TEST SHOWS MICRO/LEVEL® ISOLATORS PROVIDE SUPERIOR VIBRATION REDUCTION AND SUPPORT COMPARED TO FELT COMPOSITION PADS

Durex Incorporated
Union, New Jersey, 1989.

Management at DUREX, a large contract stamping plant, has long understood the need to mount presses in a way that would reduce the transmission of vibration to the building and surrounding machinery. This counter-productive vibration and structure-borne noise from the floors, walls, ceiling and press structure, has a detrimental, fatiguing effect on machinery and people.

In an attempt to reduce vibration, some presses were installed on felt type pads used on some press mounts and also supplied in sheets cut to size. However, after installing the felt pad material, the vibration transmitted by the presses was not reduced satisfactorily. Machine leveling; tool alignment and "walking" were also problems.

Information obtained at a seminar on improving press operations and mounting techniques, persuaded Durex's Vice President, Andrew Hines, to contact the Vibro/Dynamics LLC. He requested that Vibro/Dynamics supply a set of their Micro/Level® Anti-Vibration Isolators for one of his presses.

Mr. Hines also decided to perform vibration comparison tests on the presses, first installed on the felt composition pad, and again when re-installed and Fine-Tuned on Micro/Level Isolators selected especially for that press.

A series of vibration tests were made on the foundation support a Niagara Model BP2-300-60-36 press.

The test performed two functions:

1. *Measurement of the vibration response of the foundation to the impact force created between the press feet and foundation each time a part was blanked by the press.*
2. *Measurement of the total press frame loading required to make the same part (using the existing load monitoring and die protection systems).*

These tests were performed first with the press mounted on the felt pads and, second, with the press mounted on four of the Model LCM1230/44-2.5E10 Vibro/Dynamics Micro/Level Anti-Vibration Isolators.

Vibration Reduction

The test results showed that on average, *the felt transmitted over 6 times, more vibration* to the foundation than the Vibro/Dynamics Isolators. At the right front foot, the *felt transmitted about 10 times more vibration* than the Vibro/Dynamics Isolators. In other words, up to 90% additional reduction in foundation vibration occurred after removing the felt pad and re-installing the press on the Vibro/Dynamics Isolators. On the average, an 84% additional reduction occurred. See Table 1.

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Table 1 Foundation Vibration Near a 300 Ton Blanking Press Mounted on Felt Pads Compared to Vibro/Dynamics' LCM1230/44 Micro/Level Isolators			
Accelerometer Location	**Acceleration Units***		
	Installed on 1" Thick Felt Pads	**Installed on (4) Vibro/Dynamics' Isolators**	**Percentage of Additional Reduction**
Near Right Front Foot	11.97 g	1.25 g	90 %
Near Right Rear Foot	7.78 g	0.92 g	88 %
Near Left Front Foot	2.14 g	1.32 g	38 %
Near Left Rear Foot	5.64 g	1.02 g	82 %
Average	**6.88 g**	**1.13 g**	**84 %**
** 1 g = 386 inch/second/second*			

Micro/Level Anti-Vibration Isolators provided improved performance in large part because of the superior qualities of the custom engineered neoprene resilient cushion.

This significant reduction of vibration transmission has also reduced press related noised in similar test (M/L-701).

Uniform Support

In addition to high isolation effectiveness, Micro/Level Isolators are designed to provide *ultra precise adjustment* to level the press bed and provide the *proper support to each press foot.*

The LCM1230 Isolators used in these tests are equipped with the Vibro/Dynamics Lod/Sen™ option. This system allowed the percentage of weight supported by each isolator to be measured and observed while adjusting the leveling screws. This resulted in a superior installation over the original condition on the felt pads. During the operation of the press, when mounted on the felt pads, a swaying motion of the press was noticed.

The left front press foot was observed to oscillate in the vertical direction at each stroke and the felt pad under the same foot had partially worked its way out from under the press foot. This condition indicated that most of the press weight was supported by the left rear – right front diagonal pair of press feet, with the remaining weight supported on the right rear foot. Very little, if any of the press weight was supported by the left front foot. This improper support of the press was a result of using the felt type pad and caused the press to twist out of alignment under its own weight. Further evidence of the non-uniformity of support is the lower magnitude of foundation vibration measured near the left front foot.
See Table 1 and Figure 2.

As the dies closed at the bottom of each press stroke, the press structure was forced to snap temporarily into better alignment. This repeated action causes extra wear on press components, increases stress in the press, and shortens die life.

Precision Leveling and Parallelism

The press bed was leveled to within .001 inch per foot at all four of its edges by adjusting the isolators' leveling screws, with each isolator supporting its proper share of the press weight. Also achieved by isolator adjustment was a condition of flatness to within .001 inch per foot across the length and width of the bed surface.

This precision leveling capability of the isolators is very important in that it provides for proper alignment of the press structure. By also providing uniformity of support, the press alignment is maintained throughout the operating cycle. This reduces premature wear on bearing, gibs, etc. Furthermore, it results in a flat uniformly supported bed, allowing for excellent parallelism between bed and slide and increased tooling life.

Less Tonnage Required

A comparison was also made of the tonnage required to stamp the same part as measured by the existing press frame load monitoring system. It was found that the press had to exert extra energy to overcome the twist and misalignment when mounted on the felt type pads. See Table 2. On average, it required 252.7 tons to stamp the part when the press was mounted on felt and only 241.3 tons when the press was mounted on Vibro/Dynamics Anti-Vibration Isolators. Also, the required press frame loading was more consistent (i.e. lesser standard deviation) for the press mounted on Vibro/Dynamics Isolators. The reduction 11.1 tons occurs because of the more uniform support given by the LCM1230/44 Isolators, and the greater effectiveness of these isolators. All of the above help to reduce press downtime, maintenance costs, and increase productivity.

Test Procedure:

An accelerometer pick-up was rigidly mounted to the foundation surface next to each press foot. Calibration was accomplished by setting the input sensitivity of the two-channel spectrum analyzer to the factory calibration setting of the accelerometer used.

The press was single stroked to make each part (blank) from .060" +/- .005" thick 302 stainless steel material.

The resulting vibration signal from the foundation accelerometer was captured by the analyzer when triggered by a signal from an accelerometer placed on the press foot. The measured vibration signals were stored on the computer hard disk, and later recalled to be plotted with identical scales.

Table 2

Total Required Press Frame Loading for a 300 Ton Blanking Press on Felt Pads Compared to Vibro/Dynamics' LCM1230/44 Micro/Level Isolators

Installed on 1" Thick Felt Pads			Installed on Vibro/Dynamics' Isolators		
Test Number	Mean Value	Standard Deviation	Test Number	Mean Value	Standard Deviation
1	250.8	4.3	1	241.4	2.3
2	254.5	2.6	2	241.4	2.6
3	253.0	3.1	3	241.7	2.8
4	251.3	4.8	4	241.0	2.7
Totals	252.4	3.95	Totals	241.3	2.51

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All tests were done using the same press, running at the same speed, and using the same dies and material lot, over a period of two consecutive days.

The measurements were first made with the press mounted on the felt pads. The isolators were then installed and adjusted to precisely level and "Fine-Tune" the press weight distribution and to remove any twist of the press structure and get the bed flat. Level readings were taken on the press bed with dies removed. The die set, was then re-installed, and the press run again using material from the same lot for the comparative measurements.

During the vibration measurement, readings were also recorded from an existing press frame load monitoring system. This system had recently been installed and calibrated. The total "tonnage" required to make the part for each of 10 parts were averaged for each measurement set, for comparison of the two press mounting loads.

Test Results

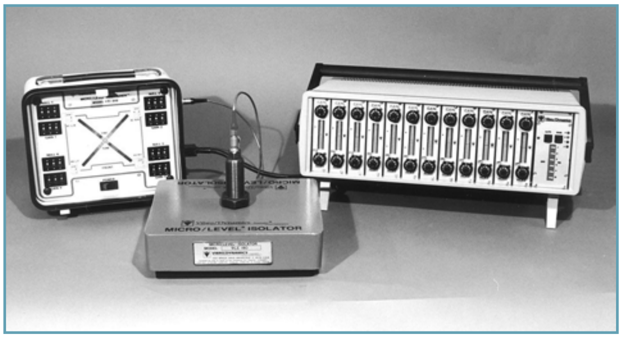
The comparative foundation vibration acceleration (magnitude versus time) time traces are arranged, See Figure 2 in the same orientation as a plan view of the press feet. The time traces are plotted using identical scales for easy visual comparison of magnitudes. The resulting peak magnitudes are given in Table 1. Readings taken from the existing press frame load monitoring system during the vibration measurements are shown in Table 2.

Final level and weight distribution readings as measured with the Lod/Sen System are given in Figure 1. These results were achieved by adjusting the precision leveling screw in each isolator using the Lod/Sen System Analyzer readout and an electronic level on the press bed. The Lod/Sen Analyzer provided an indication of the portion of the press weight supported by each isolator and the relationship of the combined portion of press weight supported on both diagonal pairs of isolators. The isolator adjustment screws were adjusted until the weight supported by diagonal pairs of isolators was optimized along with achieving a flat press bed as indicated by the level readings at the four locations shown in Figure 1.

The level sensitivity was: One division = .005mm/m = .00006 in/ft.

Test Equipment Used:

- (2) PCB Model 307A Accelerometers
- (3) PCB Model 480D09 Power Unit
- CSI Wavepak software, on Compaq computer
- HP Model 7470A Digital Plotter



Lod/Sen Isolator with Available Analyzers.

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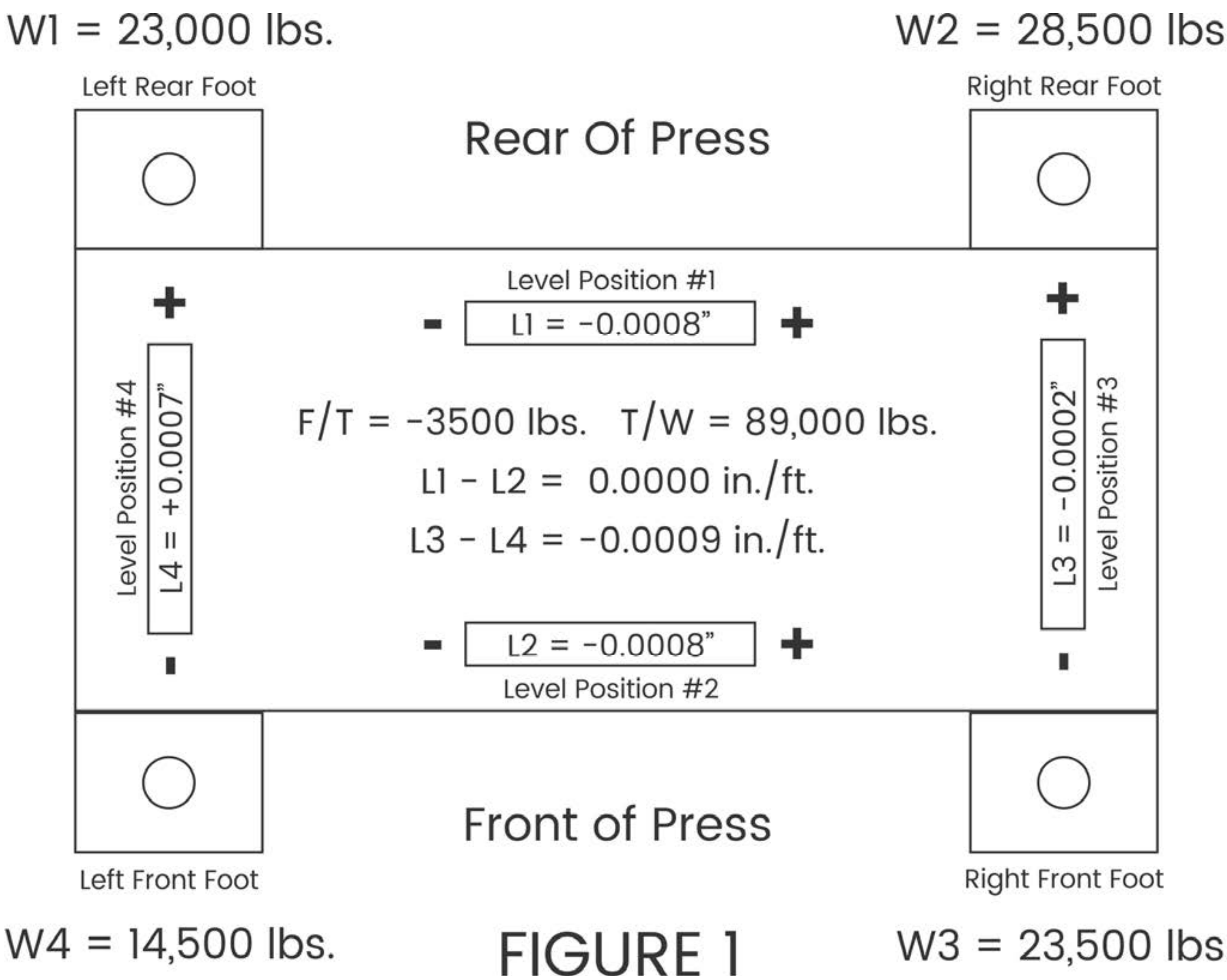

FIGURE 1

Definitions:

W1, W2, W3 and W4 – Lod/Sen System readings showing the portion of press weight supported by the corresponding isolator.

F/T = (W2 + W4) – (W1 + W3). This reading shows the difference between the combined portions of press weight supported on both diagonal pairs of isolators.

L1, L2, L3 and L4 - Level readings in units of slope (inches/foot). The sign convention used is (-) for high in the "front" and "left" and (+) for high in "rear" and "right" sides. The relative difference in slope readings (i.e., L1 – L2, or L3 – L4) from one side to its opposite side gives an indication of the amount of twist across the surface.

VIBRATION COMPARISON ON THE FOUNDATION NEAR A NIAGARA BP2-300-60-36 PRESS.

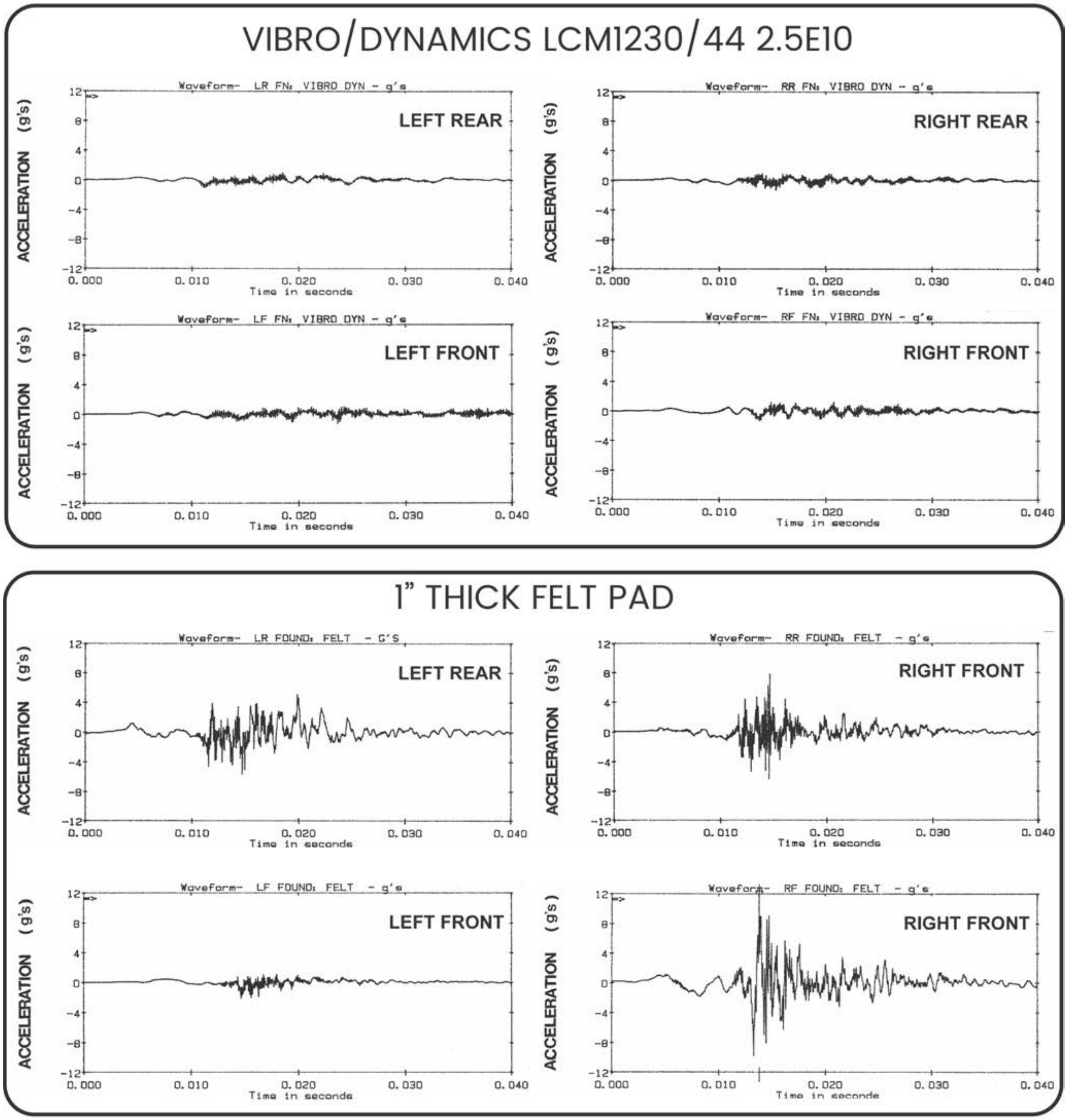

FIGURE 2