

Regional News

1210 Mid-Atlantic Region



Hosted By: The National Electronics Museum
August 11-12, 2009

Fundamentals of Metrology Workshop

The National Electronics Museum in Baltimore became the classroom/laboratory for 16 students from California, Maryland, New York and Pennsylvania representing companies as diverse as A2LA, Bausch & Lomb, Computer Sciences Corporation, Morehouse Instrument Company, Northrop Grumman, the USDA, and the U.S. Army.

Upon registration, the students were provided a password to enter the Workplace Training website to access three online training modules, "Introduction to Measurement & Calibration," "Precision Dimensional Measurement," and "Precision Electrical Measurement." The two day workshop facilitated by Dilip Shah of E = mc³ Solutions, consisted of classroom instruction the first day and a combination of hands-on lab and classroom discussion of lab results the second day. Everyone broke up into teams of two for the hands-on labs. Among the many topics presented during classroom instruction was a "Brief Introduction to Measurement Uncertainty," during which the students learned how to develop a Measurement Uncertainty Spreadsheet. Dilip ran through some examples using a spreadsheet he developed and later made available to the students. The students would put this knowledge to practical use with the measurement results obtained from the hands-on labs.

The first set of measurements required a basic ice bath using a Styrofoam cup, shaved ice and bottled water. Measurements were then taken using two different measuring systems. The first consisted of a handheld digital thermometer and thermocouple. The second used a bench DMM to measure the resistance of a 100 Ω platinum resistance thermometer (PRT). Each team had their own thermocouple wire to make a thermocouple and one PRT was passed around so the teams could compare measurement results. Dilip spoke of the errors introduced to the ice bath by the purity of the

water and ice, and the need for frequent stirring. Thermocouple myths such as, "the emf is generated at the point where the dissimilar metals meet," were dispelled and discussed along with the effects of immersion depth for both thermocouples and PRTs. Construction of the PRT was explained and their extreme delicacy highlighted. All measurement results were recorded.

The next set of measurements used the bench DMM to measure Standard Resistors. 100 Ω and 1 K Ω resistors were passed around to be measured in both 2-wire and 4-wire modes. Again all measurement results were recorded. The students then returned to their seats so Dilip could sample their measurement results and plug the data into the Measurement Uncertainty Spreadsheet.

After lunch it was back to the lab where each team wrung two gage blocks together then measured them using Digital Calipers. Dilip explained proper wringing technique then had the students' measure the blocks in different ways to demonstrate how measurement technique could affect their measurement results. Next the measurements were repeated using Digital Micrometers. Resolution of the measuring device along with measuring technique proved to be major factors in the measurement uncertainty calculation.

The background of the attendees ranged from new technicians with no former exposure to metrology, to recently promoted lab managers who had years of bench experience in past positions, to technicians returning to calibration after years in a different discipline. Folks with past experience provided a great deal of regenerative feedback over the two days with confirmations of subject matter through practical application and anecdotal tales. Students' evaluations showed high ratings for "discussions, demonstrations, application exercises and question/answer time contributed to learning" and "instructor skill, knowledge and delivery." A low score was given to "classroom was conducive to learning," with the most common complaint being "too cold!"

Now it's time for a "Shout Out," thanks go to Paul Hanssen of Workplace Training for providing the online training and lunches, Dilip



Jack Derrenberger gets crushed ice to create an ice bath.



Left to right: Vincent Pugh, Curran Weber, Marion Burke, Jim Dodge and Jacob Gerlach take measurements using thermocouples in ice baths.



Jim Dodge gives Marion Burke the data to record.

Shah for his excellent teaching skills, Northrop Grumman for providing the National Electronics Museum facility, Jim Salisbury of Mitutoyo for loaning the Digital Calipers and Micrometers, Bernie McDermott and Mike Nixon of Northrop Grumman for providing the electrical instruments, Jim Dodge and Chuck Garside of Northrop Grumman for pro-



Foreground: Henry Zumbrun uses Digital Calipers to measure a Gage Block while Bill Brown records the measurement result.



Mike Crowson records measurement results relayed by Doug Knowles.



Jack Derrenberger uses Digital Calipers as Bill Turner looks on.



Marion Burke gives Jim Dodge the thumbs up as Jim successfully wings two Gage Blocks together.

viding gage blocks and the sine bar, and last but not least the attendees and their companies for choosing this NCSLI coordinated event to fulfill their training needs (the CEU's are in the mail).

The NCSLI is in the infancy stage of holding these types of workshops and hopes to make more of them available to members and non-members alike in regions throughout the continental US. Success of future workshops is critically dependant on the growing success of the early workshops, so please keep an eye open for upcoming events. You can support these efforts by attending or recommending someone from your company attending. Two days before this particular workshop I was chatting with an Audit Coordinator here at Northrop Grumman. When I told her about the workshop she said she wanted to attend, thinking it would be a great way to get a basic understanding of calibration since her new position would involve auditing the Cal Lab. Unfortunately she had vacation plans that kept her from attending; however had she known sooner she would have rearranged her vacation. Another way to support is by attendees providing feedback so we can accentuate the good and improve the not-so-good.

The cost was \$810 to students and NCSLI members. For non-members the cost was \$1045. Future workshops will focus on different topics and use a variety of training providers. As with any event, attendance fees are set to cover the cost of registration, advertising, administration, facility, and training provider fees when a minimum number of attendees sign up. As more events are held we would hope to see attendance fees reduced and quality of service rise. If you would like to coordinate a training workshop please contact the NCSLI 161 Training Resources Chair, Matthew Denslow of the Bionetics Corporation at: matthew.denslow@afmetcal.af.mil.

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