Performance Test

Performance Test on Load Cell Amplifier for Controllers (LAC)

We have searched for a suitable amplifier for load cells capable of generating both 4-20 mA scale as well as a 0-10 V scale outputs. In our search, we discovered most amplifiers were simply not very stable. The resolution was 4 decimal places at best and most were only stable to 3 decimal places. If you are concerned with T.U.R. and meeting a tolerance, this lack of stability and/or resolution is a very dominant contributor to your overall uncertainty. Obviously, this impacts the calibration uncertainties. Furthermore, an unstable amplifier can drastically undermine the performance of a load cell and lower the measurement quality even though the user has invested in acquiring a high-quality load cell. In summary, the best way to evaluate the performance of an amplified load cell system is to consider all the influencing factors and evaluate the overall performance of the system.

To evaluate the performance of Morehouse LAC amplifiers, a 10,000 lbf Morehouse shear web load cell was coupled with an amplifier and calibrated in our 12,000 lbf deadweight frame at various test points. The amplifier was set to generate an output of 4-20 mA for the range of load cell capacity. The output of the amplifier was then read at each load point to the last most stable digit. This test was conducted in accordance with ASTM E74 procedure and load cell performance factors such as lower limit factor (LLF), and class A loading range were determined based on the obtained data. LLF is really the expected performance of the device. Most of the amplifiers available on the market gave us an overall LLF accuracy of 0.02 % of full scale. However, the Load Cell Amplifier for Controllers (LAC) allowed us to read to 5 decimals on this 10000 lbf load cells, and the overall accuracy was better than 0.005 % of full scale. Table 1 displays the results of the load cell amplifier system calibration and resulting accuracy values.

Table 1: ASTM E74 Calibration Results for 10,000 lbf Load Cell System with LAC

Factor	Output mA	LBF	%FS
LLF	4.0004401	0.28	0.003
Class A	4.1760276	110.24	1.102
Class AA	4.8801378	551.20	5.512

At this point, we knew we had to test another one. We did the second test on a 1000 lbf Morehouse Ultra- Precision Load Cell and the test proved conclusive. Table 2 contains the calibration results for the 1000 lbf load cell system with LAC. Furthermore, Figure 1 demonstrates the non-linearity analysis performed on the 1000 lbf load cell. The maximum non-linearity observed was around 0.007 % of the full-scale output. It is noteworthy to mention that the rated non-linearity of the Morehouse Ultra-Precision Load Cell is 0.02 % FS. This test proved that LAC did not undermine the performance of the load cell system with regard to non-linearity.

Table 2: ASTM E74 Calibration Results for 10,000 lbf Load Cell System with LAC

Factor	Output mA	LBF	%FS
LLF	4.0003742	0.02	0.002
Class A	4.1496986	9.35	0.935
Class AA	4.7484929	46.77	4.677

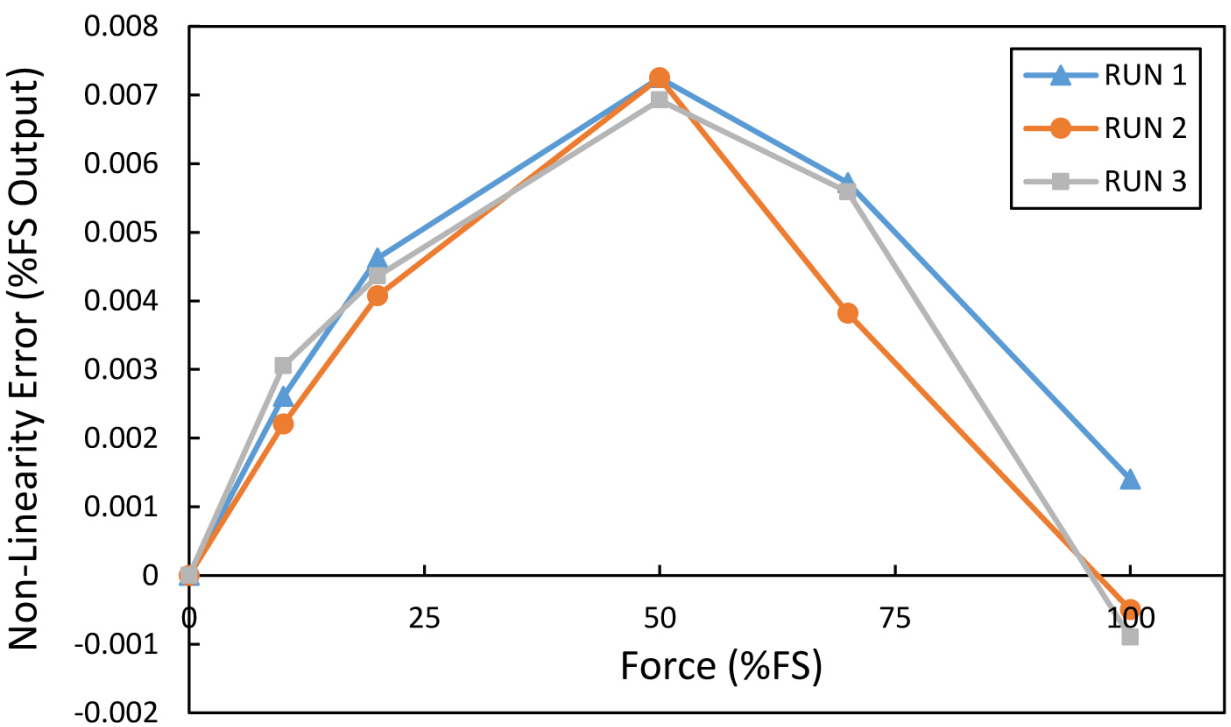

Figure 1: Non-Linearity Analysis of the 1000 lbf Load Cell System with LAC

By conducting this set of performance tests, we finally found a load cell amplifier that would not degrade the accuracy of the load cell. We are very pleased to add the Morehouse LAC to our product line. This is an exceptionally stable amplifier with high versatility which can help make your industrial control or automations system more effective. It offers bipolar voltage output ±10V, and current output 0-20 or 4-20mA. It can drive up to 8 Pc 350-ohm load cells and features a wide voltage range and isolated power supply.