

November 14, 2008

▪ **TEST REPORT** ▪

**PN 81697**

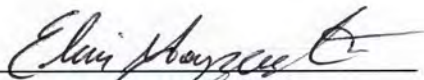
*PO 4934*

**Engineering Department**  
**Dynamic Characterization**

Prepared For:

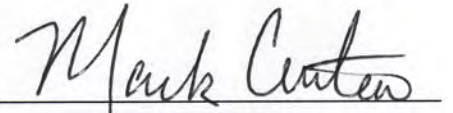
Mr. Don Delany  
Kellett Enterprises, Inc.  
201 Beverly Road  
Greenville, SC 29609  
Phone: (864) 244-7248  
Fax: (864) 292-8612

Prepared By:



Edwin Goyzueta  
Staff Engineer

Approved By:



Mark Centea  
Manager, Engineering

**ISO 9001:2000**  
Registered

ISO 9001:2000 Registered  
Member of ACIL: The American Council of Independent Laboratories

**MEMBER**  
**ACIL**

Letters and reports are for the exclusive use of the clients to whom they are addressed and shall not be reproduced, except in full, without the written permission of Akron Rubber Development Laboratory, Inc. (ARDL). The information contained herein applies to the specific material, products or processes tested or evaluated. No warranty of any kind is herein construed or implied. The liability of ARDL, Inc. shall be limited to the amount of consideration paid for services.

[www.ardl.com](http://www.ardl.com)

2887 Gilchrist Rd. | Akron, Ohio 44305 | [answers@ardl.com](mailto:answers@ardl.com)  
Toll Free (800) 830-ARDL | Worldwide (330) 794-6600 | Fax (330) 794-6610

November 14, 2008

Mr. Don Delany  
Kellett Enterprises, Inc.

Page 2 of 6  
PN 81697

Phone: (864) 244-7248  
Fax: (864) 292-8612

**Subject:** Dynamic Characterization and Coefficient of Friction

**Received:** One (1) material identified as LP-13, 3/8 inch thick

**Dynamic Characterization:**

Test Parameters:

Specimen:	2.0 inch x 2.0 inch x 3/8 inch thk.
Pressure Sweep:	25-500 Psi, 25 Psi increments (Compression)
Frequency Sweep:	10-60 Hz, 10 Hz increments
Amplitude:	0.001 inch (p-p)
Equipment:	MTS 831.20 Elastomer Test System
Test Fixture:	Compression Platens
Temperature:	23°C

Procedure: Each specimen was stabilized at test temperature for at least 24 hours prior to being mounted on the MTS machine for testing. The actuator was positioned, the load and displacement were zeroed, and the test was begun following the parameters above.

**Test Results:**

Specified Frequency	Specified Mean Level	Pressure	Overall Displacement	Neoprene Displacement	Damping Coefficient
Hz	N	PSI	mm	%	N-Sec/mm
10	444.82	25.00	0.17	2.74	35.67
10	889.64	50.00	0.24	3.79	57.46
10	1334.47	75.00	0.29	4.62	80.94
10	1779.29	100.00	0.34	5.41	90.44
10	2224.11	125.00	0.40	6.22	94.72
10	2668.93	150.00	0.45	7.15	84.41
10	3113.76	175.00	0.53	8.31	85.65
10	3558.58	200.00	0.62	9.76	101.68
10	4003.40	225.00	0.73	11.51	106.45
10	4448.22	250.00	0.86	13.52	101.40
10	4893.04	275.00	1.00	15.74	94.14
10	5337.87	300.00	1.14	17.95	103.02
10	5782.69	325.00	1.28	20.17	106.77
10	6227.51	350.00	1.41	22.24	102.46
10	6672.33	375.00	1.53	24.15	103.62
10	7117.15	400.00	1.64	25.86	104.41
10	7561.98	425.00	1.74	27.43	109.81
10	8006.80	450.00	1.83	28.82	110.52
10	8451.62	475.00	1.91	30.06	110.11
10	8896.44	500.00	1.98	31.20	100.37

**Figure 1: Dynamic Characterization Results At 10 Hz**

Specified Frequency	Specified Mean Level	Pressure	Overall Displacement	Neoprene Displacement	Damping Coefficient
Hz	N	PSI	mm	%	N-Sec/mm
20	444.82	25.00	0.18	2.85	19.78
20	889.64	50.00	0.25	3.90	30.51
20	1334.47	75.00	0.30	4.73	39.59
20	1779.29	100.00	0.35	5.53	45.89
20	2224.11	125.00	0.40	6.36	50.09
20	2668.93	150.00	0.47	7.33	48.06
20	3113.76	175.00	0.54	8.53	47.65
20	3558.58	200.00	0.64	10.03	47.52
20	4003.40	225.00	0.75	11.83	48.77
20	4448.22	250.00	0.88	13.88	47.07
20	4893.04	275.00	1.02	16.11	47.27
20	5337.87	300.00	1.16	18.33	51.45
20	5782.69	325.00	1.30	20.52	51.80
20	6227.51	350.00	1.43	22.56	50.94
20	6672.33	375.00	1.55	24.43	53.23
20	7117.15	400.00	1.66	26.13	50.28
20	7561.98	425.00	1.76	27.66	54.68
20	8006.80	450.00	1.84	29.02	53.45
20	8451.62	475.00	1.92	30.25	52.68
20	8896.44	500.00	1.99	31.36	50.06

**Figure 2: Dynamic Characterization Results At 20 Hz**

Specified Frequency	Specified Mean Level	Pressure	Overall Displacement	Neoprene Displacement	Damping Coefficient
Hz	N	PSI	mm	%	N-Sec/mm
30	444.82	25.00	0.19	2.93	13.34
30	889.64	50.00	0.25	3.96	21.04
30	1334.47	75.00	0.31	4.81	27.30
30	1779.29	100.00	0.36	5.61	30.24
30	2224.11	125.00	0.41	6.46	31.14
30	2668.93	150.00	0.47	7.46	33.93
30	3113.76	175.00	0.55	8.71	33.03
30	3558.58	200.00	0.65	10.27	31.63
30	4003.40	225.00	0.77	12.12	32.27
30	4448.22	250.00	0.90	14.20	32.90
30	4893.04	275.00	1.04	16.44	33.04
30	5337.87	300.00	1.18	18.66	33.82
30	5782.69	325.00	1.32	20.82	35.70
30	6227.51	350.00	1.45	22.84	35.41
30	6672.33	375.00	1.57	24.70	33.45
30	7117.15	400.00	1.67	26.36	33.93
30	7561.98	425.00	1.77	27.87	35.78
30	8006.80	450.00	1.85	29.21	31.80
30	8451.62	475.00	1.93	30.41	32.45
30	8896.44	500.00	2.00	31.49	32.01

Figure 3: Dynamic Characterization Results At 30 Hz

Specified Frequency	Specified Mean Level	Pressure	Overall Displacement	Neoprene Displacement	Damping Coefficient
Hz	N	PSI	mm	%	N-Sec/mm
40	444.82	25.00	0.19	2.98	10.48
40	889.64	50.00	0.26	4.02	16.46
40	1334.47	75.00	0.31	4.89	21.64
40	1779.29	100.00	0.36	5.69	24.64
40	2224.11	125.00	0.42	6.56	23.22
40	2668.93	150.00	0.48	7.59	22.46
40	3113.76	175.00	0.56	8.89	24.51
40	3558.58	200.00	0.66	10.47	24.64
40	4003.40	225.00	0.79	12.38	24.82
40	4448.22	250.00	0.92	14.49	24.67
40	4893.04	275.00	1.06	16.75	25.69
40	5337.87	300.00	1.20	18.97	24.91
40	5782.69	325.00	1.34	21.12	24.82
40	6227.51	350.00	1.47	23.12	26.03
40	6672.33	375.00	1.58	24.95	25.38
40	7117.15	400.00	1.69	26.58	28.25
40	7561.98	425.00	1.78	28.07	26.79
40	8006.80	450.00	1.87	29.38	25.91
40	8451.62	475.00	1.94	30.57	23.68
40	8896.44	500.00	2.01	31.63	27.51

Figure 4: Dynamic Characterization Results At 40 Hz

Specified Frequency	Specified Mean Level	Pressure	Overall Displacement	Neoprene Displacement	Damping Coefficient
Hz	N	PSI	mm	%	N-Sec/mm
50	444.82	25.00	0.19	3.02	8.44
50	889.64	50.00	0.26	4.08	12.70
50	1334.47	75.00	0.31	4.94	16.99
50	1779.29	100.00	0.37	5.76	18.85
50	2224.11	125.00	0.42	6.64	18.24
50	2668.93	150.00	0.49	7.71	18.24
50	3113.76	175.00	0.57	9.05	18.73
50	3558.58	200.00	0.68	10.67	19.21
50	4003.40	225.00	0.80	12.63	19.45
50	4448.22	250.00	0.94	14.77	20.08
50	4893.04	275.00	1.08	17.02	20.60
50	5337.87	300.00	1.22	19.25	20.18
50	5782.69	325.00	1.36	21.39	21.34
50	6227.51	350.00	1.48	23.37	19.67
50	6672.33	375.00	1.60	25.17	20.85
50	7117.15	400.00	1.70	26.79	20.75
50	7561.98	425.00	1.79	28.25	20.53
50	8006.80	450.00	1.88	29.55	20.77
50	8451.62	475.00	1.95	30.71	19.37
50	8896.44	500.00	2.02	31.76	20.98

Figure 5: Dynamic Characterization Results At 50 Hz

Specified Frequency	Specified Mean Level	Pressure	Overall Displacement	Neoprene Displacement	Damping Coefficient
Hz	N	PSI	mm	%	N-Sec/mm
60	444.82	25.00	0.19	3.06	7.17
60	889.64	50.00	0.26	4.12	11.67
60	1334.47	75.00	0.32	4.99	14.86
60	1779.29	100.00	0.37	5.83	15.57
60	2224.11	125.00	0.43	6.72	15.86
60	2668.93	150.00	0.50	7.82	15.95
60	3113.76	175.00	0.58	9.19	16.64
60	3558.58	200.00	0.69	10.86	16.18
60	4003.40	225.00	0.82	12.86	16.66
60	4448.22	250.00	0.95	15.02	16.27
60	4893.04	275.00	1.10	17.29	16.95
60	5337.87	300.00	1.24	19.51	16.53
60	5782.69	325.00	1.37	21.63	17.90
60	6227.51	350.00	1.50	23.59	16.91
60	6672.33	375.00	1.61	25.38	17.59
60	7117.15	400.00	1.71	26.97	17.49
60	7561.98	425.00	1.80	28.41	16.08
60	8006.80	450.00	1.89	29.70	17.69
60	8451.62	475.00	1.96	30.84	16.87
60	8896.44	500.00	2.02	31.88	16.58

Figure 6: Dynamic Characterization Results At 60 Hz

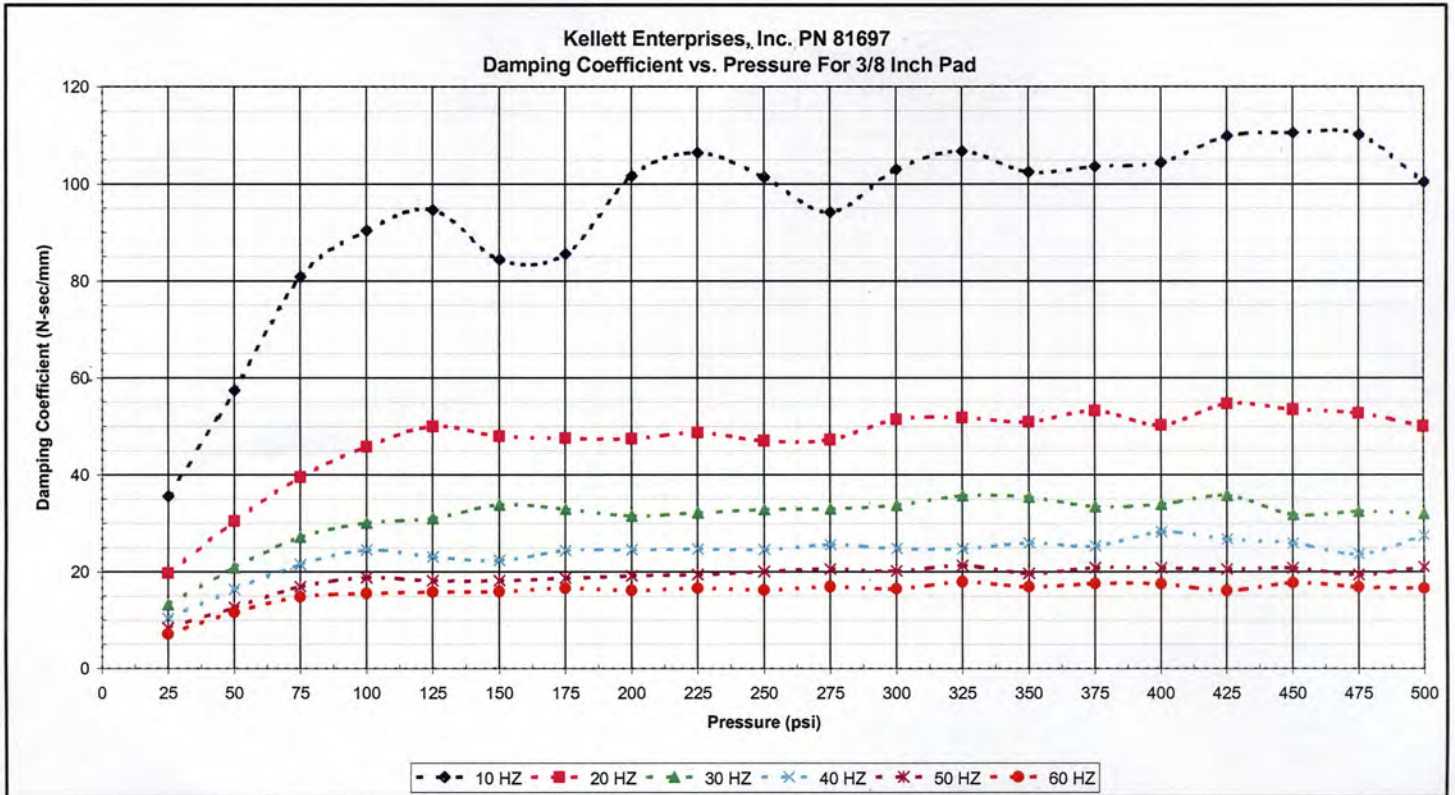


Figure 7: Dynamic Characterization Damping Coefficient vs. Pressure

**Coefficient Of Friction, ASTM D 1894-99 (Modified):**

Procedure: Three specimens were prepared from each submitted sample by mounting a 2" x 2" section on a steel plate. Each specimen was pulled at 6 in/min. across a cold-rolled, high carbon steel substrate, polished smooth to the touch. The sample was loaded with a 200-gram weight. The average was reported.

<u>SAMPLE ID</u>	<u>STATIC, <math>\mu</math></u>	<u>DYNAMIC, <math>\mu</math></u>
LP-13, 3/8 inch thick	0.542	0.515

Prepared By: *Edwin Goyzqueta*  
Edwin Goyzqueta  
Staff Engineer

Approved By: *Mark Centea*  
Mark Centea  
Manager, Engineering