



Measurement
Quality Division
The Global Voice of Quality™

The Standard

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Goals

- Participation in the management and technical development of the field of measurement quality
- Developing a written body of knowledge
- Developing a certification examination for metrologists and calibration personnel
- Providing the opportunity to learn how the principles of quality improvement and quality assurance apply to the measurement process
- Supporting the development of uniform national and international standards to meet current and future measurement quality needs



The Phil Stein 10th Anniversary Memorial Lecture Series

Newsletter Editor

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Letters to the Editor

The Standard welcomes letters from members and subscribers. Letters should clearly state whether the author is expressing opinion or presenting facts with supporting information. Commendation, encouragement, constructive critique, suggestions, and alternative approaches are accepted. If the content is more than 200 words, we may delete portions to hold to that limit. We reserve the right to edit letters and papers.

Information for Authors

The Standard publishes papers on the quality of measurements and the measurement of quality at all levels ranging from relatively simple tutorial material to state-of-the-art. Papers published in *The Standard* are not refereed in the usual sense, except to ascertain that facts are correctly stated and to ensure that opinion and fact are clearly distinguished one from another. The editor reserves the right to edit any paper. Please single space after sentences and use Times New Roman, 12 pt. font.

From the Desk of the Editor/Publisher

Greetings! As interim editor of *The Standard* until a handoff to Sam Windsor with the next issue, I offer many thanks to Jay Bucher* who punctually published the *The Standard* since 2005 for the Measurement Quality Division. Jay set the standard high and will be a hard act to follow. We also have a new chair, Heather Wade. Please welcome these new leaders of the division along with other faithful volunteers of the Measurement Quality Division.



2014 has been a good year for MQD, having participated in the NCSLI Technical Exchange in Raleigh, NC, followed by conducting the Phil Stein 10th Anniversary Memorial Lecture Series for students at The Monroe Community College in Monroe, MI.

Dilip A. Shah

***Note to Division:** Please see a memorial to Jay Bucher on page 4.

The Standard is published quarterly by the Measurement Quality Division of ASQ; deadlines are February 15, May 15, August 15, and November 15. Text information intended for publication can be sent via electronic mail as an attachment in MS Word format (Times New Roman, 12 pt.). Use single spacing between sentences. Graphics/illustrations must be sent as a separate attachment, in .jpg format. Photographs of MQD activities are always welcome. Publication of articles, product releases, advertisements, or technical information does not imply endorsement by MQD or ASQ. While *The Standard* makes every effort to ensure the accuracy of articles, the publication disclaims responsibility for statements of fact or opinion made by the authors or other contributors. Material from *The Standard* may not be reproduced without permission of ASQ. Copyrights in the United States and all other countries are reserved. MQD's homepage can be found at asq.org/measure. © 2014 ASQ, MQD. All rights reserved.

The Chair's Corner

Heather Wade



I'm excited to begin my term as MQD's chair. I am fortunate to be surrounded by such competent and capable leaders and mentors in the MQD board. I would like to thank Dilip Shah for his leadership as the immediate past chair. I know I have big shoes to fill and am confident that MQD will continue to grow and be successful in providing quality metrology and calibration training and opportunities.

The division continues to be in a strong and stable financial position. The board will continue to dedicate our finances to sponsor and participate in providing training opportunities for its membership and the metrology community. This year we participated in the NCSL International Technical Exchange and the Phil Stein Memorial Lecture series. We also participated in conferences including the Measurement Science Conference, March 10 – 14, in Long Beach, CA (www.msc-conf.com), ASQ World Conference for Quality and Improvement, May 5 – 7, in Dallas, TX (asq.org/wcqi/), ASEE Annual Conference, June 15 – 18, in Indianapolis, IN (www.asee.org/conferences-and-events/conferences), NCSL International Annual Conference, July 28 – 31, in Orlando, FL (www.ncsl.org), and a joint conference with the Inspection Division, September 18 – 19, in Dayton, OH. We also participated at local ASQ section and NCSL International regional meetings. We hope you had a chance to attend some of these events.

In addition to conferences, trainings, publications, and leadership opportunities, the MQD also sponsors the Certified Calibration Technician (CCT) exam, of which I also serve as the ASQ Certification Board CCT Subcommittee chair. If you work in the field of metrology and want to define yourself as a highly qualified professional, become a Certified Calibration Technician (<http://cert.asq.org/certification/control/calibration-technician/index>).

Our division stands out as a premier ASQ division because of what it accomplishes and provides for its membership. We will continue to seek and follow up on your input and feedback. We are here to serve you—our members. Part of my vision for the MQD is to continue bringing more volunteers into division leadership and committee positions. I would like to increase our division's Web presence on ASQ's website and on LinkedIn. To accomplish this, we need your help and involvement. If you have the desire to become involved, whether it is helping with Web presence or in other leadership or committee capacities, please contact me.

The best way to reach me is by email, wade@nsf.org.

I look forward to serving you, our members.

Sincerely,

A handwritten signature in dark ink that reads "Heather Wade". The signature is written in a cursive, flowing style.

Heather Wade

wade@nsf.org

In Memoriam: Jay L. Bucher

Heather Wade



It is with great sadness that I share the news of Jay Bucher's unexpected illness and death. Jay passed away at age 64 on April 18, 2014 from complications of multiple brain tumors. His death was a short seven weeks from the day the tumors were diagnosed. Our hearts go out to his beloved wife, daughter, extended family, co-workers, friends, students, neighbors, and the rest of the quality community.

In the time I knew him, Jay was an active participant and important contributor to ASQ, Measurement Science Conference (MSC), NCSL International, and the world of metrology publications. When I began working in the field of metrology, I did not come through the U.S. Armed Forces PMEL schools. I needed to find experts in the field from whom to study and learn. Jay was one of those folks I sought out. He readily took me under his wing. It is because of his encouragement and leadership that I am now chair of ASQ MQD and chair of the ASQ CCT Exam Subcommittee. His encouragement also pushed me to write and present papers at regional, national, and international conferences around the world and to also help co-author *The Metrology Handbook, Second Edition*.

Jay brought to the metrology and quality world a passion for high-quality work and innovation. He started his calibration and metrology career with the U.S. Air Force's Precision Measurement Equipment Laboratories (PMEL) program in 1971. Retiring from the U.S. Air Force after 24 years of service, Jay spent time as the senior metrologist for the Royal Saudi Air Defense Force PMEL, in Jeddah, Kingdom of Saudi Arabia. He also worked for Raytheon Middle East Systems and spent 10 years as the manager of metrology services for Promega Corporation in Madison, WI. In 2002, Jay also established his own consulting company, Bucherview Metrology Services, LLC, and consulted, full-time starting in 2008, for clients ranging from NIST to a third-party one-person calibration function, including more than a dozen Fortune 400 companies.

Over the years, Jay presented papers and taught tutorial workshops at MSC and NCSLI conferences. He also conducted virtual and in-house training workshops on "A Paperless Calibration Department That Meets Biotech, Pharmaceutical, & Medical Device Requirements." His work with NCSLI went beyond just teaching tutorials and presenting papers. Jay also started the Madison, WI section for NCSL International in 2000, and was a section coordinator and North Central U.S. region coordinator.

Jay was the editor and co-author of the 2004 ASQ Quality Press publication *The Metrology Handbook*, and subsequent edition published in 2012. He has authored six additional books, with the latest being *A Calibration Training Program for the 21st Century*, which was published in February 2012. He always strove to keep his writing style and topics as down-to-earth and understandable for any level of reader. For those who knew him, you can hear his voice in his writings.

Jay was instrumental in the foundation of the ASQ Certified Calibration Technician (CCT) exam program. He became an ASQ CCT himself and qualified as a subject matter expert for writing and reviewing of the CCT exam during workshops held by ASQ. He was the CCT certification exam chair from 2009 until July 2012. Since the establishment of the CCT exam in June 2003, more than 3,000 professionals worldwide now hold CCT certification!

Jay held nearly every elected and volunteer member leader position in ASQ MQD. He maintained a strict newsletter publication schedule that, among other division successes, garnered ASQ MQD repeated J.S. McDermond Total Quality Awards from ASQ for outstanding division member engagement, satisfaction, and loyalty. ASQ MQD continues to have among the most loyal ASQ members of any division! This is certainly a reflection of Jay's influence.

<http://www.cressfuneralservice.com/obituary/124356/Jay-Bucher/#>

MQD Treasurer's Report

November 2014

As per September 30, 2014, Bank Statement

MQD continues to have a strong balance sheet (Statement of Financial Position) with over \$186,400.00 combined checking and saving account balances.

Commercial checking account ending ledger balance as of September 30, 2014:	\$106,183.62
Commercial checking account outstanding checks as of September 30, 2014:	\$0.00
Money market saving account ending balance as of September 30, 2014:	\$80,314.00
Membership revenue for nine months ending September 30, 2014:	\$22,383.00
Investment income for nine months ending September 30, 2014:	\$59.00
Royalties income for the period from July–December 2013 and January–June 2014:	\$2,217.00
Total revenues for all sources for nine months ending September 30, 2014:	\$24,660.00
Budgeted MQD expenses for nine months ending September 30, 2014:	\$23,442.00
Net surplus (net profit) for nine months ended September 30, 2014:.....	\$1,217.00

Respectfully Submitted,

Christopher L. Grachanen
ASQ MQD Treasurer

Don't Trash Your Observations

Christopher L. Grachanen



I was recently involved in helping a calibration laboratory obtain **ISO/IEC 17025 accreditation**. This was the laboratory's first attempt at becoming accredited. The laboratory's parent company had already gone through the trials and tribulations of becoming certified to ISO/IEC 9001:2008 and as one would expect, much of the heavy lifting associated with the fundamental requirements for ISO 9001 documentation such as the corporate quality manual and high-level quality procedures dealing with procurement, records retention, etc., had already been established and demonstrated satisfactorily.

Becoming ISO/IEC 17025 accredited requires a lot of preparation in terms of developing standard operating procedures specific for calibration-related activities, satisfying proficiency testing requirements and performing measurement uncertainty analysis just to name a few. One of the areas auditors evaluate during an on-site assessment is the skills and knowledge of calibration personnel in performing calibrations applicable to a laboratory's scope of accreditation. This typically requires auditors to witness personnel performing calibrations and asking them questions during the activity. As calibration personnel are normally not under the scrutiny of auditors, a subject matter expert engaged laboratory personnel through some typical calibrations to prepare them for the upcoming audit, i.e., coaching. This preparation was deemed adequate, but as we shall see it failed to catch a nonconformance, which proved to be a major audit finding.

The on-site witness calibration assessment involved two experienced calibration personnel who were very knowledgeable in the technologies and idiosyncrasies associated with the calibrations they were performing. One of the calibration personnel demonstrated a calibration involving a relatively new calibration system with automated data acquisition capability. The auditor was satisfied with this demonstration and no nonconformities were noted. However, the second calibration personnel demonstrated a calibration that involved hand scribing measurement data, which was then entered into a computer program for archiving and analysis. This demonstration was performed without a hitch until the auditor asked what the person did with the hand-scribed measurement data once it was entered into the software program, which prompted the reply, "I discard them."

At first glance this may seem harmless, as the measurement data are archived in the software program, but per **ISO/IEC 17025 section 4.13.2 Technical records**, "*The laboratory shall retain records of original observations. ...*" This obviously was not being done and resulted in a major audit nonconformance. This situation was timely rectified by including in the incoming inspection form a table for recording measurement data. Note: The incoming inspection form is used to document customer equipment configurations, installed options, accompanying accessories, etc., and is included with a unit's calibration report.

Editor's Comments: Note that **ISO/IEC 17025 section 4.13.2** has not changed since the original standard was published in 1999 and its subsequent revision in 2005. Since then the scanning technology has evolved quite a bit. If the original observation was scanned and stored with appropriate redundant backup safeguards, and the original physical document destroyed, it can be argued that the original observation was retained (the information should also be readily retrievable). It should also be noted that the original observation should always list the who, what, when, and how information. The author's recommendation for corrective action helps document this useful information. When recording data on the form, any blank information should be marked not applicable (N/A) to ensure that the information required was not overlooked.

Metrology Department KPIs Reporting for Calibration

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Metrology department key performance indicators (KPIs) reporting for calibration should quantify and report, like other business functions, functional KPIs in terms that everyone can easily understand. To accomplish this objective, an organization benefits when they use an **integrated enterprise excellence (IEE) value chain** approach for this reporting, which aligns predictive performance measurement reporting with the processes that create the metrics.

Metrology Department KPIs Reporting in a Business Using an IEE Value Chain

According to Wikipedia, metrology is the science of measurement. Metrology includes all theoretical and practical aspects of measurement. Similarly, an organization's metrology department KPIs reporting for calibration can be a measurement of this function's effectiveness relative to a quality, cost, and time criteria.

An IEE value chain's reporting of these metrology department KPI measurements can provide a predictive quantification of future expectations, which is linked to the processes that created these metrics. With this understanding, one can determine where efforts should focus on any of these metrics that need improvement.

A high-level view of an organization's value chain is shown in Figure 1. In this value chain the primary functions of the organization are connected by arrows and the support functions are not. A computer-mouse click on a box would provide a drill down to the functional processes and their associated performance metrics.

A drill down of the "manufacture products" function would provide the associated performance metrics and processes for this function. One of the sub-functions to this "manufacture products" drill down could be metrology. A drill down of the metrology's calibration function might then yield what is shown in Figure 2.

In Figure 2, the top swim lane describes the KPIs for the metrology department calibration function relative to quality, cost, and time. The bottom swim lane is a basic calibration department process, where these steps can have drill downs to additional process details.

Predictive Metrology Department KPIs Reporting

Within the IEE system, KPIs are reported from a high-level, **30,000-foot-level perspective**. This airplane-in-flight perspective of the output of a process provides a predictive statement, when appropriate. The 30,000-foot-level methodology might initially appear to be traditional control charting; however, there are differences as described in "**x-bar and R chart issues and resolution.**" An example 30,000-foot-level report-out is illustrated in Figure 3 for the "calibration delivery time" metric in Figure 2.

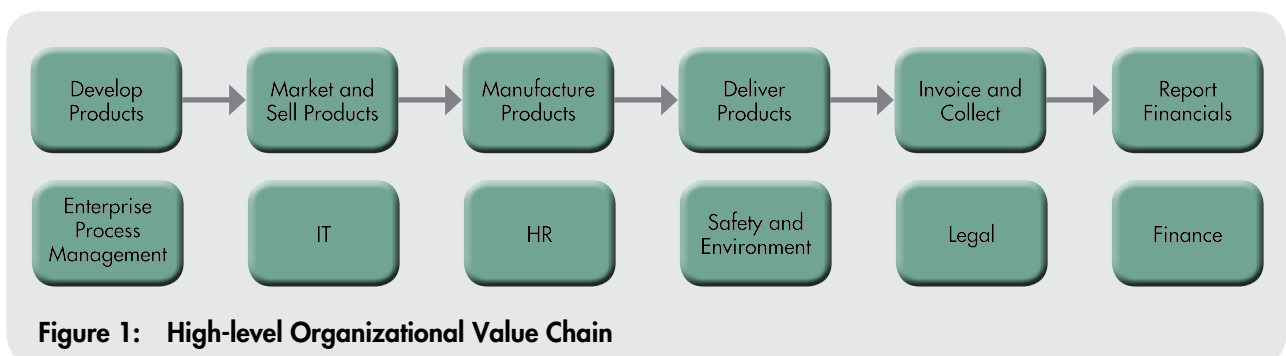
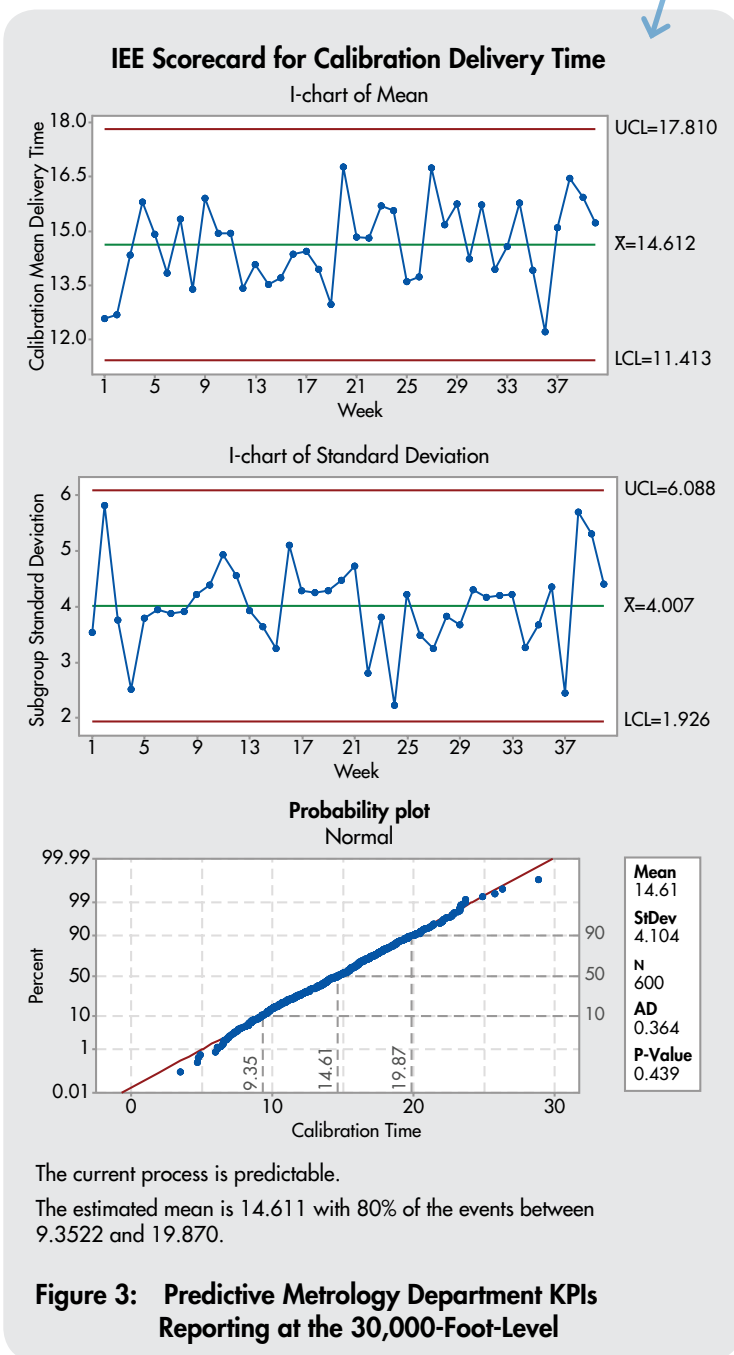
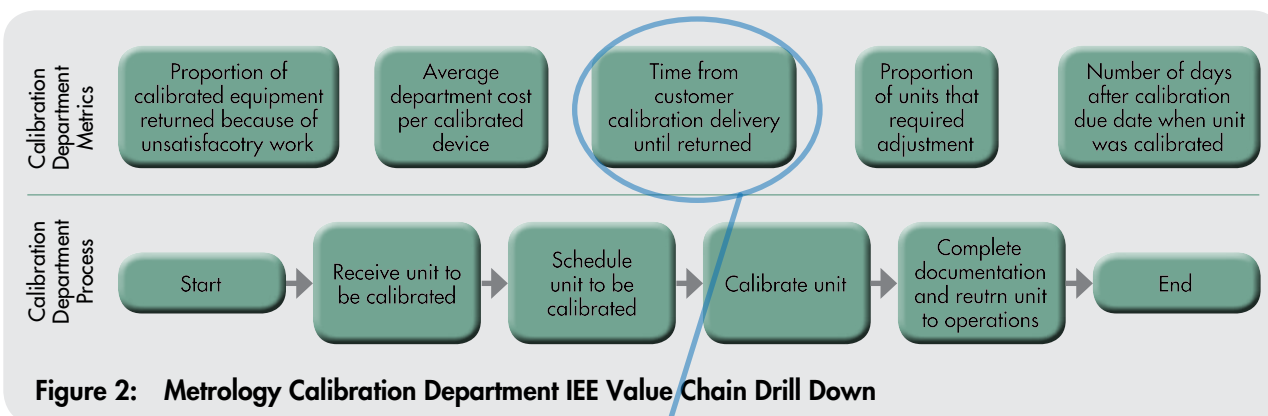


Figure 1: High-level Organizational Value Chain

cont. on p. 8



In this charting, the two top individual charts assess the stability of the process's delivery time relative to its current weekly means and standard deviations responses. Since there are no out-of-control departures or trends relative to the upper and lower control limits (UCL and LCL), this process is considered stable. Since the process has a recent region of stability, one can infer that the process is predictable. When stability occurs, the data from this recent region can be considered to be a random sample of the future.

The probability plot in the lower right corner of Figure 3 provides a prediction statement estimate. When the best-estimate drawn line in a probability plot is straight, one can assume that the data fits the probability plot's coordinate-system distribution, in this case a normal distribution.

The y-axis in this **probability plot** is a measure of percent-less-than. For a given x-value, one can estimate the expected frequency of occurrence below that value by extending a line vertically from the x-value to the best estimate line and then progress horizontally to determine the y-axis value.

Similarly, this methodology can also be applied to determine for a y-axis percentage value an estimated x-value. Since the delivery time KPI in this illustration had no specification, this determination is what was done in Figure 3 to quantify the estimated median and frequency of occurrence, which was reported at the bottom of the plot.

For this illustration, calibration delivery time is about 14.6 days with 80 percent of delivery times between 9.4 and 19.9 days. If this delivery time is not satisfactory, then something needs to be done to improve the process. Evidence that process improvement efforts were beneficial is that the individual chart(s) of the 30,000-foot-level report-out transitioned to a new, enhanced level of performance.

cont. on p. 9



Linking Metrology Department KPIs Reporting for Calibration to an Organizational Value Chain

The arrow linking Figures 2 and 3 illustrates the linkage of the delivery time 30,000-foot-level reporting metric in Figure 3 to its value chain entry. This 30,000-foot-level performance metric reporting can be made a clickable entry; e.g., through html coding.

Organizations benefit when an IEE value chain is readily available at any point in time to everyone who has authorization. Further benefits are gained when this measurement-reported data are automatically updated. These objectives can be accomplished using, for example, **enterprise performance reporting system (EPRS) software**.

Metrology Department KPIs Reporting of Other Metrics

The above illustration demonstrates the report-out format when there are multiple samples in a subgroup; however, some of the metrics shown in Figure 2 involve attribute data and a single point for each time-series timeframe. A similar 30,000-foot-level reporting format is available for each of these format types. For additional information about this reporting, see **Forrest's favorites**.

Summary

Management and others in a metrology department can gain much insight to how their processes are performing when they evaluate their KPIs through the **transition of traditional scorecard or dashboard reporting to an IEE 30,000-foot-level measurement approach** with value-chain integration. From this form of reporting, the organization can determine the most appropriate actions or non-actions relative to process improvement efforts that should be undertaken.

News and Announcements From the Industry

A2LA Receives Full TNI Recognition to Accredite Field Sampling and Measurement Organizations (FSMOs)

February 3, 2014, Frederick, MD – The American Association for Laboratory Accreditation (A2LA) is pleased to announce it has received full recognition by The NELAC Institute's National Environmental Field Activities Program to provide accreditation to field sampling and measurement organizations (FSMOs). This accreditation program is specifically designed for organizations engaged in environmental sampling and field measurement activities such as testing laboratories, engineering firms, environmental consulting organizations, and government agencies. Upon receiving this final recognition, A2LA has issued two scopes of accreditation to accredited FSMOs and is currently accepting new applications.

A2LA's preliminary recognition to accredit FSMOs was granted in 2011. To achieve full recognition, A2LA underwent a review of its FSMO accreditation program documents as well as an on-site technical evaluation of an FSMO assessment. Several of A2LA's environmental assessors successfully completed TNI's NEFAP Assessor Training course. Richard Sheibley, veteran assessor, served as the lead assessor during A2LA's on-site evaluation. Sheibley lent his years of experience and technical knowledge to this evaluation, resulting in a final evaluation report with zero nonconformities identified.

FSMO accreditation is based on A2LA's assessment of an environmental organization's performance, including their quality system, procedures, staff competence, and reporting of sampling and testing performed on matrices such as water, soil, and air. The FSMO requirements specifically address challenges and circumstances unique to organizations that perform fieldwork. The accreditation is granted based on a two-year cycle. Interested parties may contact Lauren Smith (lsmith@a2la.org) for more information regarding the FSMO accreditation program.

About A2LA:

A2LA is a nonprofit, nongovernmental, public service, membership society. A2LA provides world-class accreditation and training services for testing and calibration laboratories, inspection bodies, proficiency testing providers, reference material producers, and product certifiers. Services are available to any type of organization.



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Measurement Quality Division at 2014 Measurement Science Conference

As always, it was a pleasure to see **Phil Painchaud** drop by for a visit to the MQD booth at the 2014 Measurement Science Conference (MSC). Phil turned 95 years young April 24, 2014. Happy birthday to Phil. Phil's column, "The Learning Curve" appeared in *The Standard* continuously for more than 10 years. Phil was a regular fixture at the MQD booth until a couple of years ago. It is good to see him stop by and participate in the conference as much as he can. Phil's has a mind sharper than anyone, and it is a pleasure to listen to him talk about his experiences. Phil is a real treasure to MQD.

On March 10 – 11, 2014, the division sponsored the ASQ CCT Exam Refresher Workshop to five attendees. This was followed by ASQ administering the CCT exam to six candidates on March 21, 2014. Many thanks go to **Duane Allen** (past MQD chair, 2001–2003) for proctoring the exam at MSC since its inception in 2009. Three of the candidates who took the

CCT Exam Refresher Workshop took the exam and passed. A total of five out of six candidates who took the exam passed. Many thanks also go to **Mary Martin** of the ASQ Certification workgroup for arranging exam administration logistics and ensuring that the exams were graded expeditiously. Most of the time, exam results are posted in less than four business days.

On March 12, the division sponsored the Measurement Uncertainty Workshop as part of MSC tutorial program, which was attended by 16 students from across the nation. This has been the longest-running workshop at MSC (15 years!) and continues to draw a good number of attendees. Both the workshops were facilitated by **Dilip Shah** (MQD past chair, 2012–2013).

The division also hosted a session titled "**ASQ Certifications and Its Competitive Advantage on Innovation in Quality and Metrology.**" Dilip Shah hosted the session and **Heather Wade** (MQD chair, 2014–2015, CCT certification chair) participated in the panel discussion.



Left to right:
Dilip Shah,
Phil Painchaud,
Heather Wade

The Phil Stein 10th Anniversary Memorial Lecture Series Starts This Year!

Phil Stein was 62 years old when he passed away unexpectedly on June 24, 2004. Just like our other Phil (Painchaud), Phil was a genius and, more importantly, a mentor to me. There were many times that Phil and his wife Carole and I would have wonderful philosophical discussions during and after dinner after the ASQ MQD meetings. Normally, we would be the last ones to leave just before the restaurant closed. I remember distinctly the phone call I received from another dear colleague, Tom Pearson, on June 24, 2004 as I was on The Ohio State University campus shepherding my older son through his freshman orientation. It was a shock to hear of his death.



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