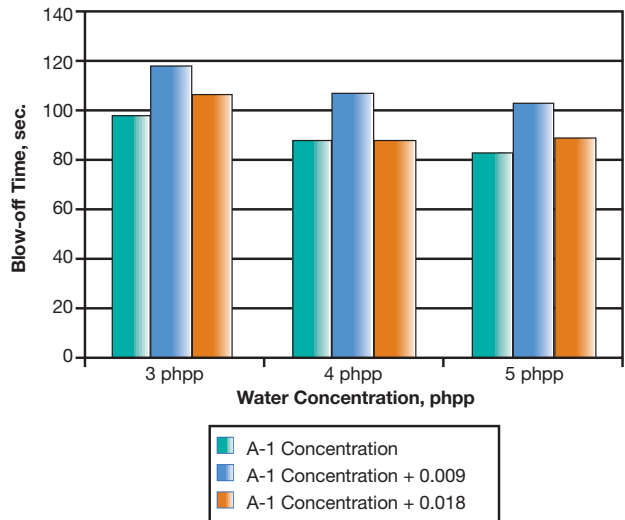
Figure 1: Comparison of Maximum Temperature Achieve



Note: A-1 concentration = 0.115 phpp @ 3 phpp water, 0.09 phpp @ 4 phpp water, 0.065 phpp @ 5 phpp water

Another significant measure of catalyst performance is blow-off time. Note that the blow-off time achieved using Niox catalyst A-1 can be matched with Niox catalyst EF-700. Again it can be extrapolated that had the catalyst been increased by about 20% for the 3-phpp water foam equivalent blow off time would have been achieved.

Figure 2: Comparison of Blow-off time



Note: A-1 concentration = 0.115 phpp @ 3 phpp water, 0.09 phpp @ 4 phpp water, 0.065 phpp @ 5 phpp water

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NIAX* Catalyst EF-700 in flexible slabstock foam

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MOM-121-203-20E-GL 03/11 Printed in U.S.A.

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