Morehouse Instrument Company

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Force and Torque Calibration Quarterly

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(PICTURE OF MOREHOUSE QUICK CHANGE ADAPTERS. THESE ADAPTERS REDUCE CALIBRATION SETUPS BY REDUCING THE EQUIPMENT NEEDED FOR TENSION AND COMPRESSION.)

A Message from the President

Welcome to our third Morehouse Instrument Company newsletter. This July, we attended NCSLI for the sixth year in a row and presented both a torque and force tutorial. Both of these tutorials received very positive feedback. In presenting these tutorials, our mission is for continuous improvement and to make every class better than the last one. Honest feedback from participants is expected and implemented. This year, we participated in "train the trainer" for the second time. There was a lot of information presented and this year's class has given us future suggestions on improving our tutorials even more. During the conference, William Lane—our Design Engineer—and Henry Zumbrun each received a 5-year award for our torque tutorial. Both of us are honored to be a part of NCSLI. We have also added Phil Smith to our staff. For those who do not know Phil, we will be running a future newsletter article on him. Phil comes to Morehouse with the task of leading a Business Development team. The goal of this team will be to better serve our customers through a "More Service" campaign. We will be improving our calibration reports and will continue to provide custom engineering solutions for machined products.

-Henry Zumbrun

Tips from the Cal Lab – Setup Reduction

About three years ago, several Morehouse employees went through a lean manufacturing course. Part of this course emphasized reducing cycle time by reducing the amount of time it would take to set up equipment to run a part. During the class, the concept "quick changeover" was applied to single piece flow. We had the idea to apply some of these setup reduction concepts to our calibration lab since the workflow mimics that of single piece flow production. The purpose of setup reduction is to reduce changeover time. In the calibration lab, this may mean switching to a new instrument or switching from one mode to another. Reducing the changeover time allows for a more efficient calibration process that does not sacrifice quality, while improving cycle time. Reducing cycle time allows for improvements regarding on-time delivery, reduction in cost from excess inventory, and increase in machine capacity levels. In a company-wide effort, we developed "quick change" calibration adapters. These adapters simplified our setups, improved our performance, and were cost-effective compared to the alternative of multiple pieces of threaded rod or multiple rod end type setups. As a result of implementing setup reduction, we were able to standardize production flow, provide better measurements, and free additional floor space for future expansion.

Video can be found here

Potential Measurement Error

Unbolting Load Cells May Not Produce Repeatable Results

"If you are working to a standard such as ASTM E8 or another ASTM standard that references ASTM E4, then you must have your equipment calibrated in accordance with the ASTM E4 procedure."

If you are working to a standard such as ASTM E8 or another ASTM standard that references ASTM E4, then you must have your equipment calibrated in accordance with the ASTM E4 procedure. ANNEX A1. VERIFYING THE FORCE MEASURING SYSTEM OUT OF THE TEST MACHINE in the ASTM E4 procedure lists the reasons to perform force measuring system verification out of the test machine. These reasons include: Inadequate spacing within the testing application load train to allow placement of the force standard; physical impossibility of applying a primary dead-weight force in the compression mode without removal of the force measuring system (Note: The force measuring system includes the indicator); and test rigs that do not have a reaction frame. When you send a load cell that requires bolting, you should not expect the calibration results to be valid for your testing needs.

If you are **not testing the load cell in the machine in which it is being used and are not working to a standard that references ASTM E4 or ISO 7500**, you will need to account for additional errors due to the following: mounting considerations, variation between different bolts, material in the base, surface finish on the base, hardness, stiffness, alignment, flatness, bending, and variations from using different bolting sequences that may contribute to the uncertainty. The torque wrench that may or may not be accurate to 4 % of applied torque that was used to torque the bolts must also be considered. This assumes a torque wrench was even used. Even if all of these potential errors are quantified, an R&R study must be performed between the technicians installing the load cell in the machine and the technicians in the laboratory performing the calibration. Is there a significant difference between these technicians? My assumption is that any lab going to these great lengths to quantify all of these errors has already realized that there is probably a better way to ensure more repeatable results.

Morehouse is always going to suggest purchasing the proper equipment that will allow for calibration of the load cells in the machines that are being used. There are two very good standards that will give you the detailed instructions on how to use a load cell system to calibrate these load cells in place. These standards are ASTM E4 and ISO 7500. If you are working to ASTM standards that reference ASTM E4 as a calibration requirement, it is important to note that the entire system needs to be calibrated, if removed. When equipment is not available to allow for in-place calibrations, remember to follow the standard and account for the various uncertainty contributors listed above, in addition to environmental conditions, the uncertainty of the reference standards used to perform the calibration, the resolution of the device, the stability of the instrumentation, and the reproducibility and repeatability of the measurement process.

It is important to remember that most load cell manufacturers will not warranty a cell that has been removed from the base.

Meet Our Staff – William Lane, Design Engineer

I am William H. Lane (Bill). In 1973, I graduated from PSU with a BS in Mechanical Engineering and later acquired my Professional Engineer License (PE) in the Commonwealth of Pennsylvania.
Already related to the Zumbrun family by marriage, I joined the Morehouse Instrument Company family in 1985. My cousin Harry Zumbrun came to work at Morehouse several months prior. We were hired and trained to take over the daily operations of Morehouse Instrument Company. At the time I was hired, Morehouse was manufacturing proving rings and calibration test equipment and doing subcontract manufacturing for local companies.
When Harry and I started, there was a teletype machine in the office. Drawings were all done manually. Any quoting, purchasing or communications were typed on a typewriter. Calibration was a much smaller part of the business and would be handled by the engineer and draftsperson requiring only several hours a week.
As members of ASTM, we were involved in writing and updating the original ASTM E-74 document.
Over the past 30 years, we have upgraded our shop facility from manual equipment to CNC machine tools with CAM to generate part programs. All design, manufacturing and customer drawings are done using three-dimensional SolidWorks software. However, we have maintained the design and manufacturing information on our products as far back as 60 years and still offer service and maintenance on this equipment.
In 2004, a 500,000 Newton (120,000 lbf) primary dead weight standard was designed and built. This was installed in a new temperature-controlled calibration lab. Later, the secondary standard was up-graded to 10 Mega Newton (2.25 million lbf). In 2010, a 2000 Nm (1475 ft-lb) primary torque standard from NPL England was added in a second temperature-controlled lab. With these added facilities, a portion of the business has shifted from manufacturing to calibration and technology services. Morehouse has been transformed from a local machine shop to an international technology and service provider.
During my time at Morehouse, I have always taken a hands-on approach to every project. I am working with a great staff that includes the shop, sales, marketing, calibration and engineering teams. Recently, I began design work on a pneumatic loading torque retrofit system.
During the last several years, I have had the privilege of working with student interns from York College on projects that have the potential to develop into future products.
Personally, I am an active member of national engineering and manufacturing societies. I belong to Zion United Methodist Church and serve on their Board of Trustees.
In my spare time, I enjoy hunting, fishing, shooting sports and gardening. Email: Blane@mhforce.com

Bill Lane Circa 1988

Picture of NPL Team with Bill Lane (2nd from the left)

Picture of Bill Lane with Automated Torque System. Bill recently designed this system to eliminate ergonomic issues associated with manually lifting weights on a pan. The system is operated with a pneumatic cylinder and load cell. It is designed to be a retrofit to any current torque arm with weights.

Specifying Accredited Services – by Phil Smith

While serving as an ISO/IEC 17025 assessor, writing a deficiency against Sections 4.6.3 was common. When I joined the A2LA staff, a new guidance document was drafted and approved to help alleviate the problem with this common deficiency.

ISO/IEC 17025 Section 4.6.3 reads: Purchasing documents for items affecting the quality of laboratory output shall contain data describing the services and supplies ordered. These purchasing documents shall be reviewed and approved for technical content prior to release.

Inevitably, some of the necessary, properly specifying accredited services were missing, and the laboratories did not obtain the accredited services they thought they requested. The A2LA Guidance Document G109 provides some helpful advice. The document can be found at: https://www.a2la.org/guidance/G109_Specifying_Accredited_Services.pdf

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Upcoming Events

September 15-16: Applied Fundamentals of Force Calibration, with instructors Henry Zumbrun (Morehouse) and Dilip Shah (E=mc3)

This course will cover applied force calibration techniques and will include live demonstrations using secondary standards to exhibit potential errors made in everyday force measurements. The measurement errors demonstrated and discussed will include errors associated with improper alignment, use of different and/or incorrect adapter types, thread depth and thread loading. The course will cover the basics of measurement uncertainty and provide the tools for anyone to put together a CMC or uncertainty budget.

October 5-8: Analytical Metrology Training, with instructor J.M. Ingram

The first workshop on Analytical Metrology, for those with some knowledge of measurement uncertainty, will include Risk Analysis and Guard Banding in addition to Measurement Uncertainty Analysis. The workshop is designed for the engineer, journeyman technician, quality manager, technical manager, or anyone needing the tools to develop their own budgets, manage their decision risks, and develop mitigation strategies for measurements to meet the requirements set out in ANSI/NCSL Z540.3.

Thank You and Future Newsletters

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

Web Page Links:

Load Cell Tester http://www.mhforce.com/morehouse-load-cell-tester

Morehouse "Quick Change" Adapters video https://www.youtube.com/watch?v=EkN6tORNbzQ

Sign up for our newsletter and win a load cell tester

MOREHOUSE WILL BE **GIVING AWAY 1 LOAD CELL TESTER TO ONE OUT OF EVERY 100 CUSTOMERS** THAT ARE ON OUR MAILING LIST. AS PART OF OUR MAILING LIST, YOU WILL ONLY RECEIVE EMAIL WHEN NEW NEWSLETTERS ARE AVAILABLE (4-5 EMAILS PER YEAR). SIGN UP HERE

Load Cell Tester Can Be Used to Quickly Troubleshoot Force Transducers:

Input and Output Resistance, Resistance difference between sense and excitation leads, Signal Output, Shield to Bridge, Body to Bridge, and Shield to Body

Morehouse Instrument Company, INC.
HIGHLY ACCURATE ISO 17025 ACCREDITED FORCE AND TORQUE CALIBRATION SERVICES.
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