TECHNICAL

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

EVALUATION OF JUMBO MULLEN DIAPHRAGMS

Project 2694-4

Report One

A Progress Report

to

TECHNICAL DIVISION
FOURDRINIER KRAFT BOARD INSTITUTE, INC.

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Appleton, Wisconsin

EVALUATION OF JUMBO MULLEN DIAPHRAGMS

SUMMARY

Seven diaphragms from a recent production run were evaluated for diaphragm pressure by (1) B. F. Perkins, Inc., (2) Chicago Rawhide Company, and (3) The Institute of Paper Chemistry. The results indicated that:

1. All diaphragms met Rule 41 requirements according to the tests by Chicago Rawhide Company and the Institute. The Perkins' tests indicated that two of the diaphragms fell below the Rule 41 lower limit of 23 p.s.i.

2. The Institute and Chicago Rawhide Company evaluations were in closer agreement than the Institute and Perkins tests. Relatively large differences between test laboratories were encountered in a number of the comparisons. This possibly indicates that further refinements in test procedure may be required to obtain better reproducibility between laboratories.

In addition to the above, a few cursory trials indicated that the ambient test atmosphere may affect diaphragm evaluation.

PROCEDURE

All diaphragms were supplied by B. F. Perkins and Son, Inc. and manufactured by the Chicago Rawhide Company. Each diaphragm was evaluated by Perkins, Chicago Rawhide Company, and the Institute using the following procedure:

1. Attach a 120 p.s.i. gage with rubber coupling to the hydraulic clamp tester.
2. Insert the diaphragm in the tester using a clamping force of 1000 pounds 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 inch, ten times.
5. Check the level of the diaphragm and adjust if necessary.
6. Distend the diaphragm five times to 0.375 inch distention. Record the readings and average.

at 50% R.H. and 73°F.; however, neither Perkins nor Chicago Rawhide conduct their tests in a conditioned atmosphere. Without conditioning the test humidity would probably be quite low in the winter at normal office temperatures, and in the summer both high humidity and temperature might be encountered.

TABLE I

DIAPHRAGM PRESSURE MEASUREMENTS

Cavity No.	Diaphragm Pressures, p.s.i.				
		Test Laboratory			
	Institute	Perkins	Diff.	Manufacturer	Diff.
1	29.9[a]	22.0	-7.9	26.2	-3.7
16	26.9	24.0	-2.9	28.3	+1.4
17	26.4	22.0	-4.4	26.6	+0.2
24	26.6	23.5	-3.1	27.9	+1.3
1	27.2[a]	26.3	-0.9	23.0	-4.2
6	26.9	26.3	-0.6	27.5	+0.6
16	27.1	26.0	-1.1	25.0	-2.1

[a] Reproducibility rechecks at the Institute gave pressure readings of 29.3 and 27.7 p.s.i. for cavities 3 and 1, respectively.

A limited check of the effect of test atmosphere is being carried out. Because the variable atmosphere rooms were in use, the initial trials were carried out using a heated, dry basement area (about 85°F. and 10% R.H.) and a cold room maintained near 40°F. The cold room humidity was near 83% R.H. For the trials, diaphragm pressure measurements were first made in the 50% R.H. atmosphere. The tester was then moved into the basement or cold room and the diaphragm pressure measured after allowing the tester to stand overnight.

Table IV illustrates the effect of temperature though it should be noted that R.H. was not held constant.

TABLE IV

EFFECT OF TEMPERATURE

	Diaphragm Pressure, p.s.i.
48°F., 83% R.H.	32.6[a]
73°F., 50% R.H.	34.4[a]
85°F., 10% R.H.	37.0[a]

[a]Average of all readings at indicated condition.

Rather unexpectedly it was found that higher pressure readings were obtained in the hot, dry basement and lower pressure readings in the cold, humid conditions. The results seem to suggest that temperature has a greater effect than humidity and also that higher temperatures result in higher pressures. The latter is surprising since most substances become more flexible as temperature increases. Whether the observed effects are associated with the diaphragm, or the instrumental measurement, is not clear. A limited amount of additional work is needed to clarify the reasons for the observed effects.

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