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The Shot Peener

Shot Peening Aids in Rescue of Chilean Miners

Plus:

Seeing is Believing: A Marketing Success Story

New Almen Product Introduction

2010 Shot Peener of the Year

Volume 25, Issue 1 **Winter 2011**

Celebrating 25th Year

The Shot Peener

Dedicated to sharing information and expanding markets for shot peening and blast cleaning industries

The Shot Peener
25 years in publication
Over 6,000 readers
in 80 countries

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Articles

Shot Peening Aids Chilean Miner Rescue

One of Center Rock's drills at the mine in Chile.

"Without shot peening, our drill bits wouldn't be capable of doing their job. National Peening was an important player in the fast delivery of our equipment to Chile."

—Julie Fisher, Director of Sales for Center Rock

National Peening's facility in Salem, Virginia shot peens drill bits for Center Rock, a manufacturer and distributor of air drilling tools and products in Pennsylvania. "We use National Peening because they have machines large enough for our products and they give us quality service," says Julie Fisher, Director of Sales for Center Rock.

When Center Rock was chosen to supply pneumatic-driven air compression drills to open the rescue shaft for the trapped miners, Steve Bungard with Center Rock called National Peening to shot peen the drill bits for a "hole opener" drill that would enlarge a 6-inch shaft into a 12-inch shaft. Mike Price, General Manager with National Peening, said they had a day's notice and the machine set-ups were completed before the drill bits arrived from Pennsylvania. "We processed the hole opener drill in a few hours, literally while the truck driver waited to make the return trip," said Mike. "Center Rock advised us that they were working around the clock to make these drills and ship them to Chile as soon as possible. We were willing to do whatever it took to meet the challenge. Our employees didn't hesitate to be available on a Saturday night and they came into work as soon as the drill bits arrived in Salem," he added.

"We watched some of the TV coverage as the miners were brought up one by one. It was a good feeling to know we had a tiny part in helping with this rescue," said Mike.

National Peening's contribution to the rescue effort was featured on WSLS10, a Roanoke, Virginia television station, and in *The Roanoke Times* newspaper.

About National Peening

National Peening is a shot peening and blast cleaning facility that's been in operation since 1986. They have four locations in North Carolina, Virginia and South Carolina. National Peening has Nadcap accreditation and can certify parts to a wide range of aircraft, military and commercial shot peening specifications. They have achieved a nationwide reputation as a shot peening facility for the NASCAR industry.

National Peening was able to accommodate Center Rock's large drill bits because they design and build most of their own equipment and have customized the equipment to meet customers' applications. They peen all sizes of parts from small springs and pins to parts weighing up to 20,000 pounds.

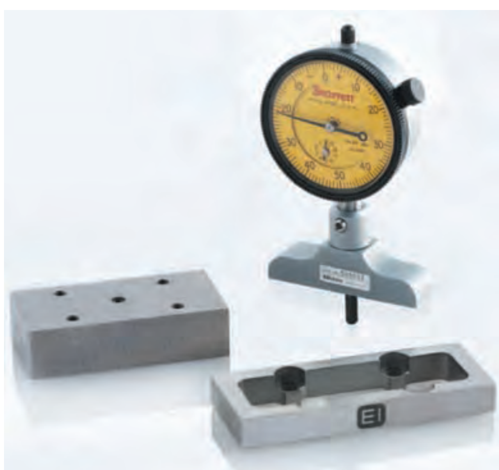
National Peening offers more services than typical for a shot peening job shop. They provide secondary processes, such as assembly and finishing—including painting, packaging, labeling—and palletizing. National Peening then ships final product to their clients' customers. ●

National Peening shot peened these drill bits for Center Rock Inc., a company that used them in their "hole opener" drill to widen the Chilean miner's rescue shaft. Note the signatures of the Center Rock crew.

PHOTOGRAPHS ARE COURTESY OF CENTER ROCK INC.

Almen Product Innovations from Electronics Inc.

Electronics Inc. (EI) is pleased to introduce innovative Almen products that will enhance a shot peening facility's ability to accurately and efficiently measure intensity. The first product is the Almen Holder Flatness Gage, a tool to verify the flatness of Almen holders. The second is a new product line and methodology for measuring intensity in components with small or inaccessible areas: The EI Almen Mini-Strip and Gage.



The EI Almen Holder Flatness gage verifies flatness without removing an Almen strip holder from test components.

The Almen Holder Flatness Gage

We're stating the obvious, but when measuring the arc of a peened Almen strip, the initial flatness of the strip and its holder are important. In fact, many specifications cite flatness requirements. For example, SAE J442 requires a flatness limit of ±0.1mm for the Almen strip holder. Since Almen gage holders are often permanently mounted to fixtures, monitoring the holder's flatness is difficult as removing the holder is time-consuming. EI's new gage solves the problem because it's simple to attach to the fixture and its dial indicator is easy to read. The procedure is accomplished in three steps:

1) Attach the flatness checker's frame to the Almen strip holder with the four supplied screws. Note: EI designed the frame's screw holes to verify the accuracy of the holder's screw locations. If you're able to attach the flatness checker's frame to the holder, the holder's hole locations are within tolerances required by SAE J442. Proper hole location is also a Nadcap requirement.
2) Place the dial indicator on the frame and traverse the length and width of the frame.
3) Observe the indicator readings. If they are within ±0.1mm, the holder surface is in compliance with SAE J442.

Other specifications may require different flatness measurements. An inch version of the gage is also available.

The Mini-Strip Product Line

The new EI mini-strip will verify intensity in small and/or inaccessible areas. This approach replaces the laborious shaded-strip procedure with a faster and more accurate process. Shot peening technicians in aerospace and spring and gear manufacturers will appreciate the ease and convenience of the new process.

The New Intensity Verification Procedure

The mini-strips measure 1'' x 1/8'' and can be attached with double-sided tape directly to a test component or simulated fixture—no need to allow room for a standard Almen holder. Plus, they're ready-to-go—no need to make a shaded strip. Their small size makes them ideal for measuring intensity in small or hard-to-reach areas like dove-tail slots in jet engine disks, gear roots, and the internal bore of springs, without creating a complicated test fixture.

The correlation between full-size Almen strips and the new mini-strips must first be established before the intensity in small and difficult-to-reach locations can be determined. The procedure requires:

1) Standard (full-size) Almen strips and a standard strip holder to develop saturation curves at both the minimum and maximum intensity range and,
2) EI mini-strips to obtain corresponding arc height.

The new Electronics Inc. Almen Mini-Strips and patent-pending TSP-M Gage.

The appropriate arc height curvature of the mini-strips must be established for the low and high intensity limits. This is done by establishing the T1 times for the upper and lower intensity limits and then exposing the mini-strips to the shot blast at these T1 times. The procedure is as follows:

1) Mount a standard Almen holder on a test fixture and attach a standard Almen strip. Peen the Almen strip and measure the arc height on the Almen gage. (Be sure to zero the gage first.) Repeat as necessary to obtain a saturation curve at the lower end of the specified intensity range (a minimum of four data points with increasing exposure times is required). EI recommends Dr. Kirk's free Curve Solver program* as the quickest and most accurate method of obtaining calculated intensity T1 from the arc height data.

   When you've obtained the proper machine adjustments that yield the lower intensity, attach a mini-strip to a convenient holder (flat surface) using double-sided tape and expose it to the blast stream for the T1 time. Place the peened mini-strip onto the new TSP-M gage. Position the strip securely on the flat supports and against the back stops. If it's not convenient to adjust the machine settings to provide the T1 exposure time, then use an exposure time near to T1. This gives you the correlation of the mini-strip to the full-size strip.

2) Repeat this procedure again to establish the T1 time for the upper intensity limit.

3) When complete, you will have a range of acceptable arc height readings for the mini-strips.

Now that you've established the correlated parameters for the lower and upper intensity range of your specification between the standard strip and the mini-strip, you must develop the process parameters to duplicate these readings on a test component or simulated test fixture. Attach the mini-strips to the test component or test fixture with double-sided tape (see page 8 for an example). Develop and record process parameters that will produce an arc height between the lower and higher correlated arc heights obtained in steps 1-3. ●

**Request the free download of Dr. Kirk's Curve Solver at www.shotpeener.com*

An Almen mini-strip mounted on the gage.

Additional Product Information

The EI Almen Mini-Strips
These are made from SAE 1070 cold-rolled steel in a special process assuring hardness of Rockwell 44-50 HRc. Strips are available in "A" thickness .051 inch and "N" thickness .031 inch.

The EI TSP-M Almen Gage
This Almen gage has many of the features of the EI #2 Advanced Almen Gage gage but the Almen strip platform has been designed to accommodate the smaller and lighter strip. Features include:

- Digital Accuracy
- Flat Check Block
- Adjustable Magnetic Grip
- One-Year Warranty
- Inch/Metric Convertible
- Data Port Output
- Convenient Battery Replacement

For more product information or to order, call Electronics Inc. at 1-800-832-5653 or 574-256-5001.

Mini-Strips Will Solve Problem

It was recently brought to my attention that many engineering drawings stipulate to shot peen all over a part's surface to a given intensity. Because the engineering drawing always takes precedence over a specification, I believe this is a problem for all shot peeners that has been overlooked since the beginning of the shot peening industry.

AMS-2430-R, section 3.2.1.4, states: "Each set-up shall be qualified for each part number. Either a scrap piece or representative fixture shall be fitted with sufficient test strip holders oriented essentially in the same manner, with the same surrounding features as the part, to represent the actual designated surface. Peening time and a saturation curve shall be established for each Almen test strip." To the best of my knowledge, this has been the standard practice throughout the shot peening industry to measure the intensity on any given part. However, in my opinion, this section leaves us in a precarious situation. Who decides what number constitutes "sufficient test strip holders" or determines test locations that are "oriented essentially in the same manner"? More importantly, how can such a non-defined requirement be reliably audited?

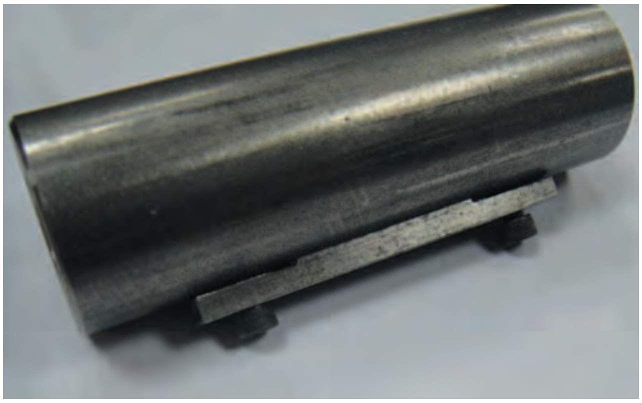
According to the Defense Contract Management Agency (DCMA), anyone performing shot peening to a drawing that "states shot peen all over to a given intensity" *must verify intensity on* <u>*all*</u> *surfaces* <u>*all over*</u>. Sampling the intensity in select locations is a direct violation of the engineering drawing. Current methods of intensity verification make this both impossible to do and technically impossible to certify.

Where does that leave the shot peener? A new solution is available. Over the past few months, Peening Technologies has been evaluating Electronics Incorporated's new Almen mini-strips for potential use in our job shops. Shot peening intensity verification has always been a problem in hard-to-reach areas or areas that are smaller than the standard Almen test strip. Often expensive and complex test fixtures are made or a scrap part is cut up to install Almen holders for standard Almen strips. If a scrap part is available, these expensive, complex test fixtures will be a thing of the past. All one has to do is to affix the EI Almen mini-strip to the desired surface using double-sided tape. Testing is still necessary to validate the correlation between mini-strips and standard strips, but I can see the day where intensity can be accurately and easily measured in areas that may have never been measured before. While this alone will not completely solve the problem of verifying intensity all over, it does provide a much more detailed idea of what is happening to the part in areas that were not previously tested. Couple this verification method with a closed-loop CNC/Robotic shot peening machine, and you can further enhance the reliability and repeatability of the process.

Due to the recent DCMA finding, parts designers (at least for the U.S. Military) are likely going to have to revise old drawings to detail the locations for intensity measurement and do the same on future designs. Ironically, the now-cancelled Mil Spec Mil/AMS-S-13165 Section 6.2 Acquisition requirements paragraph G specifically stated: "Designation of locations to be peened (**including intensity verification areas**), or locations to be free from peening as applicable." This was rarely if ever done in practice.

It is this shot peener's recommendation that designers specify the following on their engineering drawing:

- areas requiring shot peening,
- areas where peening is optional and may be incomplete,
- areas where peening is prohibited,
- areas where intensity verification is required (preferably with a diagram detailing Almen strip holder orientation),
- peening media and hardness to be used (give a range if possible), and
- amount of coverage.



Shot peening technicians at Peening Technologies in Connecticut constructed this test fixture to simulate a component that requires lance-peening of a hole. To the left is an EI Almen mini-strip attached to a holder with double-sided tape. Above, the strip holder has been attached to the fixture with the mini-strip facing inside the pipe.

2010 Shot Peener of the Year

Herb Tobben, Clemco Industries

Most of us at *The Shot Peener* and Electronics Inc. (publisher of the magazine) have had the pleasure of working with Herb in his many capacities over the years: Workshop instructor, magazine article contributor, equipment vendor, and trusted business associate. So when he was nominated as the 2010 Shot Peener of the Year, everyone on the award committee had reason to vote for him. "Herb deserves the award because he is one of the most authoritative resources on nozzle design and application. His 35+ years of experience have included some unique design approaches to blast cleaning and peening applications. Many examples of Herb's work can be found in the library at www.shotpeener.com," said Jack Champaigne, Editor of *The Shot Peener* magazine and President of Electronics Inc. "Herb is generous with his time and is always willing to share his expertise. He consistently gets the highest praise as a workshop instructor in the EI workshop student surveys," said Mr. Champaigne.

Herb Tobben was presented with the Shot Peener of the Year plaque at the 2010 U.S. Shot Peening workshop in St. Louis. Since many of us talk to Herb on a regular basis, it was tough to keep the award a secret but Herb confirms that we did, in fact, surprise him.

Herb Tobben with Clemco Industries received the 2010 Shot Peener of the Year award.

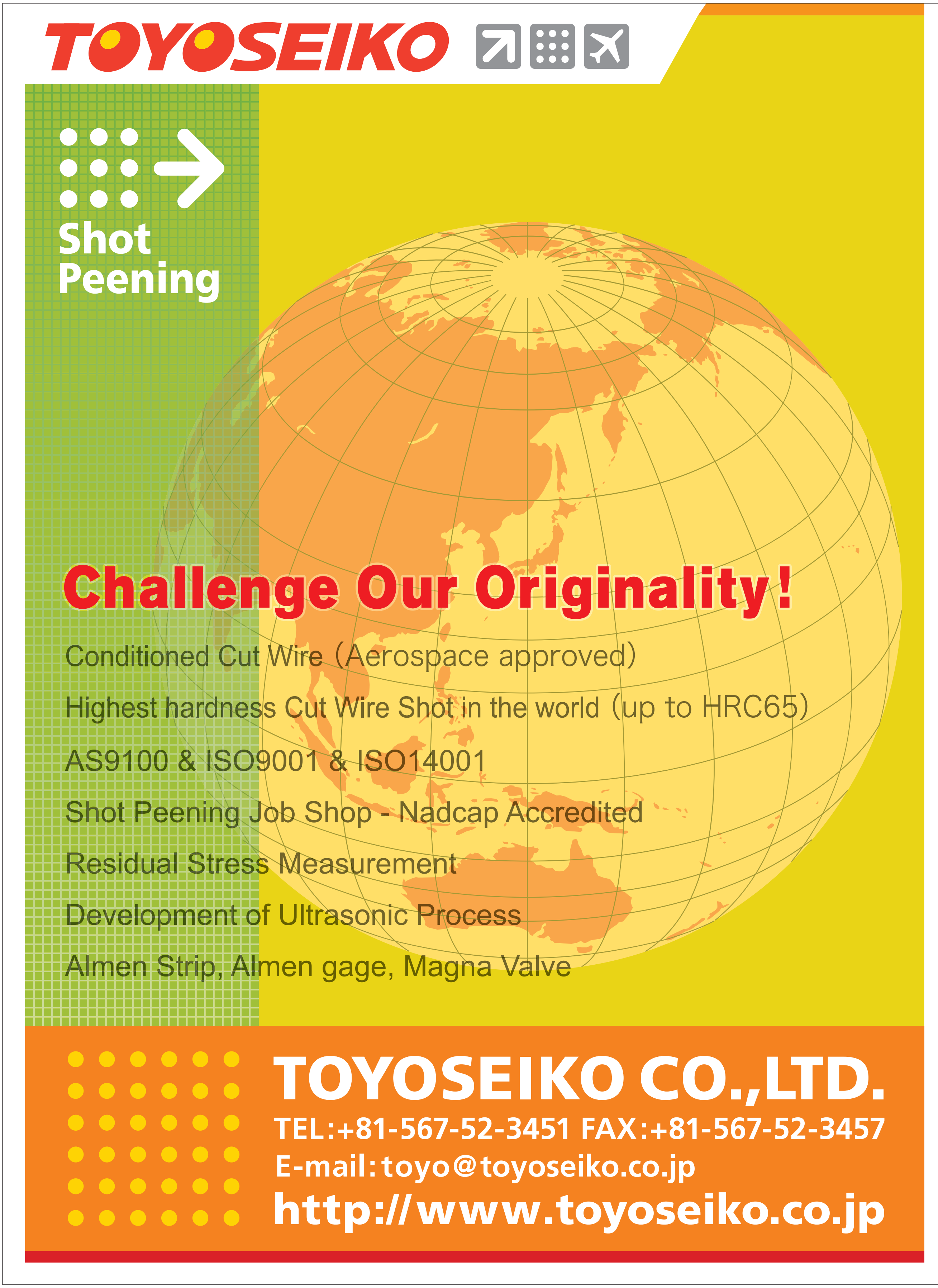
Biography

Herb Tobben is the Technician and Sample Processing Lab Manager of the Technical Services Group with Clemco Industries Corp. in Washington, Missouri. Herb has managed the company's sample processing operations in support of its ZERO engineered manual and automated cabinet product line for more than 35 years.

Herb grew up on a farm and was one of 12 children. Machine shop and welding classes in school and the knowledge he obtained in his first job as an auto mechanic were helpful when later he would be creating part-holding fixtures and prototype setups in the lab. Herb joined Clemco Industries in 1970 and has held several managerial positions in production, research and development, and technical areas. Some of his responsibilities in the Sample Processing Laboratory include working to develop surface finishing, shot peening, and surface preparation solutions for the company's domestic and international customers. "I enjoy each new project, each new challenge," said Herb. Much of Herb's time is spent on technical support work, both in house and in the field. As mentioned earlier, Herb also conducts training programs and contributes to industry publications.

When Herb isn't at work, he is enjoying life on his farm. "While at home, I enjoy having some cattle around, watching the wildlife and spending time with my two children and two grandchildren," Herb said. "Life is good."

Since 1992, *The Shot Peener* magazine has given The Shot Peener of the Year award to individuals in our industry that have made significant contributions to the advancement of shot peening. We've listed the year of the award, the recipient and their place of employment at the time they received the award on page 12.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http://www.toyoseiko.co.jp

The Shot Peener of the Year Award Recipients

1992
Charlie Mason • Menasco Aerospace Ltd.

1993
Pete Bailey • GE Aircraft Engines
Bob Thompson • GE Aircraft Engines
Jim Whalen • GE Aircraft Engines

1994
Charlie Barrett • Metal Improvement Company

1995
Dr. Kisuke Iida • Meiji University

1996
Dr. M.C. Sharma • Maulana Azad College of Technology

1997
Dr. Ing. R. Kopp • Institute Metal Forming of RWTH

1998
Dipl. Phys. Wolfgang Linnemann • Kugelstrahlzentrum Aachen

1999
Andrew Levers • British Aerospace Airbus

2000
Jonathan Clarke • Delta Air Lines
Prof. Lothar Wagner • Technical University of Brandenburg

2001
Dr. David Kirk • Coventry University, U.K.
Dale Lombardo • GE Aircraft Engines
Bill Miller • The Boeing Company

2002
David Francis • Metal Improvement Company
Shaker Meguid • University of Toronto

2003
Paul Prevey • Lambda Research
Dr. Niku-Lari • IITT International

2004
Walter Beach • Peening Technologies of Connecticut
Dr. Eng. Katsuji • Meiji University

2005
Marsha Tufft • GE Aircraft Engines
Prof. Dr. -Ing Helmut Wohlfahrt • Retired

2006
Kumar Balan • Wheelabrator Group
Dr. John Cammett • Naval Aviation Depot

2007
Ken I'Anson • Progressive Technologies

2008
Holger Polanetzki • MTU Aero Engines

2009
Michele Bandini • Peen Service

2010
Herb Tobben • Clemco Industries

Toyo Seiko's New Coverage Checker Is Successful in Field

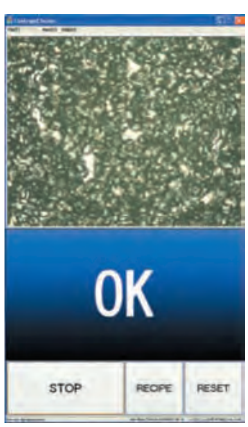
Toyo Seiko introduced the handheld Coverage Checker™ earlier this year and it's proving to be a valuable tool for their customers in several ways.

Reduced Processing Time

A manufacturer that shot peens aluminum parts needed to achieve 98% coverage. With the Coverage Checker, they discovered that their processing time was longer than necessary to achieve the desired coverage. The customer was able to cut the processing time about 15% from 30 min/batch to 25 min/batch. They appreciate the corresponding cost reduction, too.

Eliminates Human Error

An automotive springs manufacturer had a coverage requirement of "85% coverage must be guaranteed." A visual sampling inspection left them vulnerable to human error. Now they use the Coverage Checker. The pictures obtained with its camera are binarized to determine the coverage percentage and the results are displayed clearly. For example, the Coverage Checker's screen reads OK for "Okay" and NG for "No Good." Toyo Seiko's customer can now inspect the peened pieces with confidence that the readings are accurate.



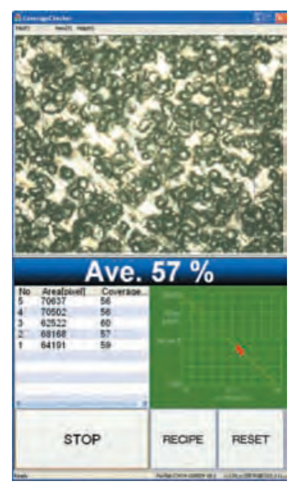
Works in Conjunction with Peenscan Pens

Oxide scale, complicated part configuration and hard materials like carburized parts can obscure the peening dimples. Toyo Seiko recommends covering the area to be peened with a fluorescent tracer dye, like Peenscan pens, and then using the Coverage Checker to verify coverage after peening.

Captures Information in Hard-to-Reach Areas

A spring manufacturer was cutting springs in half to conduct coverage tests. They recently purchased a Coverage Checker with the tool for measuring bores. The manufacturer saves time because they no longer need to conduct trials and they don't waste products for testing.

Training Tool



Visual coverage inspection requires experience. However, even a novice can obtain accurate coverage information with the Coverage Checker. In addition, the inexperienced shot peening technician can strengthen his visual skills by comparing his coverage percentages to the Coverage Checker results.

A Coverage Checker demonstration at the 2010 U.S. EI Shot Peening Workshop.

Profile Industries Says: "Seeing Is Believing"

The Missing Link

Separating round shapes from non-round shapes—that's the job of Profile Industries' Spiral Separators. The separators remove and collect the preferred round media from non-round, broken or cracked media. Profile's products separate metal abrasives, metal shot, ceramic beads, glass beads and more.

Electronics Inc. (EI) recently added a Profile separator to their in-house training facility. The EI staff likes the separator so much that they realized spiral separators were a missing link in the EI workshop's coverage on media control. Dave Barkley, Director of EI's Education Division, asked Profile to demonstrate the product at the U.S. Workshop and Trade Show in October. Steve DeJong, Profile's Sales Manager, designed banners, packed a microscope, separator and media, and headed to St. Louis.

Show and Tell

Profile has done a good job of building a worldwide customer network, but sales weren't reaching their full potential in North America. In Europe, OEMs sell a separator as part of the shot peening system. In the U.S., shot peening facilities are more likely to discard media rather than reclaim the good media with a separator.

The trade show was the first time Steve demonstrated the product to a large number of people at once. "Every time I ran media through the separator, people would come to my booth," Steve said. "When people ran their hands through the round media after it's been through the separator and looked at it in a microscope, they understood what a separator does," he added.

Continued on page 18

Steve DeJong demonstrates the Profile spiral separator at his workshop booth.

Kathy Levy is the owner of InfoProse and works as a technical writer and marketing consultant

Steve projects 12 sales from the trade show with prospects for many more, including a major aircraft manufacturer that has 20 machines with Sweco size classifiers, but not one spiral separator. That might be changing soon.

An OEM told Steve that they like separators but can't use them in facilities with noise-reduction regulations. This conversation gave Steve the chance to explain that Profile can build soundproof enclosures. (Profile also builds custom configurations for unique media applications, including fine particle media.)

Another opportunity for Steve was face-to-face time with customers that weren't using their separator correctly. "Spiral separators always work the same. It's the media flow that's inconsistent," he says. A single-spiral separator can handle up to 1,000 lbs. of media an hour (roughly 10% of the total media flow). If a machine throws more than 10,000 lbs. of media an hour, more than one separator is needed. When the separator is flooded with too much media, the rounds will go down the discharge chute with the non-rounds. Also, if the machine operator tries to run a high mix of non-rounds to rounds at a high flow rate, the separator will be less efficient. However, when a facility is in compliance with AMS 2430 that requires 90% or more round media in the mix, this issue should be rare. "If the client sends us a media sample for a lab analysis, we can resolve the media-flow problem. Usually, with some adjustments, the separator will work unless the customer has changed to a different size of media," said Steve.

Shaping Up to a Bright Future

"The separator was the hit of the workshop," says Dave Barkley. "People love to see how things work and we appreciate that Steve demonstrated the separator at his booth and during our media class." Steve is looking ahead to workshops in Canada and Mexico and Profile is on track to increasing sales in North America and beyond.

How a Spiral Separator Works

Spiral separation is a straight-forward process that's dependent on laws of physics and a precisely designed piece of equipment. Material to be separated is discharged onto a banked metal flight, which is spirally wound around a central shaft. As the material flows down the banked surface, its speed increases, and centrifugal force carries it toward the outer edge of the flight. Round materials achieve a velocity sufficient to carry them over the outer edge of the flighting, but non-round and less dense material are unable to reach the edge. They continue to travel downward and ultimately exit separately at the bottom.

The central flight of the separator must have the correct degree of pitch and be the proper length and depth to provide optimum results. Inner flights are built from either galvanized or stainless steel to eliminate buildup of static and magnetism during operation. The other components of the machines are made from welded galvanized steel which increases their ability to withstand high levels of heat and vibration and contributes to their longevity. A separator is easy to connect to shot peening equipment by either direct feed or hopper feed.

Why Shape Matters

Quality shot peening requires control over four elements of the process: Media, Intensity, Coverage and Equipment. Spiral separators are integral to media control because media must be predominately round. Broken and misshapen media can damage parts and initiate cracks.

Profile has standard and customized single and double spiral separators and the equipment configuration depends on the size and weight of the media. Customers are encouraged to send media samples to Profile for free lab analysis so that Profile can recommend the correct separator.

Five Cost-Cutting Benefits of a Spiral Separator

1 Reduces media consumption
Used media is recycled for extended media life. Profile is developing a Return on Investment Calculator to help customers see how quickly a separator pays for itself in reduced media costs. (Media manufacturers also depend on separators as an economical and effective way to prepare media for sale. Electronics Inc. uses their Profile separator to prepare media for MagnaValve testing.)

2 Protects expensive parts from damage
Broken media can damage parts upon impact. The expense of a separator is minimal in comparison to damaged components.

3 Limits wear to machine parts
Broken media creates more wear on hoses, nozzles, blast wheels, cabinet walls, screen separators and dust collection systems than round media.

4 No downtime, no maintenance
Separators have no moving parts—no downtime or maintenance—and are made from galvanized steel to withstand heat and vibration.

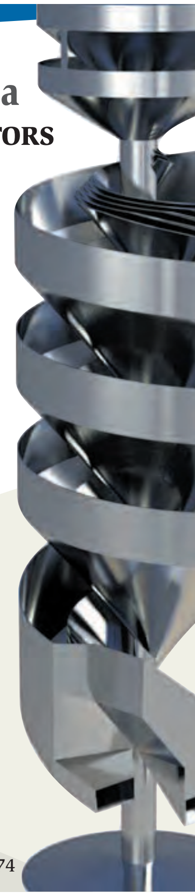
5 Zero energy consumption
Gravity, not a motor, is the operational force on a separator so it doesn't depend on expensive energy. And, fortunately, no government has found a way to tax gravity.

École Polytechnique de Montréal Requests Industry Support

Montreal, Canada. École Polytechnique de Montréal is organizing a collaborative research and development program on shot peening. The following organizations are involved: École de Technologie Supérieure, McGill University, four leading aerospace companies in the Montréal area, the Aerospace Manufacturing Technology Center and the Canadian government. Their goal is to developing accurate tools for the prediction of the shot peening results, peen forming results and the fatigue life improvement on the peened components.

The research will train highly qualified personnel, including seven PhD and two MS students, in shot peening. In this kind of collaborative project, most of the funding goes to student stipends. Therefore, the program is seeking in-kind contributions from shot peening companies to support the experimental work. The group is seeking discount or donation of an air pressure shot peening machine, peening media (ceramic, cut wire and cast steel shot), screening equipment, abrasive nozzle, etc.

Electronics Inc. has agreed to supply a MagnaValve and Almen strips for the research work and Profile Industries is donating a spiral separator. Any company interested in the supporting the research project and desires the resulting exposure to leading Canadian aerospace companies should contact Professor Martin Levesque at martin.levesque@polymtl.ca or Dr. Hong Yan Miao at hong-yan.miao@polymtl.ca.



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Tel：86-515-83859977 86-515-83793888
Fax: 86-515-83793000 86-515-83859000
Web: www.daqiabrasive.com
E-mail:keyneskhu@daqigroup.com

Blast Finishing and Shot Peening Machines

Engineered Abrasives manufactures custom and turnkey equipment for high-volume applications. Our machines are used around the world in the most demanding shot peening and blast finishing operations. We specialize in patented rotary index machines for the automotive and aerospace industries. Our index machines aren't just rugged—they are smart, too. Every action is controlled and monitored and our closed-loop systems ensure foolproof and safe operation. No media or energy is wasted at any point in the operation.

We also manufacture industrial blast conveyor systems, abrasive blast table machines, CNC abrasive blast machines, dust collectors, air deburring machines, pressure vessel systems and sand blasting equipment.

We design and fabricate all equipment at our plants in Illinois and ship around the world. We are experts at transporting and installing machines in our customers' facilities and our training and support ensures a fast start-up on the new equipment.

Machine Rebuilds

We take the manufacturing know-how that makes our new equipment a great value and apply the same principles to our rebuild work. Rebuilds are an economical alternative to new equipment and an updated machine will increase efficiency and reduce media, maintenance and energy expenses.

Job Shop Services

Shot Peening and Blast Cleaning

Engineered Abrasives provides shot peening and blast finishing services on the most state-of-the-art equipment on the market today—our own. We will analyze your part and provide competitive pricing with quick turnaround. After we complete the metal treatment, we use high pressure spray washes and ultrasonic wash/rinse and dry systems to clean your parts and assure that they arrive at your facility ready to use.

Fine Steel® Peening

Engineered Abrasives developed Fine Steel® peening for General Motors. The process is ideal for components like gears that benefit from its high KSI on the tooth surface and its elimination of gear tooth pitting.

Engineered Abrasives is an ISO/TS16949, ISO 14001 and Ford Q1 certified job shop. We meet SAE and international standards and our patented machines and processes can handle a wide range of parts.

In-House Shot Peening Support

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Inaccuracy and Variability of Shot Peening Measurements

Dr. David Kirk is a regular contributor to The Shot Peener. Since his retirement, Dr. Kirk has been an Honorary Research Fellow at Coventry University, U.K. and is now Visiting Professor in Materials, Faculty of Engineering and Computing at Coventry University.

INTRODUCTION

Every measurement ever made of a shot peening parameter has been inaccurate – to a greater or lesser extent! Every shot peening parameter varies – to a greater or lesser extent. Accuracy and variability have a powerful effect on the controllability of shot peening. They cannot, or at least should not, be ignored. Inaccuracy is the difference between a measured value and the true value. Variability is the extent to which a set of measurements deviates from its mean (average) value. Specified tolerance bands allow, however, for both inaccuracy and variability of parameters.

Three primary factors contribute to the inaccuracy and variability of shot peening measurements:

- Instrument Inaccuracy,
- Measurement Variability and
- Parameter Variability.

These three factors interact with one another – as shown schematically in Fig.1.

INACCURACY

Accuracy is often taken for granted. The emphasis in this article is therefore on inaccuracy. A simple equation connects inaccuracy with true and measured values:

True value - Measured value = Inaccuracy (1)

A measured value will differ from the true value in two respects: **Precision** and **Bias**. Precision is the last significant digit of the instrument's scale, e.g., this might be 1psi for an air pressure gage. Bias is the difference between the indicated value and the true value, e.g., if the pressure gage indicated 88psi when the true value was 91.00psi then the instrument bias would be 3psi.

Precision

Precision is important because it determines how close the instrument's reading can possibly be to the true value for a parameter. Fig.2 is a schematic illustration of the effect of low precision on inaccuracy of Almen arc height measurements. Assume (a) that a given gage reads to the nearest thousandth of an inch (b) that the gage has zero bias and (c) that the true value for the arc height of a particular sample is 9.325×10^{-3} inch - to the nearest millionth of an inch. For this particular example there is a precision inaccuracy of 0.325 – the gage displaying 9×10^{-3} when the true value is 9.325×10^{-3}. The true value could, in fact, have been anywhere between 8.500 and 9.499 and this gage would still have displayed 9 as the arc height – so that the maximum precision inaccuracy is 0.5 (for other samples).

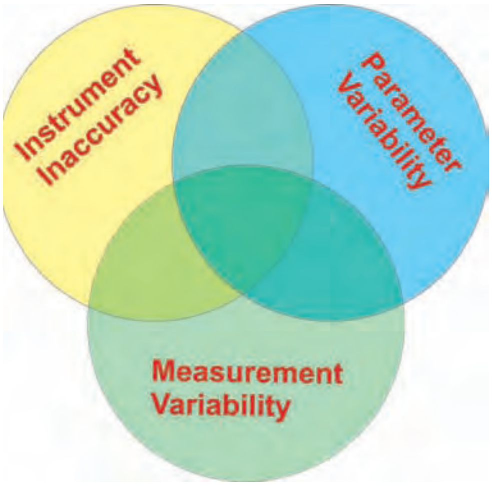

Fig.1 Interactions of Instrument Inaccuracy, Measurement Variability and Parameter Variability.

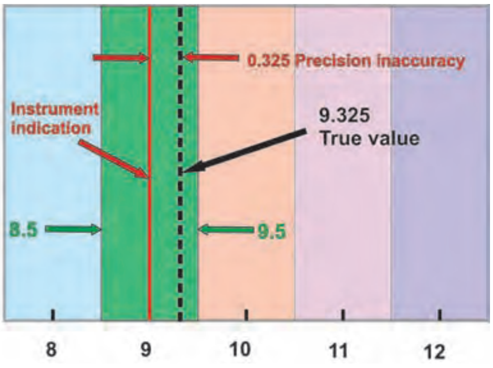

Fig.2 Inaccuracy of Arc Height Measurement caused by low instrument precision.

Modern digital Almen gages have a precision that is better than one thousandth of an inch. Fig.3 illustrates the reduction of precision inaccuracy, for the same specimen, because the gage is more precise - to one ten-thousandth of an inch. The precision inaccuracy is now, for this example, only 0.025 - as compared with 0.325 for the previous gage. True values could lie anywhere between 9.25 and 9.35 and this gage would still have displayed 9.3 as the arc height – so that the maximum precision inaccuracy is then 0.05 (for other samples).

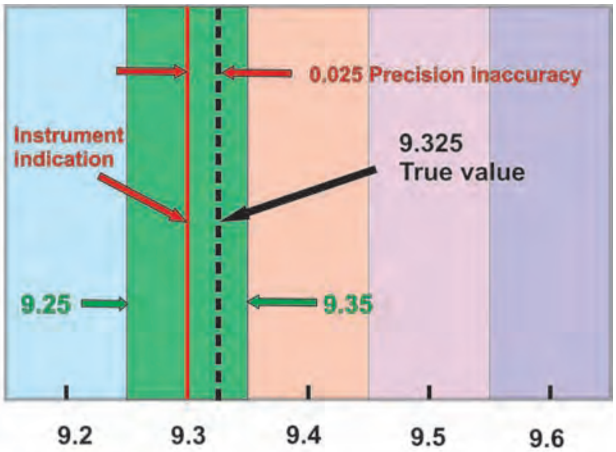

Fig.3 Reduction of inaccuracy of Arc Height Measurement by using improved instrument precision.

<u>There is generally an optimum level of instrument precision for any given application.</u> For example, it would be ludicrous to use scales precise to the nearest milligram when weighing shot to fill bags to nominally 50kg. Scale precision is related to maximum capacity so that typical milligram scales would have a maximum capacity of just over 100g. Such scales would have to be used about 500 times just to fill a single 50kg bag – multiplying the cost of the shot to the customer. Single weighings on a scale precise to the nearest gram would offer more than adequate accuracy.

Bias

Bias is the difference between an instrument's indicated value and a true value. This can only be detected if the bias is greater than the instrument's precision. If the bias <u>is</u> greater than the instrument's precision then it will have a significant effect on accuracy. The degree of bias generally changes over the range of a given instrument. Reference specimens, i.e., specimens with known true values, are needed in order to detect and determine the amount of bias.

Consider the following test question: "An Almen gage reads 10.3 (thousandths of an inch) every time a reference specimen having an arc height of 10.000 is placed on the gage. What is the bias of the Almen gage?". A quick, inaccurate, answer would be "0.3". The correct answer would be "At the moment it is somewhere between 0.25 and 0.35". "At the moment" is appropriate because the difference of 0.3 might change with time – instrument instability could be a factor. Fig.4 shows why the bias, for this hypothetical example, lies somewhere between 0.25 and 0.35 and is not precisely 0.3. The gage would 'round' any value

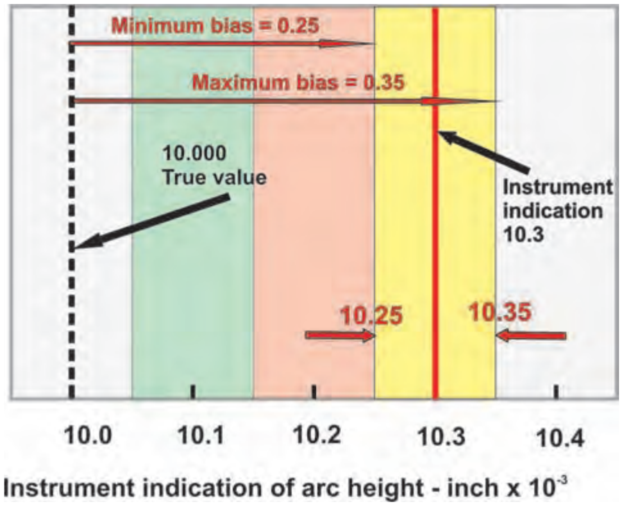

Fig.4 Example of Almen Gage bias lying between 0.25 and 0.35 (thousandths of an inch).

between 10.25 and 10.35 to its nearest precision value – 10.3.

If a bias of, for example, 0.25 to 0.35 was left uncorrected then it would have a significant effect on the accuracy of indicated arc heights for peened strips.

Bias can vary over the available range of any given instrument. Weighing scales are perhaps the easiest for detecting bias over a scale's range. Table 1 gives the measurements obtained by using a set of calibrated applied masses on a 50g capacity "Digital Pocket Scale". The scale was advertised as having an "Accuracy: ± 0.01g" and as having "Auto Calibration".

Table 1 Applied versus Indicated Masses for "Digital Pocket Scale"

Applied Mass - g	Indicated Mass - g	% Bias
1.000	1.01	1.00
2.000	2.00	0.00
5.000	5.03	0.60
10.000	10.03	0.30
20.000	20.05	0.25
50.000	50.12	0.24

The values given in Table 1 (a) illustrate the fact that manufacturers often confuse "accuracy" with "precision" and (b) reveal that the scale has a small bias that varies with the magnitude of applied mass.

Some instruments, such as Almen gages, are notoriously difficult to calibrate accurately. Almen gages support strips on four balls that are subject to wear. The author's calibration solution is to employ a carefully-preserved set of eight stress-relieved, peened, 'A' strips. These are a set that had been peened to produce a saturation curve and therefore had different arc heights. Stress-relieving involved heating for four hours at 500˚C – which reduced the arc heights by only about 10%. Polishing the stress-

relieved set 'face-up' on fine emery paper induced tiny flats on each of the four corners. A precision surface grinder was then used to produce a small central flat on the convex surface of each stress-relieved strip. Placing each such strip on an 'Engineer's stand' equipped with a calibrated digital gage allowed the 'height' (ground flat over base) of each strip to be measured. This was to determine the curvature stability of the stress-relieved strips. In practice no detectable change occurred over a ten-year period for any of this set of calibration strips.

Checking for bias, and changes of bias, is easier for some instruments than it is for others. An additional consideration is that checking takes time and therefore costs money. For some instruments e.g., air pressure gages, it is tempting to assume that the instrument does not have a bias. Complete reliance is then being placed on the inbuilt accuracy of the instrument. Critical measurements, such as arc heights, require regular checking for bias. An important guiding principle is that: "Calibration specimens should have values near to those of the objects to be measured."

VARIABILITY

Every instrument normally indicates different values when it is being used. Variability can be quantified in terms of "Variance". Variance, **V**, is the square of the measured standard deviation, **σ**, of a set of measurements. Hence:

$$\textbf{Variance, } V = \sigma^2$$

The key to understanding and using variances is to appreciate three of its features:

1 - Constituent variances are additive,

2 - Contributing variances must be identified and

3 - Contributing variances with small standard deviations can be ignored.

1 - Constituent variances are additive. Assume, for example, that single measurements of mass made on each of 50 Almen A strips indicated a variance of 11 (in arbitrary units). 50 repeat measurements made on just one of the 50 strips indicated a variance of 1. The observed variance is therefore 11 and the measurement variance is 1. Now:

Observed variance =
Measurement variance + Mass variance

so that, for this example:

11 = 1 + Mass variance

Hence we can deduce that the mass variance, for this example, is **10**, (11 – 1).

2 - Contributing variances must be identified. For example: the variances that contribute to the mass (weight) of an Almen strip can be identified as being length, width, thickness and steel density. No other properties of an Almen strip (such as hardness) contribute to its mass. If, for example, it was established that the variances of length, width and steel density for the strips were all equal to 1 then:

10 = 1 + 1 + 1 + Thickness variance

from which we can deduce that the thickness variance must be **7**, (10 - 1 -1 -1).

3 - Contributing variances with small standard deviations can be ignored. This is a very important point that is rarely highlighted. Imagine, for example, that the observed standard deviations (not variances) for length, width and steel density for a given batch of Almen strips all had a magnitude of 1 and that the observed standard deviation for mass was 10. Converting these into variances gives that:

100 = 1 + 1 + 1 + 97 (thickness variation)

That means that 97% of the observed variability can be attributed to thickness variation so that variations of length, width and steel density can effectively be ignored (as being insignificant).

Measurement Variance

Measurement variance arises when an instrument indicates different values for repeat measurements made on the same specimen. For example, a high-precision Almen gage may well indicate slightly different values for arc height when the same peened strip is measured several times. The causes of measurement variance are normally identifiable and involve a combination of operator and instrument factors. Reputable instrument manufacturers usually try to offset measurement variance. Every case is, however, different making it difficult to generalize.

The standard method for countering measurement variance is to take the average of repeat measurements on the same specimen. If two successive measurements are identical then it is generally assumed that there is no significant variance and the average is self-calculated. If, on the other hand, two successive measurements are different then further action is necessary. If the difference is only one instrument unit one can either take the average or take a third measurement. For three measurements with two the same and one differing by only one measurable digit then the value of the two identical measurements is generally accepted.

Parameter Variance

Every shot peening parameter varies. For example, Fig.5 illustrates the variability of indent size. Different parameters vary, however, in different ways. For example the variability of cut wire shot diameter is quite different from that of cast steel shot. The type of variation affects how it can be measured and controlled.

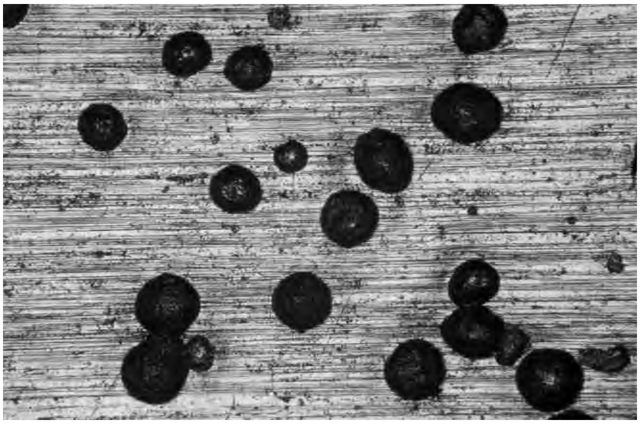

Fig.5 Variability of indent size.

APPLICATION OF VARIANCE TECHNIQUES

Management and control of variability requires that it is can be measured quantitatively. Standard deviation and variance can then be calculated automatically, for example by using Excel.

Studies of parameter variability involve several other defined terms. These include:

Population – this is the total number of identifiable objects that could be measured. A 50kg bag of 110 size steel shot would contain about two hundred and fifty million particles. The population size would then be two hundred and fifty million. Taking ten seconds per particle to measure just one parameter would take eighty years for the whole population. This leads to the need for selecting a representative sample.

Sample Size – this is the number of identifiable objects properly selected as being adequately representative of the whole population. An "adequate number" will depend on the variability of the object and the ease of making individual measurements. The greater the variability the greater is the sample size needed to be representative.

Parameter Distribution – the measured parameter values for a particular sample may have different 'distributions'. A frequently-encountered distribution is the "Normal Distribution" which has a bell shape.

Range and Average – range is the difference between the largest and smallest measurements made on a sample. Average (or Mean) is the total of the measurements divided by the number of measurements.

The following Case Study is an example of how variability techniques can be applied and analyzed.

Case Study One:
Variability of Almen 'A' Strips for Two Boxes of 50

For this study. two unopened boxes of 'A' strips, Box A and Box B, were available. The defined objectives were to (a) determine the types of size distribution, (b) calculate and compare the variability of the strips and (c) to determine the most important factor contributing to any observed size variation.

Readily-available instruments were micrometers, digital dial gages and digital weighing scales.

The easiest measurements to make were those of mass - using digital weighing scales. Complete box content weighings - on a 1000g capacity scale having a precision of 1g - gave identical values of 725g for Boxes A and B. This indicated that each strip would weigh about 14.5g (725g/50). Each strip from Box A was then weighed once – on a calibrated 50g capacity scale with a precision of 0.01g – and each strip from Box B weighed twice, (W1 and W2), once on each of successive days.

Excel provides a powerful range of analysis tools. Each of the three sets of 50 mass measurements can readily be sorted in, for example, descending order. This reveals the smallest and largest values in each batch together with the range. The average values and total mass for each batch are also indicated. Highlighting each batch of 50, then 'Formulas', 'More Functions', 'Statistical' and selecting 'STDEV' yields the standard deviation for each batch. Table 2 summarizes the application of these analysis tools. Only ten measurements from each fifty (five lowest and five highest) are shown in Table 2.

Table 2 Analyzed Measurements of Almen Strip Masses

Strip No.	Box A	Box B -W1	Box B - W2
1	14.39	14.39	14.39
2	14.43	14.39	14.40
3	14.43	14.40	14.40
4	14.43	14.42	14.41
5	14.44	14.43	14.43
etc	etc	etc	etc
46	14.50	14.50	14.50
47	14.50	14.50	14.50
48	14.50	14.51	14.51
49	14.50	14.51	14.51
50	14.51	14.51	14.52
RANGE	**14.39-14.51**	**14.39-14.51**	**14.39-14.52**
AVERAGE	**14.469**	**14.463**	**14.462**
STDEV	**0.0246**	**0.0277**	**0.0277**
SUM	**723.47**	**723.16**	**723.12**

Size distribution was assessed by constructing histograms (using Excel) for all three sets of 50 measurements – the histogram for Box A measurements being shown as fig.6. The shape of the histograms for Box B measurements had the same shape as that shown by Box A.

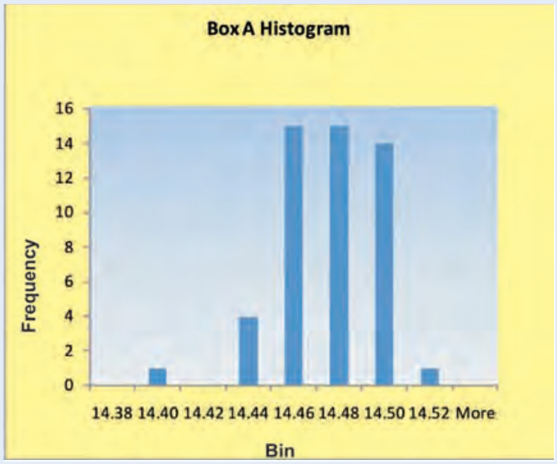

Fig.6 Histogram of mass measurements for Box A containing fifty Almen A strips.

The type of mass distribution shown in fig.6 is very similar to that of a "Normal Distribution". A Normal Distribution is very common and has an equation:

$$\mathbf{p = exp[-(x - \mu)^2/(2\sigma^2)]/[(2\pi\sigma^2)^{0.5}]} \qquad (2)$$

where **p** is probability, **x** is parameter value, **μ** is the average value and **σ** is the standard deviation (note that the variance, σ^2, is directly involved). Fig.7 on page 32 shows the Normal Probability Distribution for the Box A values (given in Table 2) of **μ = 14.469** and **σ = 0.0246**.

The mass of an individual Almen strip is its volume multiplied by its density. Volume of a rectangular strip is its length times its width times its thickness. This means that there are only four factors (length, width, thinness

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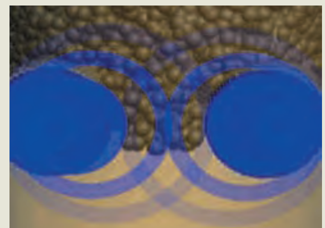

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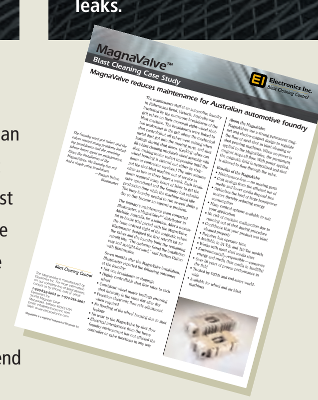

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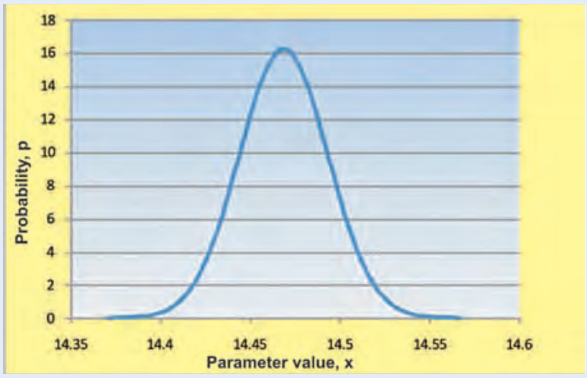

Fig.7 Normal Distribution curve for Box A parameters.

and steel density) that can possibly be responsible for the observed mass variability. Three of these factors (length, width and steel density) had such a small standard deviation that they can be ignored. This was established by selecting the lightest and heaviest strips and carefully measuring their length, width and thickness. For the Box A strips the lightest and heaviest strips were both 76.17mm long by 18.97mm wide (averages of seven measurements). The lightest strip, 14.39g, had a thickness of 1.281mm as compared with 1.295mm for the heaviest strip, 14.51g, in the batch (again averages of seven measurements). Dividing mass by volume gives a value of 7.76 for the density of both strips. Hence the only remaining significant variable is the Almen strip thickness.

The observed maximum difference in thickness for the Almen strips was 1.01%. Thickness difference will affect the magnitude of arc height induced by a given amount of shot peening. It has been established that the induced arc height is inversely proportional to the square of the strip thickness. Hence a 1.01% increase in thickness will reduce the induced arc height by 1.02% (1.01^2) e.g., from 9.76 to 9.57. Such a maximum effect is not likely to have a measurable effect on deduced peening intensity – because strips chosen for a saturation curve set would rarely include the thickest and thinnest from a box of 50.

MANAGEMENT OF INACCURACY AND VARIABILITY

Four independent factors are involved that require separate attention: **Instrument Precision, Instrument Bias, Measurement Variability and Parameter Variability**.

Instrument Precision. This the simplest factor to manage because the level of precision is pre-ordained by the instrument(s) being used. Initial purchase ensures that an appropriate level of precision is provided. Precision is, however, only part of accurate measurement.

Instrument Bias. Management of instrument bias is based on the availability of reference standards and whether or not a proactive approach is in operation. Every instrument presents different problems, so that it is impossible to generalize on their solution. For example, reference standards are readily available for weighing scales and are very simple to use. Air pressure and Almen gages, on the other hand, present much more difficult problems. A Case Study is presented that illustrates how known problems with Almen arc height measurement can be overcome.

Measurement Variability. The standard method of overcoming measurement variability is to take the average of repeat measurements.

Parameter Variability. Parameter variability is unavoidable but can readily be quantified by taking enough measurements and applying procedures such as those described in Case Study 1.

Case Study Two: Reference Standards for Almen Gage Measurements

Check blocks are commonly used to zero the gage (using the flat side) and to check one gage reading (using the singly-curved side). This does not, however, provide a reference standard for the arc height of peened strips. These have a double curvature and contact the support balls at different points from those contacted by check blocks.

An appropriate reference standard for peened strips is a set of stabilized peened strips. It has been shown that approximately half of the curvature of a peened strip is caused by residual stress and half by plastic deformation. The residual stress contribution is unstable, in the sense that peened strips slowly 'self-anneal', whereas the plastic deformation contribution is permanent. Experimental studies have shown that peened strips lose only about one or two percent of their arc height after ten years at room temperature. Thereafter no further arc height reduction is detected. 'Stabilization' consists of low-temperature annealing, which is much more effective than even ten years at room temperature. Sets of peened strips that have been stabilized cannot change their arc heights and can therefore safely be used as reference standards. Fig.8 illustrates the principle of stabilization using a set of ten peened strips.

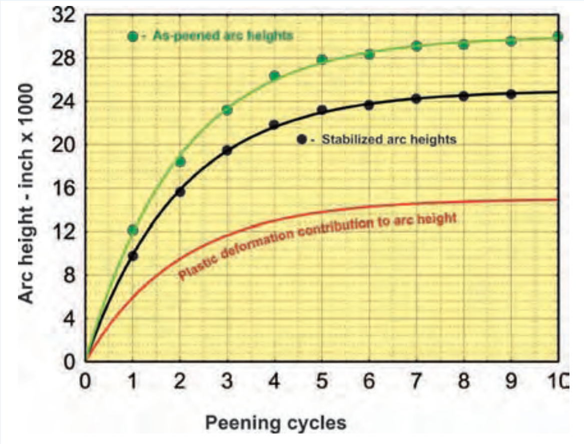

Fig.8 Arc heights and saturation curves for as-peened and stabilized strips.

Sets of stabilized strips should, ideally, have their arc heights measured several times using either a new or newly-calibrated Almen gage. A saturation curve is then produced for the set of strips and analyzed for the unique peening intensity, H, occurring at a determined fractional number of cycles, T. The individual arc heights, together with the deduced values of H and T, then act as the required reference standards.

DISCUSSION and CONCLUSIONS

Measurements inevitably involve some degree of inaccuracy and variability - in every branch of engineering. This is accommodated by having tolerance bands in specifica-

tions. Management of inaccuracy and variability costs time and money. A balance has to be achieved that is cost-effective. The optimum balance point depends upon the nature of the business involved. Some examination techniques have been included in this article but they are only intended to be illustrative of a very broad subject. Of particular note is the ease with which computer programs can be used to quantify the average, range and variability of a set of measurements. Determination of the type of measurement distribution is usually, however, of more theoretical than practical interest.

Regular use of reference standards is essential if inaccuracy is to be detected. It would be wrong to put blind faith in the accuracy of instrument readings. Measurement variability is readily countered by using repeat measurements.

It is possible to misinterpret the additive nature of variabilities. They are only additive if they are present. For example, it would be inconceivable that a saturation curve would be produced using six strips from six different batches, measured by six different operators on six different Almen gages. On the other hand, a set of stabilized strips can ensure that a given gage produces reliable measurements.

One silent enemy of accuracy is long-term drift. A relevant example is that of Almen gage ball wear. Periodic refurbishment and re-calibration is therefore necessary. Evolution of ball wear can be monitored via recorded checks using reference strips. That is facilitated if readings are fed into a computer program that can monitor progressive (and sudden) changes. ●


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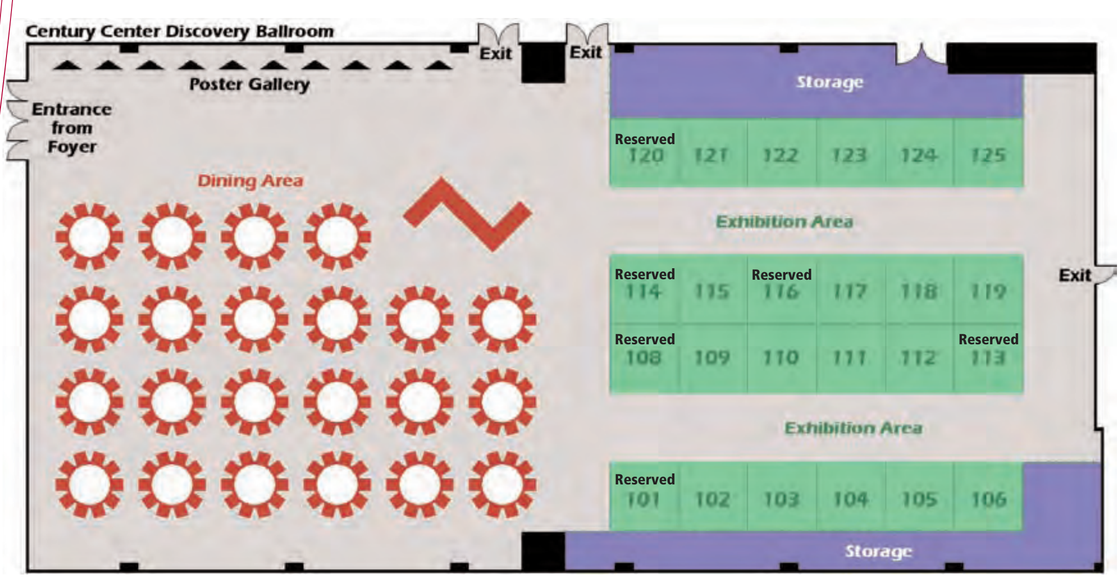


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An enclosed, climate-controlled walkway connects the South Bend Century Center Convention Center to the full-service Marriott hotel. Rooms in the Marriott are available to ICSP-11 participants at a discounted rate of $109.00 (single and double rooms). Reservations must be received on or before 5 p.m., Sunday, July 29, 2011 to receive the discounted rate. To make hotel reservations, call 1-800-228-9290 or 1-574-234-2000 and mention "ICSP-11." For highlights and photos of the Marriott and a Visitor's Guide, please visit http://www.marriott.com/hotels/travel/sbnin-south-bend-marriott.

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A 75% refund can be made up to August 30, 2011. No refunds after this date.

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WHY ATTEND ICSP-11?

- **Develop worldwide partnerships with industrial and education professionals**
- **Maintain existing contacts and marketing networks**
- **Obtain market intelligence on newest research and developments**

Cheap Can Be Very Expensive

by Nick Hart and Dan Dickey | Innovative Peening Systems

A value comparison between industrial Computer Numerical Control (CNC) and Personal Computer (PC)-based control

An alternative to CNC are PC-based numerical controls. PC systems are often priced significantly lower, but claim the same level of accuracy and dependability as dedicated CNC controllers. However, before you go the cheap route for a shot peening machine motion controller, consider some important points.

Stability

CNC controllers have developed a very stable platform. There are literally thousands of these controllers sold every month. Even the latest CNC controllers have been through many years of design adaptations, making them extremely dependable. Time between controller failures is measured in decades. For example, a leading manufacturer has a measurement of 27 years MTBF (Mean Time Between Failures) for their controllers. Ratings for most PC manufacturers would be a guess since they've not been on shop floors for extended periods and many are new and customized programs.

Support

A PC motion control developer creates a program based on the latest Microsoft operating system. That's the first problem: Microsoft doesn't develop their operating systems for industrial machine control; they are designed for office and home applications. The next issue is that continued support for PC-based systems is beyond the developer's control—it's possible only as long as the operating system functions in the same way as when the product was developed. And nothing is worse than looking for the guy that wrote the program who is no longer in business.

Most of us have felt the pain of operating system (OS) updates, from XP to Vista, then back to Windows 7. PC-based controllers ride on the backbone of the OS installed on the PC. Once the OS is updated, the application may perform erratically, unsafely, or not at all. In addition, PC users have hardware and applications that won't run on the newest types of processors, or the hard drive installed in the PC is no longer manufactured. These problems cause system downtime while an entire system is upgraded because of one component failure.

CNC systems don't have this problem as the software was specifically designed with the control system in mind and it's supported by the manufacturer of the controller. It's easy to find reliable support in the CNC industry. A good example is Fanuc FA America. They provide 15-year afterlife support on all CNC controllers. That means that 15 years after the product has been discontinued, Fanuc will have replacement parts for the controller.

Compatibility

The internal operating system of a PC system is designed for general purpose computing and the potential for conflict among the CNC components and software is real. A system lockup from a conflict is devastating when it causes a machine tool to lose its controller.

CNC systems are just that—a system of controller, amplifiers, cables, I/O, servos and spindle motors that's built for longevity. CNC controls are specialized computers which often use the same main processor as a PC, but its sole purpose is to control machinery. The design incorporates safeguards at the hardware and software level to detect problems and to stop the machine if an error is detected. Since features are specifically designed for that control, system conflicts are virtually non-existent.

PCs use a single high-speed processor to perform the majority of the tasks required by the software. This means that not all of the machine's critical functions can be monitored simultaneously. The processor must share some percentage of the time monitoring the servo positions and speed, scanning the control logic, handling operator input, updating displays, plus manage its own internal housekeeping. Although the fast speed of the processor can minimize the time that functions are left unchecked, many control functions are ignored at any given time.

CNC controls use multiple processors to control each aspect of the system. Peripheral request or machine functions can be done at a sub-system level without interfering with other processors. CNC controls utilize digital technology with servo drive systems, resulting in higher accuracy and speed.

There's Always a Bottom Line

From a capital standpoint, PC controls may be cheap but they could get very expensive later due to downtime. Lost production will have a far greater economic impact than the initial cost of a CNC system.

Next time you want to play solitaire or write a document like this one, buy a PC and get good virus protection. (Speaking of viruses, what happens if your PC-based system gets one?) Then after a couple of years, buy another because your PC will be outdated.

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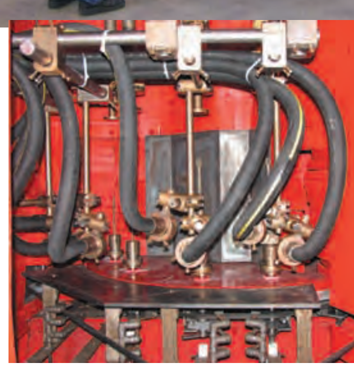

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Keeping Pace with SAE Documents

It seems like we are never done with SAE documents. The SAE Surface Enhancement Committee made significant changes to SAE J 442 (Test Strip, Holder and Gage for Shot Peening) at our meeting in St. Louis in October 2010 and therefore J 442 will be going out to the Surface Enhancement Committee for ballot. Many of these changes need to be reflected in SAE J 443 (Procedures for using standard Shot Peening Test Strip) and so this document will be opened for edits. Here's a brief summary of suggested changes in J 442:

- Add section for definitions,
- delete section 3 (Outline of Method of Control) and push that information over to J 443,
- replace term "intensity" with "arc height" where needed,
- remove section 5 along with Figure 4 and Figure 5 depicting nomenclature used for gage readings illustrating strip type (A, N or C), and move that information over to J 443.

In summary, J 442 is information on how to produce test strips, holders and gages. J 443 describes how to use the strips, holders and gages.

The SAE aerospace Surface Enhancement task group is working on a long-overdue document, Manual Peening. This has been inspired by the cancellation of AMS-S-13165, the old U.S. Government Military Specification for shot peening. The equipment requirements in section 3.2.1 state:

> **3.2.1 Automatic shot peening: The machine used for shot peening shall provide means for propelling shot by air pressure or centrifugal force against the work, and mechanical means for moving the work through the shot stream or moving the shot stream through the work in either translation or rotation, or both, as required.**

I'm not sure how some people can read this requirement and conclude that manual peening can be used to satisfy 13165. I've been told by some committee members that probably half of the peening done to this spec is actually manual peening. So, what's the problem? With the cancellation of 13165 and migration to AMS 2430, we left some orphans. AMS 2430 specifically states in section 8.5:

> **8.5 Manual peening is not directly addressed by this specification. Prior and future applications should be as agreed upon between processor and the cognizant engineering organization.**

So, once again, people doing manual peening are acting outside of the specification limits.

Now we have an opportunity to write a new specification addressing manual peening that includes machines with two hand gloves, barrel peening and tumble peening type machines or any other application where the nozzles or the workpiece are not mechanically controlled. This seems like an easy challenge at first but once you start to establish the requirements, you soon realize there is a lot to include.

For instance, how do you determine intensity in a tumble blast machine? Do you allow the strips and holders to tumble with the parts for a machine cycle? What if you place the strips and holders in the machine and let them tumble with the parts but don't turn on the media flow? Will the impact of parts onto the strips cause an arc height response even though they haven't been impacted with shot? This and other concerns led SAE to revise AMS 2430 version R to read:

> **4.4.3 Cognizant engineering organization approval of the peening procedure and inspection is required for the use of batch or bulk peening processes and machinery, such as tumble or barrel peening.**

If you're trying to keep pace with this committee you should be aware of the following new specs that have been published by SAE: AMS 2580 Shot Peening Ultrasonically Activated, AMS 2585 Shot Peening Media Ultrasonically Activated, AMS 2590 Rotary Flap Peening, AMS 2592 Flap Assemblies Rotary Flap Peening. Another work in progress is Ultrasonically Activated Needle Peening for Peen Forming.

ICSP-11 Booth Registration

The Eleventh International Conference on Shot Peening scheduled for September of 2011 has opened registration for exhibit booths. For more information, see page 36 of this magazine or visit www.shotpeening.org. Over 105 papers have been received for the conference as well as ten poster exhibits. Abstracts are also available at the web site. Students wishing to submit a poster are encouraged to contact the committee secretary, Ms. Lori Bonk, for instructions at 574-256-5001 or lori.bonk@electronics-inc.com. Students may attend the conference at a reduced fee.

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I had the opportunity to attend the Shot Peening and Blast Cleaning Workshop sponsored by Electronics, Inc. in October 2010 and was impressed by the quality of training, availability of workshop presenters and supporting literature. Workshop sessions were designed for appropriate course material and sufficient time was allocated for attendee feedback and questions.

The break-out sessions reinforced the critical concepts presented in the shot peen workshop and enabled advanced knowledge, techniques and applications. The on-going emphasis on quality, consistency and accountability in all processes was welcomed as was the input from Nadcap representatives.

Vendor displays proved helpful and ensured up-to-date knowledge of the industry, advancements, products and services available.

This was a highly professional, quality shot peen workshop. Accommodations, support staff, luncheons, etc., were excellent. Our organization has utilized other workshops in the past and would certainly recommend Electronics, Inc.'s workshop training.

—Quality Manager
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