

## STATUS REPORT

RIGID FOAMS, NEW RAW MATERIALS, EXPLORATORY  
POWDERED ASBESTOS AS A RIGID FOAM FILLER

ORIGINAL COPY

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**SUMMARY** No improvements in rigid foam properties were observed as a result of incorporating a powdered asbestos filler into NIAX Foam System T-248/T-600. The foam compression properties were severely degraded at a 10 phr asbestos level, and the asbestos filler did not improve flammability properties.

Differences in asbestos-resin mixing methods, wherein a high shear 3-roll paint mill was compared with a low shear laboratory stirrer, were not observed in the properties of the foams made with each of these respective solid-resin mixtures.

While the present study is somewhat disappointing in its findings, work now underway with other solid fillers such as zinc borate may be more encouraging and will be reported in the near future.

**INTRODUCTION** One of the objects of this study was to determine the effect of an asbestos filler on rigid foam properties. Another was to determine what effect the nature of the mixing process (i.e., mixing the asbestos into the polyol system), would have on the foam properties. In the latter study a low shear air-driven laboratory stirrer was compared with a high shear 3-roll paint mill.

Previous studies in the area of powdered fillers in rigid polyurethane foams include the work of Kessell and James<sup>(1)</sup>, who found that inert fillers did not improve the shear modulus properties of the rigid foams under study. These workers also observed that powdered fillers depressed the compressive strength properties of foams, which is in accord with the findings of the present study.

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(1) F. Hostettler, W. R. Proops, E. L. Kessel, R. VanCleve, R. H. Harding, and B. F. James, "Polyurethanes: Rigid Foam Application and Evaluation; Influence of Powdered Fillers on Modulus of Rigidity", Research Dept. Project Report, May 1, 1961.

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PLAINTIFF'S EXHIBIT

UC-4762

**DISCUSSION** In the coatings field there is considerable evidence which indicates the necessity of a high shear mixing process (i.e., mixing certain solids into a paint system), for the realization of optimum coating properties. It was of interest to ascertain whether or not an improvement in rigid foam properties would be obtained by the high shear mixing of asbestos powder into the polyol side of a foaming system.

The data of Table I indicates that, in the T-248/T-600 system of the present study, there is no significant difference between the low and high shear mixing techniques. Furthermore, the data strongly indicates that there is nothing to be gained in foam properties with the use of asbestos powder as a filler. In fact, the foam compression properties rapidly degrade with increasing amounts of filler. Likewise, no improvement is indicated in the flammability properties of asbestos containing foams.

The foam system used in this study was NIAx Resin T-248 (80 parts of BE-320, 16 parts of RO-350, 4 parts KM-1, 26 parts of U-11B, and 1.0 parts of propylene oxide), and NIAx Activator T-600 (98.5 parts of PAPI and 1.5 parts of Silicone L-5310). The procedure used for mixing the asbestos powder into the resin is described in the Experimental section. The powdered asbestos filler was obtained from Mr. N. J. Setter of the Mining and Metals Division (High Purity No. 7 Grade, Chrysotile asbestos).

While the present study is somewhat disappointing in its findings, work now underway with other solid fillers such as zinc borate may be more encouraging in that higher levels of additive do not severely depress the compression properties of the foams having the filler incorporated therein. This work will be reported in the near future.

## **EXPERIMENTAL**

### **Low Shear Mixing**

The asbestos powder was mixed into the T-248 resin system using an air driven laboratory stirrer, over a 1 to 2 minute time period. The fluorocarbon which had volatilized was then re-added, and the T-248/asbestos mixture foamed in a standard manner using T-600 as the activator in the following formulation.

#### **Formulation**

|                 |                      |
|-----------------|----------------------|
| T-248 Resin     | 127 parts            |
| T-52N Catalyst  | 1.0 parts            |
| U-11B           | 13 parts             |
| T-600 Activator | 82 parts             |
| Asbestos Filler | Indicated in Table I |

#### High Shear Mixing

The asbestos powder was first mixed into the T-248 resin system by the use of a bread dough mixer, and stirred for a period of 5 minutes. This "pre-mix" was then passed three times through a 3-roll paint mill, over about a 2-1/2-hour period. The fluoro-carbon which had been volatilized during this processing was then re-added, and the T-248/asbestos mixture foamed in exactly the same manner as described above.

#### Experimental Discussion

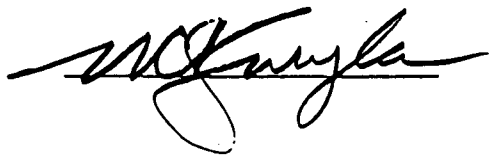
The mixing of asbestos powder into a T-248 resin system at the 5 phr level (parts per 100 parts of polyol blend) gave no particular difficulty in either the actual mixing operation or subsequent foaming of the mixture. However, at higher additive levels the mixtures were increasingly more viscous, and, in fact, mixtures containing 15 phr asbestos were semi-solid in consistency. These 15 phr mixtures were extremely difficult to foam and a good mixing of activator with the mixture could not be accomplished.

The asbestos-containing foams were all friable or "punky", this property being generally proportional to increasing asbestos content and reflected in the compression properties of the foam (Table I).

Additional work is planned for hydrophobic and chemically modified asbestos for use as fillers in rigid foams.

NOTEBOOK REFERENCE: 8WCK-21

ATTACHMENT: 1 Table

A handwritten signature in dark ink, appearing to read "W. J. K. K. K.", is written over a horizontal line.

my

TABLE I  
PHYSICAL PROPERTIES OF ASBESTOS CONTAINING FOAMS  
(SYSTEM - T-248/T-600)

| Asbestos Content (PHR)         | 0    | 5*    | 10** | 10*  |
|--------------------------------|------|-------|------|------|
| <u>Foaming Data:</u>           |      |       |      |      |
| Cream Time (sec.)              | 30   | 28    | 28   | 30   |
| Rise Time (sec.)               | 140  | 110   | 115  | 115  |
| Tack Free Time (sec.)          | 105  | 90    | 90   | 85   |
| <u>Properties Data:</u>        |      |       |      |      |
| Appearance                     | 122. | 122.  | 123. | 123. |
| Core Density PCF               | 1.65 | 1.60  | 1.77 | 2.03 |
| Closed Cells PCT               | 87.  | 85.   | 70.  | 82.  |
| Cell Volume .0001 cc.          | 0.0  | 0.0   | 0.0  | 0.0  |
| <u>Compressive Strength</u>    |      |       |      |      |
| 25C PSI PARL                   | 33.  | 20.   | 7.   | 10.  |
| 100C PSI PERP                  | 8.   | 7.    | 4.   | 6.   |
| Retention PCT                  | 25.  | 14.   | 5.   | 11.  |
| Cold Aged PSI                  | 9.   | 9.    | 0.   | 10.  |
| Dry Aged PSI                   | 92.  | 101.  | 0.   | 140. |
| Humid Aged PSI                 | 0.   | 19.   | 6.   | 10.  |
|                                | 38.  | 18.   | 21.  | 12.  |
|                                | 20.  | 10.   | 4.   | 8.   |
| <u>Cold Aging PCT Change</u>   |      |       |      |      |
| Weight 14 Days                 | -9.6 | -11.5 | -9.2 | -8.2 |
| Volume 2 Days                  | 0.   | 0.    | 0.   | 0.   |
| Volume 14 Days                 | -49. | -23.  | -3.  | 1.   |
| <u>Dry Aging PCT Change</u>    |      |       |      |      |
| Weight 14 Days                 | 2.0  | 1.1   | -6.6 | 0.7  |
| Volume 14 Days                 | 8.   | 9.    | 19.  | 7.   |
| <u>Humid Aging PCT Change</u>  |      |       |      |      |
| Weight 7 Days                  | 0.0  | 0.9   | -8.2 | 41.1 |
| Volume 14 Days                 | -0.6 | 1.2   | -8.7 | -0.2 |
| Volume 28 Days                 | 0.3  | 7.0   | -9.2 | -2.1 |
| <u>Flammability ASTM D1692</u> |      |       |      |      |
| Density PCF                    | 1.60 | 1.52  | 1.82 | 1.95 |
| Ignition Time, Sec.            | 15.  | 12.   | 12.  | 12.  |
| Extinguish Time, Sec.          | 33.  | 33.   | 34.  | 37.  |
| Burning Extent In.             | 1.2  | 1.3   | 1.2  | 1.4  |
| Burning Rate In/Min            | 0.0  | 0.0   | 0.0  | 0.0  |

\* Low Shear Mixing  
\*\* High Shear Mixing

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