

Force and Torque Calibration Quarterly



A Message from the President

Welcome to our first ever Morehouse Instrument Company Newsletter. Throughout our relatively short 85-year history, we have collected a significant amount of data regarding Force Calibration and, more recently, Torque Calibration. We have provided training classes at NCSLI's regional events, and have given our Fundamentals of Torque Calibration Class for the last five years at the NCSLI conference.

Our Engineer, William Lane, teamed up with David Waind at Stahlwille to present Torque at MSC. During the last four years, we have hosted 1 and 2-day Force classes here at Morehouse. We continue to offer classes, and often partner with other industry experts to present multiple day classes. Currently, we have a 2-day Force course scheduled on March 23, 2015, with Dilip Shah covering Measurement Uncertainty on the first

day, and Henry Zumbrun presenting a full day force workshop on day #2. In addition, I have published various articles on topics ranging from why we need torque traceability (NIST does not offer Torque Calibration) to the effect of ignoring the trailing zero. With all of this being said, we have decided to start a newsletter to share some of our acquired knowledge. I sincerely hope you enjoy it. – Henry Zumbrun

INSIDE THIS ISSUE:

Point of Use	1
Thread Loading	2
Company History	3
Cut Cable	3
Trivia Question	4

Tips from the Cal Lab – Point of Use to Save Time

Have you ever noticed a technician running around your facility asking, "Does anyone have a 5/32-inch Allen wrench?" Well, if you are reading this and you are not in the United States, Liberia, or Burma, the 5/32-inch may not make much sense. Didn't the US Government pass something in 1988? Oh yes, they passed the Omnibus Trade and Competitiveness Act. So, the technician should really be asking, "Does anyone have a 3.5 mm Allen wrench?" If this or

a similar scenario happens at least twice a week, and it takes the technician 10 minutes to find the misplaced or appropriate tool, this would add up to 1,040 minutes per year. 1,040 minutes equates to 17.33 hours per year wasted on hunting down the right tool. If your lab rate is around \$60.00/hr, that's over \$1,000.00 that could be added to the bottom line. The cost of most common tools and a magnetic strip is less than \$50.00. I think we invested about \$35.00 in

the tools pictured below.



If you notice the picture on the far left, you will see a common theme at Morehouse. The theme is "point of use." We keep the most commonly used tools close to the machines where the technicians work. We do this to reduce cycle time, and because we do not like excess motion.



(PICTURE OF MOREHOUSE 10 MN UNIVERSAL CALIBRATING MACHINE AREA)

Potential Measurement Error

Loading Through Bottom Threads in Compression

It is important to remember that not all calibration laboratories provide the same type of calibration service. For load cells calibrated in compression there may be a noticeable difference in output. The output is dependent on the calibration fixtures used at the time of calibration, the alignment of the UUT (unit under test), the hardness of the top adaptor used, etc. These are all potential topics for later newsletters. In this article, we are going to discuss how loading through the bottom threads in compression may affect the output on certain types of load cells.

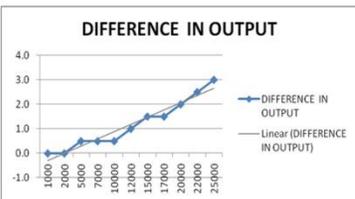
For some labs, it is standard practice to load flat against the base, while other labs may load the cell through the threads. It is important for you, the end user, to know if your load cell was calibrated against a flat base or through the bottom threads; it could make a difference. At Morehouse, our standard procedure is to load a cell flat against the base, as seen in the picture on the bottom left. We are aware of other labs whose standard procedure is to load the cell through the bottom threads. For shear web type load cells there is a difference and that we can put a number on the potential difference between these two calibration methods. For the test below, we took a standard shear web style load cell and calibrated it using our dead weight force machine. We believe we can realize the unit of force with this machine to about 0.0015 % or better. The results listed below show a difference of about 0.012 % in output at full scale. This 0.012 % difference is about four times larger than the original reported uncertainty. If the compression calibration method is not listed on your certificate of calibration, I would suggest calling your calibration laboratory and asking how they calibrated your load cell in compression. We shot a video that shows a different test with similar results; the video can be found at <http://www.mhforce.com/force>.

“It is important for you, the end user, to know if your load cell was calibrated against a flat base or through the bottom threads; it could make a difference.”

COMPRESSION LOADING OF LOAD CELLS LOADING AGAINST THE BASE OF THE LOAD CELL VERSUS LOADING THROUGH THE BOTTOM THREADS

THIS TEST WAS DONE TO SHOW THE POTENTIAL DIFFERENCE IN OUTPUT BY LOADING A SHEAR WEB LOAD CELL AGAINST THE BASE OF THE LOAD CELL VESUS LOADING THROUGH THE BOTTOM THREADS

THE TEST INSTRUMENT USED WAS A MOREHOUSE ULTRA PRECISION LOAD CELL AND A MOREHOUSE 4215 METER
 THE FORCE WAS APPLIED TO THE LOAD CELL USING MOREHOUSE 120,000 LB DEAD WEIGHT MACHINE S/N M-7471
 THE WEIGHTS IN THIS MACHINE WERE CALIBRATED DIRECTLY BY NIST AND ARE ACCURATE TO .0015% OF APPLIED FORCE.
 AN ASTM-E74 CALIBRATION WAS PERFORMED ON THE LOAD CELL AND THE UNCERTAINTY OF THE LOAD CELL WAS DETERMINED TO BE .798 LBF
 FOR THE PURPOSE OF THIS TEST THE LOAD CELL WAS KEPT AT THE SAME ORIENTATION, ONLY THE BOTTOM ADAPTERS WERE CHANGED



FORCE APPLIED	LOAD CELL OUTPUT LOADED AGAINST BOTTOM BASE	LOAD CELL OUTPUT LOADED AGAINST BOTTOM THREADS
1000	999.0	999.0
2000	1998.0	1998.0
5000	4996.0	4996.5
7000	6995.0	6995.5
10000	9994.5	9995.0
12000	11994.0	11995.0
15000	14993.5	14995.0
17000	16993.5	16995.0
20000	19994.0	19996.0
22000	21994.0	21996.5
25000	24994.0	24997.0



The History of Morehouse Instrument Company

In 1920, Morehouse Machine Company was founded by William S. Morehouse and became known for its ability to manufacture precision parts. This was due to the machining skills of Mr. Harry E. Zumbrun.

During the early 1920's, Morehouse quickly grew a reputation as the machine shop that could improve on existing designs. One of those designs came from the National Bureau of Standards (NBS).

Mr. Morehouse had a second cousin who happened to work at NBS; he put Mr. Morehouse in touch with certain scientists. The year was 1925, and those scientists were Dr. H. L. Whittemore and Dr. S. N. Petrenko of the United States National Bureau of Standards (NBS). Dr. Whittemore and Dr. Petrenko approached Morehouse about developing an instrument for calibration of force measuring systems.

Throughout the late

1920's, Mr. Morehouse and Mr. Zumbrun developed and perfected this instrument, which is now known as the Morehouse Proving Ring. Today, there is a Morehouse Proving Ring on the International Space Station.

As the years passed, with the introduction of rocket and jet engines and the need for precise measurement of the thrust generated by these engines, Morehouse Company and generations of the Zumbrun family designed and developed instruments and machines for the calibration of those thrust measuring systems. Morehouse developed Universal Calibrating Machines, Dead Weight machines, and several general verification instruments, all relating to force measurement.

Today, Morehouse Instrument Company is a world leader in precise and unquestionable force calibration. Morehouse Instrument Company offers accredited force

calibrations traceable to the National Institute of Standards and Technology and is certified accordingly.

Following the tenacity of its forefathers, Morehouse Instrument Company set forth, in 2010, to complete the construction of its Primary Torque Calibration Laboratory. With a little help from the lads over at NPL, Morehouse Instrument Company has become the home to the NPL torque machine that is the second most accurate torque machine in the world.

Since its inception, Morehouse Instrument Company has remained in the Zumbrun family. Knowing the value of cousins, we tend to keep some around. So if Mr. William Lane (1st cousin of Mr. Harry Zumbrun), Mr. Henry Zumbrun (son of Harry), or Mr. Ed Lane (son of William Lane) answers the phone, be sure to ask for their first name to avoid any confusion.



Mr. Harry Zumbrun and Mr. William S Morehouse circa 1930



Morehouse Brinell Proving Ring S/N 14
Calibrated by
U.S. Bureau of Standards
Test # 47197 May 24, 1926

Zumbrun Family History at Morehouse

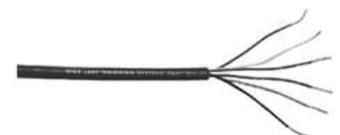
- 1920's – Mr. Harry Zumbrun
- 1940's – Mr. Henry Zumbrun and Sara Zumbrun Paul
- 1980's- Present Mr. Harry Zumbrun
- 1990's – Present Mr. Henry Zumbrun II

Whoops, I accidentally severed my cable again.

Oh no, I just severed my cable! I'll just make a new one. My output won't change, right? When replacing a cable, there are a number of details to consider. Is the cable wired with 4 wires or 6 wires? What is the length of the new cable? What is the wire gauge for the new

cable? All of these questions need to be answered before producing a new cable. If you wire the new cable with sense leads, length and wire gauge may not significantly impact the measurement result. If you only have a 4-wire setup, all bets are off when determining the new output. With a 4-wire

system, the only safe bet is to get your system recalibrated.



Our second newsletter will feature an in depth article on 4 versus 6 wire load cell cabling.

Morehouse
Instrument Company
1742 Sixth Ave
York, PA 17403
Phone:
(717) 843-0081
E-Mail:
Sales@mhforce.com
We're on the Web!
Visit us at:
www.mhforce.com

Upcoming Events

On Monday, March 22 and Tuesday, March 23, Morehouse will be hosting a 2-day force course. Day 1 will be a Measurement Uncertainty boot camp that will be taught by special guest instructor Dilip Shah. Day 2 is a basic Fundamentals of Force class that features a bit of hands-on activity and has been deemed "the best force class available on March 23, 2015 in York, PA." – Sir Fourptfor E. Newton

Morehouse will be at the NCSLI conference in Grapevine, Texas from July 18th through July 24th. During this time, we will be giving 2 half-day tutorials:

Sunday, July 19th 8:00 AM-12:00 PM – T12 Force Calibration

Monday, July 20th 8:00 AM-12:00 PM – T20 Fundamentals of Torque Calibration

Thank You and Future Newsletters

If you've made it this far, I would like to extend a giant "thank you" for reading our first official newsletter.

Do you have a topic you would like to see covered, or would you like to submit a guest article for an upcoming newsletter? Please feel free to contact us with topic suggestions

or article proposals. We are always looking to improve, so please feel free to contact us and provide any feedback.

Please email any correspondence to
hzumbrun@mhforce.com

Pointless Opinion #1

There is a major problem in the toilet paper industry that requires more testing. It seems that the tensile strength of toilet paper is much lower than the torque required to unroll it. I kindly ask for all toilet paper manufacturers to use a more accurate testing regime.



Trivia Question: The first 5 people to answer correctly will win a Morehouse USB Dual Purpose 4 GB Flash Drive

Question: What meter does Morehouse currently offer that has true 6-wire sensing capabilities with an illuminated display?



Morehouse
Instrument Company, INC.

HIGHLY ACCURATE ISO 17025 ACCREDITED FORCE AND TORQUE CALIBRATION SERVICES.
MANUFACTURER OF REFERENCE AND FIELD CALIBRATION STANDARDS.

1742 Sixth Avenue
York, PA 17403-2675 U.S.A.
Tel: (717) 843-0081 Fax: (717) 846-4193
Email: sales@mhforce.com
website: www.mhforce.com