

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

EVALUATION OF EUROPEAN MULLEN DIAPHRAGMS

✓ Project 2694-4

Report Five

A Progress Report

to

TECHNICAL DIVISION
FOURDRINIER KRAFT BOARD INSTITUTE, INC.

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SUMMARY

Recently, a member company of the FKI observed that Mullen diaphragms supplied by B. F. Perkins¹ to Europe appeared to differ significantly from the diaphragms supplied by Perkins to the domestic market. Eight of the European diaphragms were evaluated at the Institute. B. F. Perkins was also contacted to obtain information relative to the European diaphragms.

It was found that

1. The European diaphragms are manufactured for B. F. Perkins by Diaphragm Industries (DI) from polyurethane. Perkins also supplies these diaphragms to Karl Frank in Germany. Diaphragms for the domestic market are made by Chicago Rawhide Manufacturing Company from natural rubber.
2. Diaphragms made by Diaphragm Industries carry only a mold cavity number. On diaphragms made by Chicago Rawhide Manufacturing Company the mold cavity number is prefaced with the letters EP.
3. The European diaphragms exhibited pressures at 3/8 inch which ranged from 24.9 to 32.5 p.s.i.g. The average pressure was 27.5 p.s.i.g. In contrast, the last batch of domestic diaphragms evaluated at the Institute exhibited pressures ranging from 30.0 to 33.6 p.s.i.g. and the average pressure was 31.6 p.s.i.g. Thus, the European diaphragms exhibited a lower average pressure and varied over a wider range.
4. B. F. Perkins also supplies the DI diaphragms to the domestic leather and textile industries — apparently because they give a longer life.

¹Div. of Standard International Corporation.

INTRODUCTION

Recently, one of the member companies of FKI indicated that diaphragms supplied by B. F. Perkins¹ appeared to differ significantly from the diaphragms supplied by Perkins to the domestic market. Accordingly, they submitted eight of the European diaphragms for evaluation and comparison with domestic diaphragms. The results obtained are summarized herein.

PROCEDURE

Each diaphragm was evaluated using the following procedure for determining the distention pressure.

1. Attach a 120 p.s.i. gage with rubber coupling to the Mullen tester.
2. Insert the diaphragm in the tester using a clamping force of 1000 lb. when tightening the clamping ring.
3. Adjust the diaphragm so that its top surface is level with the top of the bottom platen.
4. Distend the diaphragm to 0.71 in., ten times.
5. Check the level of the diaphragm and adjust, if necessary.
6. Distend the diaphragm five times to 0.375-in. distention.

Record each pressure reading and average.

In addition to the above, caliper readings were obtained on the center and rim portions of each diaphragm.

¹Div. of Standard International Corporation.

DISCUSSION OF RESULTS

The results obtained on the European diaphragms are summarized in Table I together with results obtained on the last batch of domestic diaphragms submitted by B. F. Perkins (see Report Four, Project 2694-4, July 7, 1971). Table I shows that the European diaphragms exhibited distention pressures ranging from 24.9 to 32.5 p.s.i.g. and averaged 27.5 p.s.i.g. In contrast the domestic diaphragms exhibited pressures ranging from 30.0 to 33.6 p.s.i.g. and the average pressure was 31.6 p.s.i.g. Thus, the European diaphragms exhibited a lower average pressure and varied over a wide range.

The mold cavity designation on the European diaphragms consists of numerical figures - 3, 8, etc. B. F. Perkins advised that this indicates the diaphragms were manufactured for Perkins by Diaphragm Industries (DI). The cavity numbers on diaphragms for the domestic trade (manufactured for Perkins by the Chicago Rawhide Manufacturing Company) are prefaced by the letters "EP" - EP1, EP2, etc.

B. F. Perkins advised that prior to about three years ago they supplied the same type of diaphragm to both the domestic and European market. Since then they have supplied diaphragms made by DI to the European market. Starting about three years ago the domestic leather and textile industry requested diaphragms having greater life. Apparently, about this time Perkins tried using diaphragms made from polyurethane by DI. The DI diaphragms normally exhibit lower distention pressures and are more variable. They are not made to a specified distention pressure level. Apparently, the DI diaphragms are specified by the textile industry when textiles contain nylon thread. Perkins also advised that Karl Frank

TABLE I
DIAPHRAGM RESULTS

European Diaphragms				Domestic Diaphragms ^a			
Cavity No.	Pressure, p.s.i.g. ^b	Caliper, pt. Center Rim		Cavity No.	Pressure, p.s.i.g. ^b	Caliper, pt. Center Rim	
3	25.6	98.0	67.7	EP1	31.9	97.1	64.6
3	25.7	97.2	66.5	EP2	31.3		
6	26.0	98.9	69.0	EP3	32.1		
8	26.2	100.5	71.2	EP4	30.9	97.2	61.0
8	32.5	102.2	72.1	EP5	32.0	99.0	65.3
8	32.4	102.1	70.9	EP6	32.6		
9	26.9	99.7	69.8	EP7	31.2		
14	24.9	95.2	66.0	EP8	32.6		
				EP9	31.5		
				EP10	30.0	96.8	64.0
				EP11	31.6	99.0	66.1
				EP12	31.1		
				EP13	30.7		
				EP14	30.5	98.9	63.2
				EP15	33.6		
				EP16	31.3		
				EP17	30.3		
				EP18	31.5	97.0	61.4
				EP19	31.0		
				EP20	32.6		
				EP21	31.4		
				EP22	32.4		
				EP23	32.7		
				EP24	30.2		
				EP25	32.7	96.9	64.2
Av.	27.5	99.2	69.2		31.6	97.7	63.7

^aResults obtained on last batch of diaphragms submitted by B. F. Perkins. See Project 2694-4, Report Four, July 7, 1971.

^bPressure at 3/8-inch distention.

in Germany buys his diaphragms from them and they supply him with the DI type. Furthermore, some U.S. paperboard companies request the DI diaphragms.

As a matter of interest, B. F. Perkins has advised that the domestic supplier - Chicago Rawhide Manufacturing Company - is going out of the molding business because it has not been profitable to them. Consequently, Perkins will have to find a new diaphragm manufacturer.