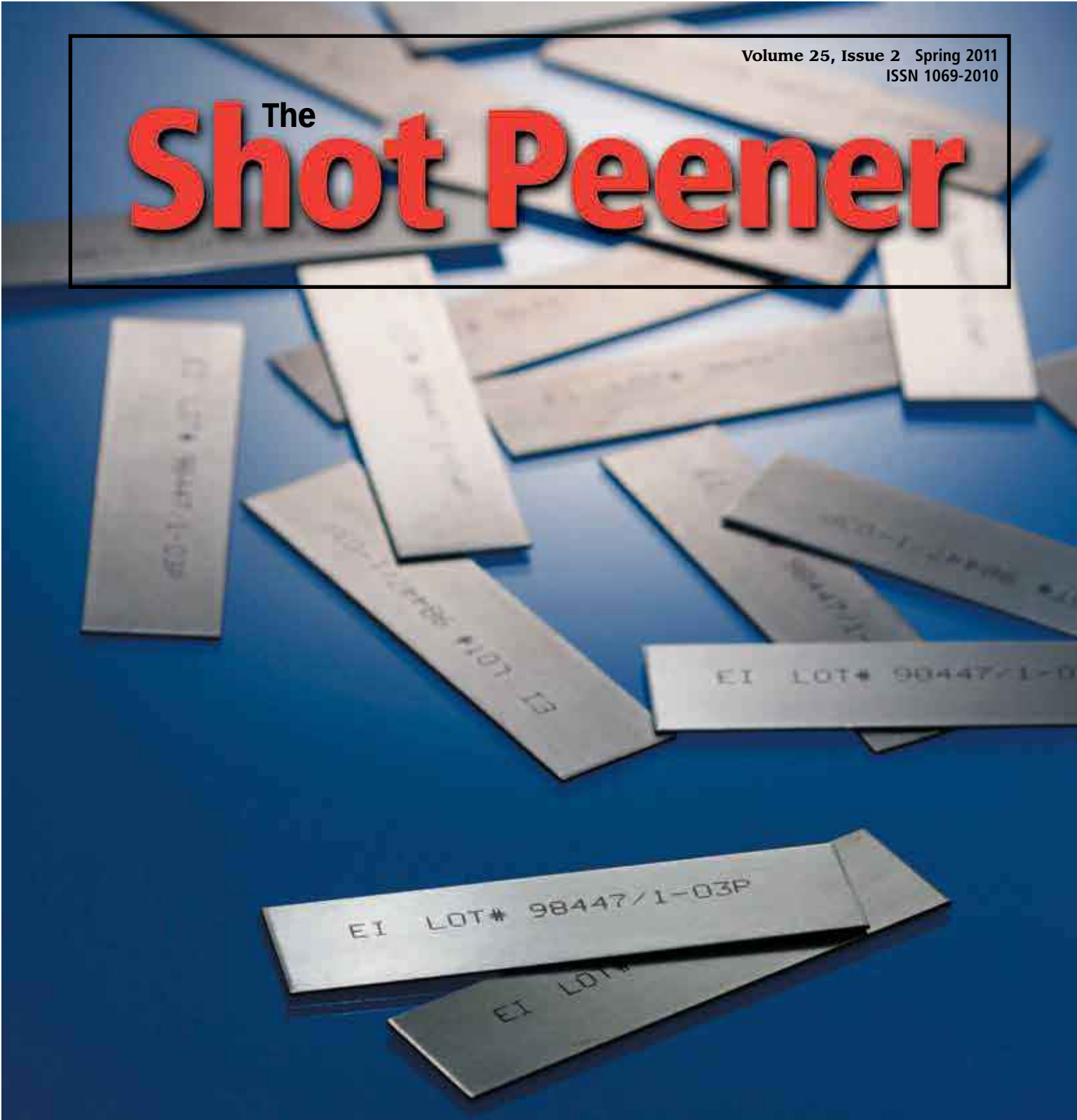
Volume 25, Issue 2 Spring 2011
ISSN 1069-2010

The Shot Peener



The New Numbered Almen Strips with Coverage Check Finish

Plus:

Are You LinkedIn Or Missing Out?

Shot Peening Equipment for Steam Turbine Blades

Properties of Carbon Steel Shot

Portable Coverage Measurement Device

Smart Measurement by ONLY touch screen

COVERAGE CHECKER

Portable Coverage Measurement Device

COVERAGE CHECKER

COVERAGE CHECKER the device for easy and precise coverage measurement

- Automated coverage inspection eliminates human error.
- Multiple operators will get consistent results.
- COVERAGE CHECKER measures coverage in coil spring bores and other narrow areas.
- A nozzle is available to measure coverage in the interior walls of holes.
- Beginners can measure coverage as skillfully as experienced operators.
- COVERAGE CHECKER is a good training tool.

Distributor

Country	Company	TEL	E-MAIL
USA	Electronics Inc.	+1 574-256-5001	sales@electronics-inc.com
CANADA	Shockform Inc.	+1 450-430-8000	sales@shockform.com
EUROPE	SONATS	+33 251-700-494	sonats@sonats-et.com

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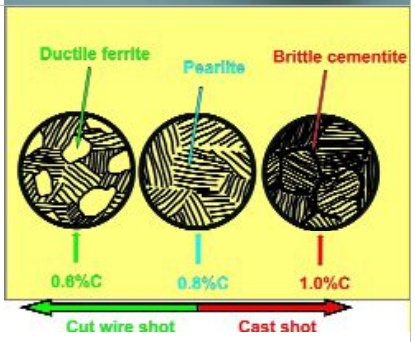
Volume 25, Issue 2 **Spring 2011**

Celebrating 25th Year

The Shot Peener

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

Celebrating 25 years in publication • Over 6,000 readers in 80 countries



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

Introducing the Next Generation of Almen Strips

Numbered Almen Strips with Coverage Check Finish

Numbering System
- Provides a tracking method for meeting specifications, and first-in, first-out, ISO and Nadcap requirements
- Allows lot-to-lot comparison for process consistency
- Part of Electronics Inc.'s comprehensive traceability and audit program
- Denotes genuine EI product

Coverage Check Finish
(U.S. Patent No. 6,568,239)
- Lapses in coverage are easy to check visually
- Contributes to a proper flapper peening technique
- Enhances capabilities of coverage checker tools

The Almen strip hasn't changed significantly since its development in the 1940s by John Almen. Year after year, the deceptively simple test coupon fulfilled its function as an indicator of shot peening intensity. Shot peening was growing increasingly sophisticated; however, mostly due to its contribution to the aerospace industry. Electronics Inc. (EI) recognized this and has developed an Almen strip with features to help peening facilities meet the demands for increased process and quality control.

THE ELECTRONICS INC. NUMBERING SYSTEM

The new strips are printed with their lot numbers. This numbering system will simplify record-keeping for facilities that want to:
- Maintain a tracking system to meet specifications and manual procedures
- Meet ISO and Nadcap requirements
- Perform lot-to-lot comparisons for process control
- Maintain first-in, first-out inventory control

An Added Convenience

Lot numbers are clearly printed on EI's Almen strip boxes but sometimes boxes are thrown away and sometimes strips from different boxes are mixed together. A numbered strip will be a real convenience in those instances. (See the next article on the ultimate strip mix-up.)

Backed by EI's Traceability and Audit Program

EI's lot numbering system is an outward symbol of their commitment to making the strips the most dependable and consistent strips on the market. Electronics Inc. has developed a traceability program, represented by the strips' lot numbers, to track Almen strips back to their heat number. A heat number is a unique identification code for a piece of metal that holds information about its origins. The heat number provides a method for tracking materials and is an important part of quality assurance and control.

In addition, EI audits four documents from their steel supplier:

1) Material certificate - steel composition must conform to SAE 1070 specifications.
2) Inspection records for thickness, width and length.
3) Process control charts for hardness.
4) Decarburization report that confirms zero surface decarburization. (Decarburization is a change in the structure and content of steel in which some of the carbon in the surface layer or layers of the steel is lost. If an Almen strip has decarburization, its hardness may be compromised and its performance will be unreliable.)

EI's steel supplier is a global industrial group with advanced steel production capabilities and is happy to comply with EI's audit program. Most EI customers will never need to take advantage of the traceability and audit program. Nevertheless, if a supplier or manufacturer in the aerospace, automotive or medical industry faces a liability situation, they can have confidence in the completeness of information on every step of the EI Almen strip manufacturing process, and that the strips were manufactured to the highest standards.

Denotes Genuine EI Strips

Electronics Inc. has been producing its own brand of Almen strips since 2007. EI took on the responsibility of manufacturing Almen strips to meet the increased demand for strips and to provide better quality control. Unfortunately, non-EI strips have been sold as EI product with the potential for harming EI's reputation. One such instance was brought to EI's attention recently by a distributor when it was discovered that non-EI strips were packaged in white boxes with photocopies of EI strip certification and sold as EI strips. These strips weren't performing to specifications but EI quickly proved that the strips weren't their product. The new identification system is for the protection of the customer and EI. If "EI" isn't printed on the strip, it's not an EI strip.

THE COVERAGE CHECK FINISH

The strip's patented finish sets it apart from other strips in looks and function. For the first time, an Almen strip will:
- Make visual inspection for coverage uniformity easier. (See Figure 1, page 6) Lapses in coverage in the dark, mottled areas of other strips are difficult to see.
- Reveal improper blast patterns on setups for small or masked areas.
- Contribute to a proper flapper peening technique. Orbital patterns are immediately visible on the EI strip so the operator can make adjustments to his technique, if needed, before peening the actual part.
- Enhance the capabilities of coverage check tools. The new strip is the ideal strip to use with coverage check tools because its bright finish uniformly reflects

Innovative Peening Systems

Plastic Media Blasting & Blast Rooms

Automated Shot Peening & Abrasive Blasting

Innovative Peening Systems is a manufacturer of high quality automated shot peening and abrasive blasting machinery. Our CNC robotic computer controlled shot peening and abrasive blasting machines offer cutting edge motion control and shot delivery technologies. Machinery meets or exceeds AMS-2432 and AMS-13165 specifications.

Our CIMCAP (controlled intelligent motion computer alarmed parameters) software is a PC based operator interface for process reporting. This closed loop system allows for detailed process monitoring.

Other machinery types include blast rooms, centrifugal wheel (roto) blasting machines. IPS also offers a detailed job shop for shot peening, plastic media blasting and machine repair and modifications. Our airfoil coatings job shop provides sacrificial protection reducing corroding and eroding while leaving substrate metal intact.

Innovative Peening Systems, 2825 Simpson Circle, Norcross GA 30071. Ph 770-246-9883, Fax 770-246-9860
Innovativepeening.com

light, making it easier for the tool to accurately read the surface.

- Verify uniform peening on strips that have been peened at low intensity. It will be easy to see small dents on an EI strip.
- Provide easy-to-read lot numbers. For operators that used to write lot numbers on the strips: No more smeared numbers in illegible handwriting. Also, the strip's light surface provides great contrast for the large, black lettering.

Please note: The strip with Coverage Check Finish was developed to assist in coverage determination in certain circumstances. The strip is not meant to replace a coverage control procedure on actual components.

PROVEN CONSISTENT PERFORMANCE

Laboratory and field tests are continuously performed to ensure consistent performance among lots of the numbered strips, and between EI numbered strips and the original EI strips. Customers can have complete confidence in the strips' consistency, even if they use both the older EI strips and the new numbered strips during a shot peening process. Performance testing histograms are available upon request and a sampling is shown in Figure 2.

Figure 1. These strips underwent the same peening process. Verification of uniform coverage is easier on the new strip with Coverage Check Finish than on the darker, mottled strip.

The Electronics Inc. Numbered Almen strips are available at the same price as the original EI strips. For more information and to order, call 1-800-832-5653 (USA and Canada) or 1-574-256-5001.

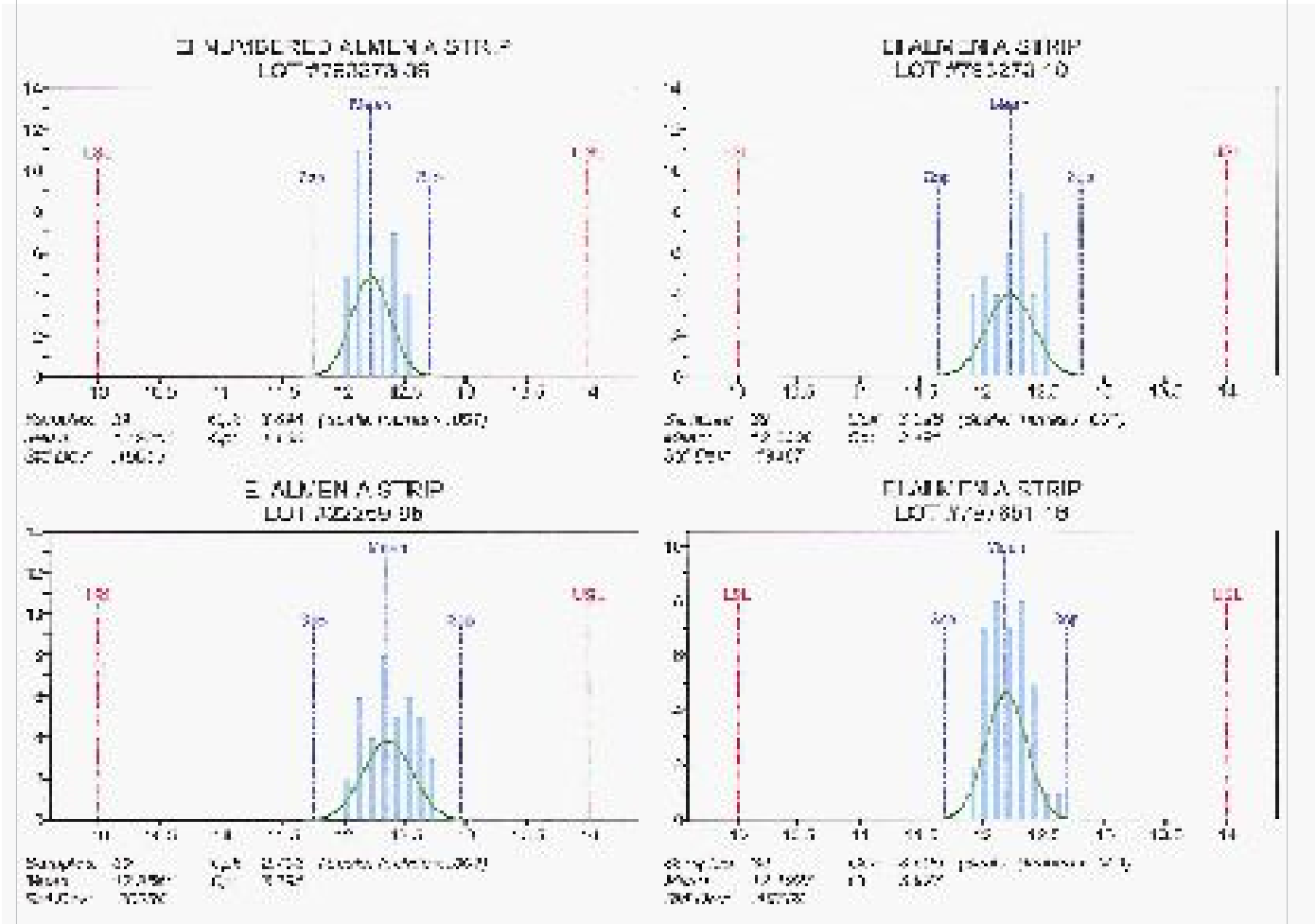
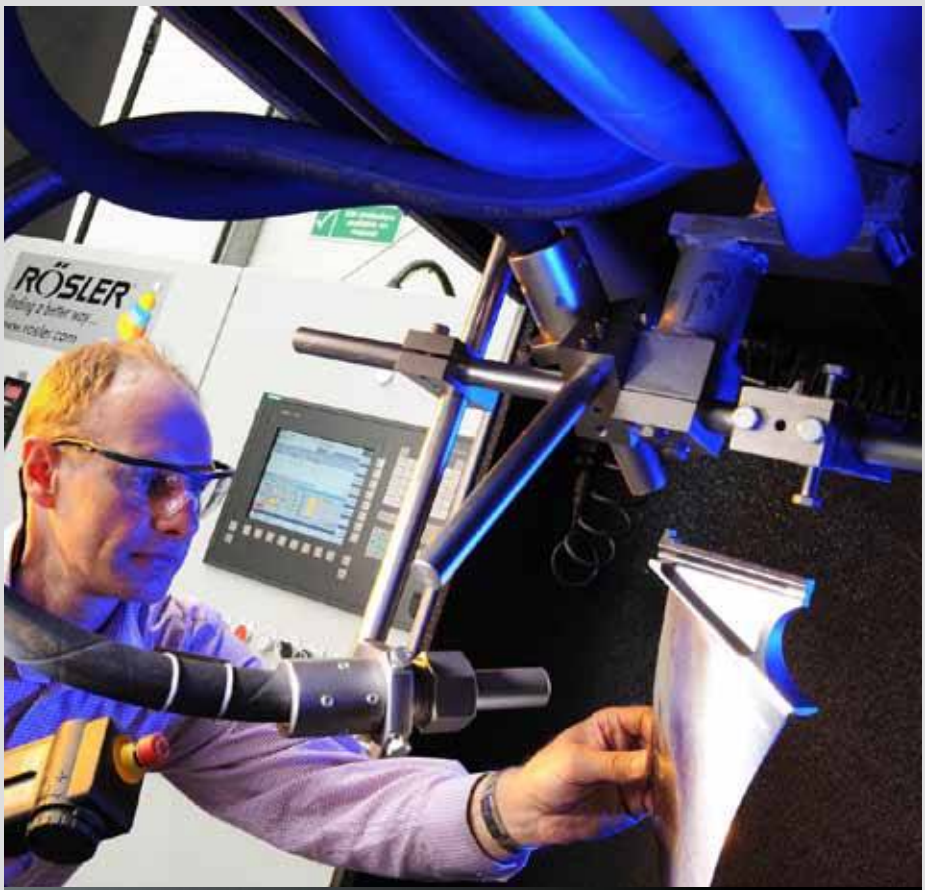


Figure 2. Laboratory and field tests are performed to ensure consistent performance between the new and older EI Almen strips and between lots of the numbered strips. Additional testing histograms are available. Call 1-800-832-5653 (USA and Canada) or 1-574-256-5001.



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RÖSLER® finding a better way ...

The Ultimate Strip Mix-Up

A customer called Electronics Inc. (EI) and was very upset. "Your strips from lot 76547/1-23 aren't conforming to their N1-SS designation," he said. "We want them replaced." N1-SS strips are 100% inspected for prebow to ±0.0003'' and are used in the most demanding aerospace applications. The following are results from the Failure Analysis conducted by EI's Operations Manager. The analysis uncovered multiple problems when the strips, recovered from the customer's worksite, were inspected.

The Ultimate Strip Mix-up

Before 2007, EI didn't manufacture their own strips—for the sake of simplicity, they will be called "earlier" EI strips. A visual inspection showed that earlier EI strips had been mixed with newer EI strips in some of the boxes. The earlier EI strips were darker due to a different heat treatment and they had oil stains. (Figures 1 and 2). Dark coloration and oil stains aren't defects, just an indicator of a different manufacturing method. Also, some of the boxes had an older package design that EI hasn't used for several years and these were clearly marked with lot number B55294B-08 and a N1-S grade.

The newer EI strips were measured for compliance to the N1-SS prebow specification (0.0003") on the EI Super Gage (Figure 3). The Super Gage has a resolution of 0.00001", compared to a TSP-3 Almen gage which has a resolution of 0.00005". EI has two Super Gages and two gage operators, and the readings from the instruments are compared and monitored. For additional verification, the prebow of the strips was measured on a TSP-3 and the results were the same: All of the new EI strips were within N1-SS specification.

EI then measured the earlier EI strips for compliance to the N1-SS prebow specification. Some of the strips did not meet the prebow requirement. The earlier EI strips were not sold as N1-SS strips, as the boxes were clearly marked with the N1-S grade, but the inclusion of these strips with the EI N1-SS strips accounted for the customer's claim that EI strips weren't meeting specifications.

Boxes With Altered Labeling

In addition to the mixing of the strips, there is another interesting twist to the story. Two of the EI boxes from the customer had altered labeling. The "Lot Number," "Inspected By" and "Date" had been marked out with a black marker and replaced with lot number 76547/1-23 and a 2009 date. EI's Operations Manager removed the black marker and found lot number B55294B-08 and a 2006 date (Figure 4). The N1-S grade had been checked on the top of the box by EI and it was not marked out. The Super Gage operators measured the prebow of strips in lot number B55294B-08 and the strips conformed to N1-S specification.

The Failure Analysis was shared with the customer and the customer accepted the findings.

EI's new numbering system will denote genuine EI Almen strips. If numbers on a strip or box have been altered, the customer should contact EI or their distributor immediately.

Figure 1. The box on the left holds the newer EI strips and the "earlier" EI strips. The ends of the earlier EI strips are darker due to a different heat treatment.

Figure 3. An EI "super" gage with .01000'' certified step block. EI has two super gages that measure prebow to a resolution of 0.00001'' and meet SAE J 442 and AMS 2430 for #2 Almen gages. The readings from the gages are continually compared and monitored for accuracy.

Figure 2. When strips were pulled from the box, it was even more obvious that they were from different manufacturing processes. Note the oil stains on the strips on the left.

Figure 4. EI was curious about the black markings on two of the returned boxes. They removed the marks and found a different lot number and date.

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LinkedIn is the world's largest professional network with over 100 million members from 200 countries and territories.

LinkedIn is available in six languages: English, French, German, Italian, Portuguese and Spanish

More than half of LinkedIn members are currently located outside of the United States

There were nearly two billion people searches on LinkedIn in 2010

More than one million companies have LinkedIn Company Pages

Roughly one million new members join LinkedIn every week, at a rate equivalent to a professional joining the site faster than one member per second.

Source: http://press.linkedin.com/about

You have the power to exponentially expand your horizons with LinkedIn, the social network for professionals. I'm not here to convince you to join LinkedIn, much less provide training on how to use it. The site (www.linkedin.com) is user-friendly and there are many books, blogs and YouTube videos about LinkedIn. No, this article is for those of you who have a LinkedIn profile but aren't taking full advantage of its offerings. I'll have to assume that you have valid reasons for being on LinkedIn, such as:

- your company requires employees to have a LinkedIn profile
- you're an independent consultant and want to promote yourself in a professional venue
- you want to establish or maintain your reputation as an expert in your field
- you want to network with other professionals
- you want to find a job, employees, or suppliers
- you're interested in getting feedback from customers and prospects
- you have a clear expectation of a return on investment for the time you spend on LinkedIn

I will share the LinkedIn philosophy that differentiates it from other social networking sites, its tools that can benefit the shot peening (and blast cleaning) professionals, and how two people in our industry are using LinkedIn. All of this is in hopes that you'll take advantage of its full potential.

Pay It Forward

I was pleasantly surprised to learn that LinkedIn is about more than finding jobs or new business leads. LinkedIn has a heart. When you join LinkedIn, you're expected to give more than you receive. Some of the ways you can help others include:

- If you can be truthful, always give a positive recommendation when asked and put some thought into it to make it as powerful as possible
- Give a recommendation without being asked and make someone's day
- Contribute to a group's discussion by asking questions, providing answers, or sharing tips, documents and videos that will be helpful to group members
- Watch for opportunities to mentor
- Help job hunters make connections

Whatever your reasons for helping others, you'll get out of LinkedIn what you put into it. As we explore Groups and the Questions/ Answers forum, you'll read about more ways to contribute.

The Power of Groups

LinkedIn has over 220,000 groups. If you don't belong to relevant groups, you're missing out on one of the most powerful tools on LinkedIn. For starters, when you're accepted into a group, every group member becomes a connection. You won't need an introduction or InMail to contact them. If you want to learn more about a group member, you can view their full profile. Here are a few more reasons to join groups.

- Group discussions will often address the problems and opportunities that you face.
- Discover hot buttons and problems you can solve for customers or your employer.
- Your Group's icons will be listed on your profile page. Visitors to your profile will see that you're engaged and active in LinkedIn and they'll learn more about your interests and areas of expertise.
- You can become an expert in your field for that group by sharing information and answering questions. Shot peening is still a relatively unknown application in the metal treatment toolbox, and the opportunity to share information and become the shot peening expert in a group is noteworthy.
- Learn an industry's jargon.
- The ideal employee, employer, client or supplier could be a group member.

LinkedIn will also provide you with a list of additional groups that might interest you based on your current group memberships. And when you review the list of group members and see people from your field, you know it's a good group.

The following are group listings with potential for the shot peening and blast cleaning industry. This list is from a 15-minute search—imagine what else is available.

Aerospace MRO A group for professionals that are involved in Aerospace Maintenance, Repair & Overhaul. The goal is to share ideas, experiences and comments.

Aviation & Aerospace Maintenance (MRO, Jobs, News) A subgroup of Mexico's Aerospace Industry & Jobs. Links professionals in the Aviation/Aerospace Maintenance, Repair & Overhaul (MRO) area to share experiences, job opportunities, news.

Premier Shot
A cut above

Robert D. Gillespie
1943 - 2011

The Premier Shot Company staff has suffered a tremendous loss with the passing of our President, Bob Gillespie. We are, however, dedicated to continuing Bob's commitment to providing quality products and services.

We've appreciated the outpouring of support and your business during this difficult time. Thank you.

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The advantages of the Premier Shot Company

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Materials for Medical Implants This group is intended to identify and discuss developments in the field of materials for medical implants; including, but not limited to, advances in resistance to infection, and improvements in tissue integration and stability.

Mining and Construction Equipment To exchange ideas, techniques and knowledge that can benefit people in the mining and construction industry.

Bodycote Thermal Processing Forum For admission to the Bodycote Thermal Processing Forum, please ensure your LinkedIn profile contains some reference to thermal processing, heat treatment, or a related method of metal surface treatment. This forum also welcomes metallurgists from the automotive and aerospace industries. Keywords: heat treating, heat treat, steel, stainless steel, metallurgy, hot isostatic pressing (HIP), nitriding, Nadcap, carburizing, induction heating, electron beam welding (EBW). (Has this group heard of shot peening?)

Gear Manufacturing This group is for sharing the process of gear manufacturing and difficulties that are countered while maintaining the profile accuracy and finishing of gear tooth of bigger module gears.

Gear Manufacturing Industries For everyone in the Gear Manufacturing Industry who would like to network and discuss the latest trends and technologies in Gear Manufacturing. All sales/marketing people who are presently working in any gear manufacturing industry are welcome to join.

Wind Power Operation and Maintenance For professionals involved in the Operation and Maintenance part of wind energy in the Nordic and Baltic region. Developers, educators, manufacturers and owners are all welcome to join the discussions on turbines, gearboxes, blades and more.

The Question and Answer Forum

Do you have a business-related question and would like relevant, quality answers from experts? Forget about Google, tap into LinkedIn. Asking a question in the Question/Answer section is similar to posting a question to a group but you can designate the audience (i.e., everyone, your network, or specific connections in your network). Before you post a question, search "Answers" and you might find the answer in this huge database of information.

Why should you answer a question? Again, members are expected to give more than they take so please be willing to share your expertise. Second, you'll receive exposure and free publicity. When you answer a question, your name and contact information are part of the answer. The answer will have a link to your profile and it will become part of your profile. The person that posted the question also has the opportunity to rate the answers. A good rating or the rating of "best" will designate you as an expert in your field.

Granted, there aren't going to be many questions on shot peening, but are you a business owner, sales representative, world traveler, trainer, manufacturer or global supplier? You have knowledge and experience to share.

Find a Job, Employee, or Clients

LinkedIn is THE network for job seekers and employers. There are employment resources in LinkedIn with a wealth of information on how to use them. LinkedIn is a great networking site for consultants, too. Instead of launching a website in the immense ocean of the internet and hoping someone finds you, a keyword-rich profile and your network can bring prospects to you. You can "fish" for ideal clients and learn more about them before you cold call, send an InMail, or connect through a group or your network.

Two LinkedIn Participants

Kumar Balan, International Sales Manager
Wheelabrator Group

When I asked Kumar why he joined LinkedIn, he said that he is building "personal brand equity." A salesperson's equity is his experience, expertise, reputation, and the relationships he has built and maintained. Ultimately, these elements will contribute to his company's and customers' revenue and growth. Here is how Kumar's profile expresses his brand equity:

- A professional photo. People want to see who their doing business with and a photo increases your "likability."
- The right amount of connections. When I wrote this article, Kumar had 116 connections. Too few connections would indicate that he isn't putting in the effort. Most people aren't willing to connect with members that have only a couple connections. Too many connections can send the wrong message, depending on your field.
- A complete work and education list.
- Kumar has given recommendations so he understands the Pay It Forward concept. Recommendations are also a good indicator of a person's values and ability to build relationships.
- He has received very strong recommendations that cover several attributes.
- He belongs to relevant groups. Kumar's groups signify his desire to stay on top of industry trends and explore new markets.

Marcel Von Wonderen, Master Engineer
KLM Royal Dutch Airlines

Marcel has a profile that reflects his wide range of responsibilities as Master Engineer/Process Equipment and Materials Development for KLM. He has taken advantage of additional LinkedIn tools that showcase his skills as an educator, including PowerPoint presentations and links to his website. He also has an impressive list of honors and awards.

"I use LinkedIn to network and get connected with professionals in my field," said Marcel. "The best part of LinkedIn has been getting in touch with people that I had lost contact with."He belongs to several groups and follows group discussions, including Air France-KLM. Following your own company is a great news source, especially if your company is a large international organization. "Air France-KLM continuously informs followers about the newest developments and innovations. The posts aren't only about KLM but also about colleagues and competitive airlines," added Marcel.

Make the Connection

Ultimately, LinkedIn is about finding and keeping connections that can deliver business, information, a new job or employees. LinkedIn is a great resource for people like me—consultants in creative fields. But what really intrigues me is its potential for a relatively unknown industry like shot peening. I hope you'll use LinkedIn to introduce yourself and shot peening to a global community.

Kathy Levy is the owner of InfoProse and works as a technical writer and marketing consultant
www.linkedin.com/in/infoprose

Getting Beyond the Root of the Problem

If you've got a peening or finishing surface preparation application question, Clemco can help.

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Herb Tobben, Sample Processing Manager, is EI's 2010 Shotpeener of the Year and a regular speaker at the US Shot Peening Workshop.

Our Customer's Application: Shot peening steam turbine blades

Through their local distributor, a customer who manufactures and remanufactures steam turbines came to us with a critical peening application. They needed to ramp up production and peen the root section of steam turbine blades. While there were numerous blade sizes, some of these blades had very large root sections. Due to their size, some were, in fact, too large to fit through the standard door opening of our indexing turntable unit.

The specification called for peening the root sections at .006 to .010A intensity on the Almen strip. The spec varied part to part and our customer needed to maintain peening intensity within a very narrow range in their production run.

The peening objective was maximizing fatigue life and preventing blade failure. A failure at high speed would damage or destroy a costly turbine and risk shutting down their customer's power generation equipment. Any failure would be catastrophic, but should the turbine be installed in a nuclear power plant, the consequences could be far-reaching and disastrous.

The customer's blades came in a variety of shapes and sizes so one important consideration in the machine design was minimizing changeover time between the runs of different blades. We were not privy to the actual production figures; however, we were led to believe their production was substantial. The challenge was to design a system for large parts and a process involving numerous nozzles.

Our Automated Solution: A continuous turntable cabinet, 6 feet wide by 6 feet deep by 8 feet tall

The size of the parts and number of nozzles called for ¼-inch plate steel construction so the enclosure could withstand the barrage of steel shot. To maximize production, we worked with the customer to develop a fixture system that maximized the number of different parts they could process and reduce, as much as possible, the changeover downtime.

All the fixtures had the same OD, but had different cutouts to accommodate the variety of part sizes and shapes. The fixture system design allows workers to prepare parts for peening by inserting them into their fixtures in advance. And instead of having to screw the fixtures onto each satellite, the operators can simply set each fixture into an available slot on the continuous table.

To further enhance productivity, various aspects of the shot peening process are controlled by a PLC (programmable logic controller). This user-friendly feature simplifies the part changeover process. It controls the number of nozzles, cycle time (nozzle on and off time), media flow, and the range and speed of the oscillators.

When the processing begins, eight blast nozzles, some fixed and some that oscillate on a 24-inch stroke arm, completely peen the root sections that are exposed on the fixture. The blast system comprises a 10-cubic foot, 8-outlet pressure blast machine. For repeatability and quality assurance, each outlet is furnished with a shot flow controller.

For the large number of nozzles, two screw conveyors evacuate the spent steel shot. A bucket elevator carries the media to the top of the air-wash separator; and from there the shot cascades through a multi-screen vibratory classifier.

The vibratory classifier is an essential system component as it maintains the proper operating mix of media to keep production peening intensity within the specified range. As required, the operator sends a part with an Almen block attached through the system at prescribed intervals to verify and document the results.

This new system replaced an older machine that couldn't keep pace with the demands of production or deliver the quantity and quality of parts to specification. The customer has indicated that they are confident that this new machine has the flexibility needed to accommodate future requirements for many years to come.

The FlapSpeed™ Controller with USB Data Recording

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- The transfer of reports to a PC using the included 2Gb USB memory key.
- The possibility to input personal "Intensity vs. RPM" curves for up to 5 operators.
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The FlapSpeed™ Controller with USB Data Recording
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In Memory of Robert Gillespie
1943 - 2011

The shot peening community is deeply saddened to lose Bob Gillespie, who passed away on January 13th. Bob worked in the field of shot peening and blasting media for over 30 years, including 17 years at Metal Improvement Company and his successful career as founder and president of Premier Shot. However, if the real value of our lives will be judged by the lives we touch, the following comments from friends and business associates give the true measure of Bob.

We thought highly of Bob as a trusted business associate. He was a true professional and always a gentleman. He will be missed by all who were fortunate enough to have known him.

—Bill Rhodaberger
Ervin Industries

It has been a while since Bob and I talked, but seeing the news of Bob's passing brought back good memories around the workshops. Bob was an honest, smart, and funny man that I am happy I got to know.

—Dale Lombardo
GE Energy

Bob was one of the first people I met when I joined the peening world. He was a delightful and intelligent man, always wearing a smile and offering a friendly handshake. The world has lost another nice man.

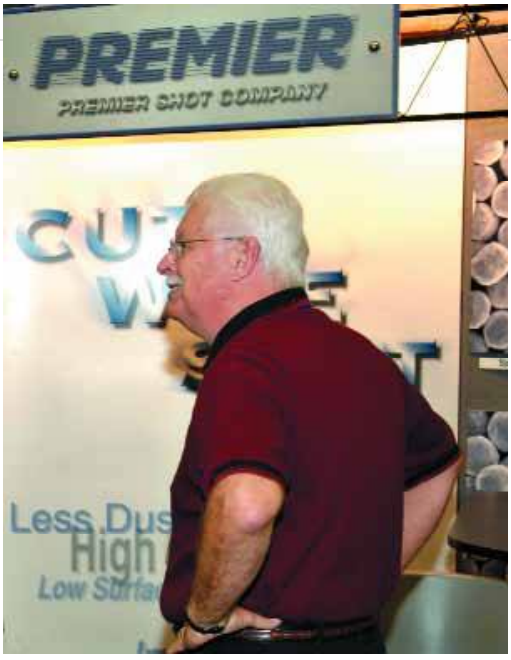
—Daryll McKinley
Airbus Americas

Bob was a great instructor. At our workshops he willingly lectured on topics outside of Premier's product line to help better the industry. Socially he was always friendly and nice to be around.

—Dave Barkley
Electronics Inc. Education Division

Bob was truly more than a business associate; he was a friend. He will truly be missed.

—Dwight Lutsko
Lutsko Ind Sales



Bob will be missed by all of us here at the Boeing company in Seattle.

—Hali Diep
Boeing Research and Technology

I met Bob through the EI shot peening workshop many years ago. He was friendly, personable and always willing to lend a hand. If he and Teddi (his wife), got the Premier booth set up quickly, he would help other people get their booths set up. He was knowledgeable about so many things in the shot peening industry. He was even knowledgeable about my area of expertise—nozzles—and we had many enjoyable conversations.

—Herb Tobben
Clemco Industries

In addition to remembering Bob's always pleasant and gentlemanly ways, two other remembrances stand out – his well-run Cincinnati MIC and a trip with him to Germany to start GE's use of cut wire shot and his entrance into that industry. Good luck to Teddi in carrying on that business – she will do well.

—Pete Bailey
Electronics Inc.

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I have known Bob Gillespie for a very long time. It was probably when he established Premier Shot Company and I got a letter announcement. I still have the letter. I kept the letter, and many, many fine memories of the one of the greatest friends anyone could ask for. Bob's help in our SAE committees will be sorely missed. He was often referred to as "Mr. Media Spec Guru." Bob knew all about media, not just cut wire but all of the medias. What do I remember the most about Bob? His ever-present smile. His constantly pleasant demeanor. His willingness to share his knowledge. Bob served as an excellent role model of how to be a great guy. I am very sad at his passing. I shall miss him greatly.

—Jack Champaigne
Electronics Inc.

Bob was a major contributor to MIC and the shot peening industry. He will be missed by all.

—Jim Daly
Metal Improvement Company

To use an analogy that most of us are familiar with, Bob's presence in the peening industry was much like the benefits conditioned cut wire brought over cast shot when it was introduced. He brought in an new phase, a new knowledge base, and an improvement to the process of shot peening. More importantly, he was happy and enthusiastic to share it with anyone who came to him with a problem concerning peening media. I have benefited from his knowledge several times when in a technical bind about an application. Always eager to explain and help out, Bob will be missed very much.

—Kumar Balan
Norican Group

Bob's passing is a tragic loss to the metal finishing industry. He was hands-on knowledgeable, always available and willing to help with a problem and a great guy. He will be sadly missed by all of us at Pellets LLC.

—Mike Deakin
Pellets LLC

My sympathy to all family and friends who mourn Bob's passing. Goodbye Bob, you were a true gentleman.

—Paul Huyton
Airwave

Bob will be missed by me in more than one way. Bob was more than just a supplier of peening media to us. He was a friend and a valuable resource for information, not just to me, but the entire shot peening community through his work as a contributor to the SAE Surface Enhancement committee.

—Walter Beach
Peening Technologies of Connecticut

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Properties of Carbon Steel Shot

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

Most shot peening is carried out using carbon steel shot. This shot is produced either by casting directly to almost spherical shapes or by cutting lengths of wire and pounding the cut lengths into acceptable sphericity. Finished carbon steel shot particles have a tough core with, of necessity, a brittle skin of iron oxide, see fig.1 (where the skin thickness has been deliberately exaggerated).

Fig.1 Section of spherical carbon steel shot particle.

Cast and cut wire carbon steel shot are both produced in "regular hardness" and "high hardness" grades. Table 1 summarizes some of the requirements specified in AMS 2431. The average carbon content of cast steel shot can be seen to be 50% greater than that of cut wire steel shot.

Carbon steel shot is produced in vast numbers. The vastness of scale can be illustrated by 'round number' calculations. A ladle containing 10 cubic meters of molten steel can be cast into shot in a single pouring. One cubic meter of steel has a mass of 7.8 metric tons. If the average shot mass is 1 milligram then 78 billion shot particles will have been produced in a matter of minutes. If the average cross-section of wire is 1 square millimeter then 10 cubic meters of wire would have a length of 10,000 kilometers. Cutting that wire into lengths averaging 1 mm would require 10 billion cuts.

Carbon steel shot has to have several properties that include hardness, shape, size, toughness, wear-resistance and low cost. This article is an account of some of the factors that enable the required properties to be achieved.

BRITTLE IRON OXIDE SKIN

The iron in carbon steel oxidizes when exposed to air. Iron plus oxygen gives iron oxide. Iron oxide is a brittle, ceramic-type, material that fractures very easily on impact. It follows that steel shot impacting a component shatters part of its oxide coating contributing vast numbers of minute iron oxide particles to the 'atmospheric dust' inside the peening cabinet. When iron oxide shatters, the skin is rapidly healed by further oxidation. The net effects are that (a) loss of shot mass is unavoidable and (b) clouds of iron oxide particles are generated that can explode.

Fig.2 (page 26) represents a slice of a carbon steel shot particle. The iron oxide coating has a variable chemical composition – Fe_xO_y. The ratio of y to x varies continuously from 1 at the shot interface to 1.5 at the air interface. A ratio of 1 gives FeO, 1.33 gives Fe_3O_4 and 1.5 gives Fe_2O_3.

When shot is heated in an air furnace the oxide layer grows thicker and thicker. The mechanism is that iron atoms diffuse into the layer at the shot/oxide interface whereas

Table 1. Some Requirements for Carbon Steel Shot

Cast Shot		Cut-Wire Shot	
Carbon Content	0.8 - 1.2 wt.%	Carbon Content	0.45 - 0.85 wt.%
Regular Hardness	45 - 52 HRc	Regular Hardness	45 - 52 HRc
High Hardness	55 - 62 HRc	High Hardness	55 - 62 HRc

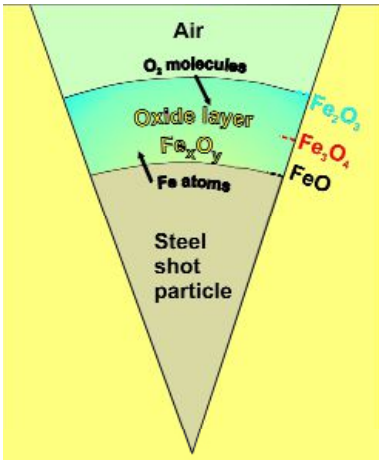

Fig.2 Slice of shot particle showing iron oxide layer of variable chemical composition.

oxygen atoms diffuse into the opposite side of the layer at the oxide/air interface. Hence the outer layer is saturated with oxygen and the inner layer is saturated with iron. Layer thickening can be reduced, even reversed, by controlling the atmosphere in the furnace.

Fragmented oxide particles are minute so that the area to volume ratio is enormous. One cubic centimeter, for example, could have a surface area of 10 square meters. Each particle has regions varying from saturated Fe_2O_3 to pure iron. The oxide layer is, by definition, chemically-bonded to the shot particle so that, on fracture, very tiny areas of steel are torn away with the oxide fragments. Because most of each oxide fragment is unsaturated with oxygen further oxidation is required to give chemical stability. This further oxidation is exothermic (heat is given out) which contributes to the explosive potential of the peening cabinet atmosphere.

HIGH-TEMPERATURE STRUCTURE OF CARBON STEEL SHOT

If carbon steel is heated to an appropriate high temperature, then it adopts a very simple crystalline structure called "austenite." Carbon atoms are free to roam in a face-centered-cubic matrix of iron atoms. At a shot particle's surface they can either emigrate (de-carburization) or immigrate (carburization) – depending on the surrounding atmosphere. Within the particle they are randomly distributed in the holes (interstices) between the iron atoms, moving freely from hole to hole. A key factor is the relationship between carbon content and the "appropriate high temperature." Fig.3 illustrates the relationship.

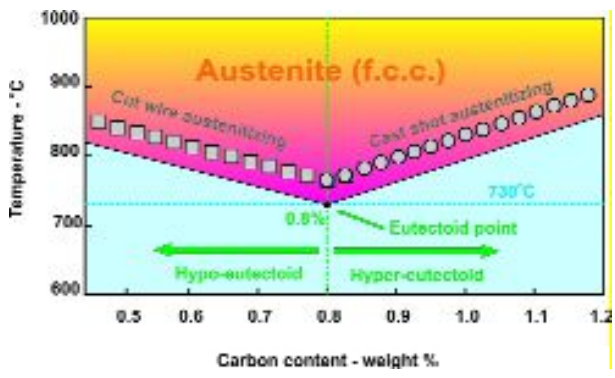

Fig.3 Schematic representation of carbon steel shot austenitizing.

The minimum temperature above which carbon steel austenetizes is about 730˚C for a 0.8% carbon steel. This is the so-called "eutectoid point." Lower and higher carbon contents than 0.8% require higher temperatures than 730˚C. Lower carbon content steels are called "hypo-eutectoid" and higher carbon content steels are called "hyper-eutectoid." These words derive from the Greek word "eutectos." The values of 730˚C and 0.8% carbon vary slightly with the presence of minor alloying elements. The appropriate austenitizing temperature for cut wire shot varies from about 780˚C to about 870˚C depending on its carbon content – as shown in fig.3. Cast steel shot can be austenitized at temperatures between 780˚C and 900˚C – again depending on the carbon content. Austenitization temperatures should not greatly exceed the minimum - in order to avoid coarsening of the austenite grains (which results in a lowering of eventual properties).

Austenitizing is a vital part of carbon steel shot manufacture. Only one austenitization is required for cast steel shot. The as-quenched shot particles are normally austenitized before hardening by quenching and subsequent tempering. Production of the wire for cut wire shot requires several austenitizations. Molten steel can be continually cast into round billet shape having a cross-section of about 10000 mm^2. Billets are then hot-rolled in a multiplicity of reductions to rod of about 100 mm^2 cross-section. That corresponds to an elongation of 10000% - only achievable because hot austenite self-anneals after every reduction. Hot-rolled steel rod is subsequently cold-drawn to the required wire diameter. Rod with a 100 mm^2 cross-section cold-drawn down to a 1 mm^2 cross-section (in multiple pulls) is being elongated by another 10000%. The wire has to be austenitized several times during cold-drawing in order to restore its ductility.

A consequence of the foregoing factors is that a carbon steel of close to the eutectoid temperature is very popular for converting into shot. Such steels require the lowest temperature of re-heating in order to be austenitized. Heating to these lower temperatures is quicker and cheaper than heating to higher temperatures. A very important additional benefit is the reduced amount of oxidization that occurs at lower austenitization temperatures. The thickness of oxide skin layer can therefore be minimized.

LOW-TEMPERATURE STRUCTURE OF CARBON STEEL SHOT

At high temperatures iron and carbon atoms co-exist happily as austenite. At low temperatures the opposite is true. Carbon atoms are forced to migrate - forming structures that depend on the rate of cooling from the austenitic state.

Slow Cooling

If austenite is cooled relatively slowly then there is time for the carbon atoms to be migrated as an extreme act of segregation. Most of the iron atoms then form themselves into "ferrite" which is virtually pure body-centered-cubic iron. The remaining iron atoms bind themselves to the carbon atoms in a highly regimented format – three atoms of iron for every carbon atom. This three-to-one ratio leads to its chemical formula of Fe_3C – a brittle ceramic substance called "cementite." Layers of cementite alternate

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with layers of ferrite to form crystals of "pearlite," shown in fig.4. Pearlite consists of seven parts of soft, ductile, ferrite to one part of hard, brittle, cementite. As a combination, this structure has sufficient ductility to allow the huge amounts of cold working needed for wire production.

The microstructure of slowly cooled carbon steel depends on its carbon content. Fig.5 illustrates the relationship. For hypo-eutectoid steel compositions, cut wire, the slow-cooled structure consists of pearlite with some ductile ferrite – the amount of ferrite increasing as the carbon content reduces. For hyper-eutectoid steel compositions, cast shot, the slow-cooled structure is pearlite with some brittle primary cementite – the amount of brittle primary cementite increases as the carbon content increases. Fortunately, cast steel shot does not need to be slow-cooled at any stage of its manufacture.

Fig.4 Schematic representation of "Pearlite" structure.

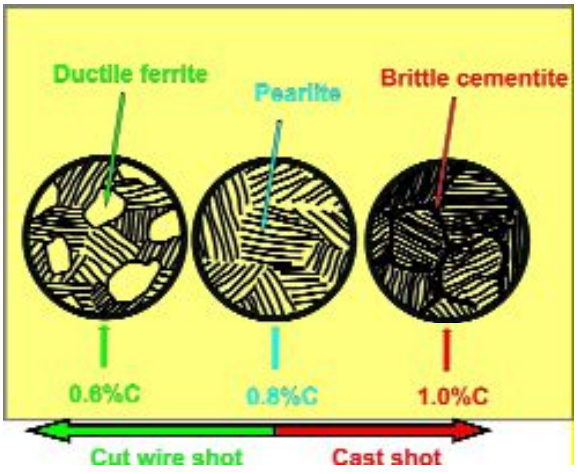

Fig.5 Schematic representation of slow-cooled carbon steel structures.

Rapid Cooling

If austenite is cooled rapidly there is insufficient time for the carbon atoms to migrate through the lattice to form either pearlite or cementite.

Quenching to far below the critical temperature of 730˚C (see fig.3) induces a truly cataclysmic change in structure. At room temperature, austenitic carbon steel has so much pent up energy that it 'explodes' into a structure called "martensite." Needles of martensite nucleate and then propagate, at almost the speed of sound, in any one of twenty-four directions within each austenite grain. Enormous micro-stresses are generated as the growing needles crash into each other and become locked together. The enmeshed martensitic structure is very difficult to deform – hence its high hardness. The corresponding brittleness can be alleviated by post-quench heating – "tempering." Heating to a few hundred degrees Celsius allows a very limited amount of carbon atom migration – to more comfortable locations - and reduces the micro-stress levels. The resulting structure is called "tempered martensite." Tempering increases toughness and deformability.

The crystal structure of martensite is almost identical to that of ferrite (which is body-centered-cubic). A cube has three edges of identical length. Carbon atoms in quenched austenite do a 'shimmy' towards just one of three edges, see fig.6, at the same time as the face-centered- cubic austenite transforms itself into a body-centered cubic arrangement of iron atoms. The carbon atoms are smaller than the iron atoms but still have to push them apart to fit into the available space. This type of crystal structure is called "body-centered-tetragonal." Because the carbon atoms are pushing the iron atoms apart in just one of three possible directions then that direction, "c", becomes larger than that of the other two directions, "a".

The ratio of "c" to "a", tetragonality, increases with carbon content, as illustrated in fig.7. Hardness increases as tetragonality increases.

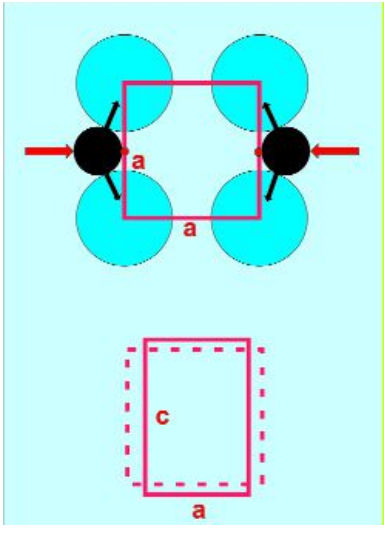

Fig.6 Carbon atoms distorting cubic arrangement of iron atoms.

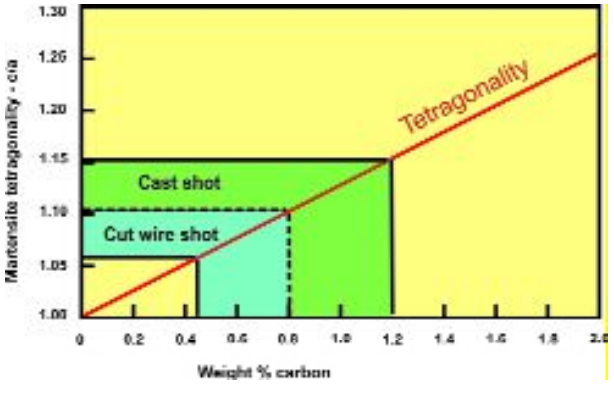

Fig.7 Increase of martensite tetragonality with increase of carbon content.

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Rapid Cooling to Tempering Temperatures

Quenching austenitic carbon steel into molten lead or salt generates a structure that is intermediate between martensite and pearlite – called "bainite." A significant amount of carbon migration can now occur so that minute particles of cementite are formed within a matrix of ferrite. Quenching of austenitized wire into molten lead prior to cutting is employed by at least one major producer of cut wire shot. Fig.8 illustrates the difference between conventional "cold quenching" and "hot quenching."

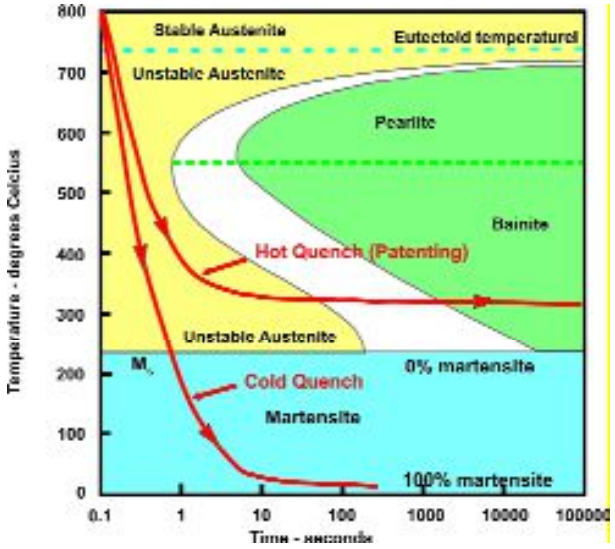

Fig.8 Transformation of austenite by either Cold Quenching or Hot Quenching.

Cold-Working

Cold-working of carbon steel increases its hardness but decreases its ductility. A maximum hardness is reached beyond which the hardness starts to fall – "work softening." Cast steel shot is not cold-worked prior to use. Cut wire shot, on the other hand, suffers very considerable cold-working as a necessary part of both wire drawing and conditioning. Drawn wire must have its ductility restored at intervals of drawing. Cutting of the drawn wire into cylindrical pieces involves massive plastic deformation at the sheared interface. This induces localized work-hardening and can also induce phase transformation.

Several specifications require that shot is produced to two levels of hardness. High-hardness cut wire shot can be produced by controlling the carbon content, work-hardening and heat-treatment hardening contributions. The hardness of cast shot can be controlled by the carbon content and the level of tempering.

SHAPE GENERATION

Near spherical shapes arise when liquid steel is atomized into shot particles. Spheres have the smallest ratio of surface area-to-volume. Hence surface energy is minimized by the liquid droplets if the droplets are spherical.

Shape generation from cut wire cylinders is much more complicated. Conditioning is used to convert cylindrically shaped pieces into near spherical shapes. Shape change is effected by a combination of plastic deformation and erosion as cut wire particles are fired against hard surfaces.

Specification SAE J441 requires that a designated cut wire shot size is to be produced using wire of the same diameter. For example, SCW/CW-41 is to be produced using wire having a diameter of 41 thousandths of an inch. 41 thousandths of an inch corresponds to 1.0 mm. If a 1 mm diameter, 1 mm long, cylinder is converted into a perfect sphere entirely by plastic deformation then it would have a diameter of 1.144 mm. This shape change is illustrated in fig.9.

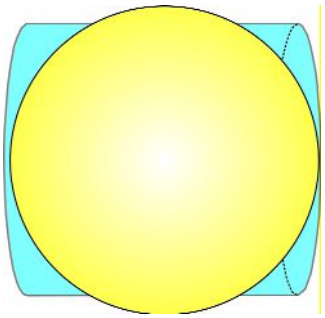

Fig.9 Shape change from unit cylinder to sphere.

In practice, cut wire conditioning is dominated by plastic deformation but has a minor erosion element. The total amount of both elements will increase with the degree of conditioning. Three grades of conditioning are generally recognized: "Conditioned," "Double Conditioned" and "Spherical Conditioned." Both plastic deformation and erosion elements of shape change will increase as sphericity is approached. The ratio of the two elements will be affected, to some extent, by the metallurgical properties of the cut wire. Erosion can be measured by weighing equal numbers of cut wire particles at each stage of conditioning. No definitive information is available to the author at this instant. Such information as is available indicates that the mass loss is only approximately 1 – 2% for "Conditioned," 2 - 3% for "Double Conditioned" and 3 – 5% for "Spherical Conditioned" grades.

SIZE DISTRIBUTIONS OF CAST AND CUT WIRE SHOT

In a perfect world wire could be cut into identical cylinders every one of which would receive identical conditioning and end up as having identical sizes. In the real world there is a 'normal distribution' of size for cut wire shot batches. Nevertheless the standard distribution is usually small, so that almost every cut wire particle has a very similar size. Cast shot variability has been discussed in detail in another article in this series. A complete cast of shot has a size variation similar to that of a 'normal distribution.' Subsequent sieving, however, divides the cast into size categories. Within a given category of cast shot the size distribution is approximately linear.

New Shot

The relative uniformity of cut wire shot size is often claimed to be an advantage when compared with the variable size of a sieved batch of cast shot. Fig.10 (page 32) illustrates, schematically, idealized differences in size distributions between new cut wire and new cast shot.

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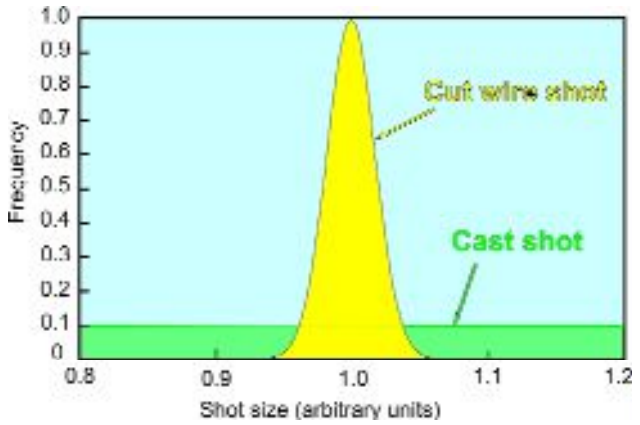


Fig. 10 Schematic representation of difference between cast and cut wire size distributions.

Cast shot is shown as having a uniform linear size distribution. Real distributions may have either a positive or negative slope with some curvature.

Used Shot

As soon as a shot particle is used to strike an object, it must lose some of its mass, The size distribution therefore changes. It is standard practice to replenish the shot charge to compensate for size mass reduction together with the loss due to fracturing of some particles. Replenishment changes the size distribution.

As a simple model, consider a charge of cut wire shot that has lost 10% of its size uniformly due to wear and has been replenished with 10% of new shot from the same original batch. We now have a 'bi-modal' shot size distribution, as shown in fig.11. This is the addition of the normal distributions of the used shot (mean size reduced to 0.9) and new shot (mean size of 1.0).

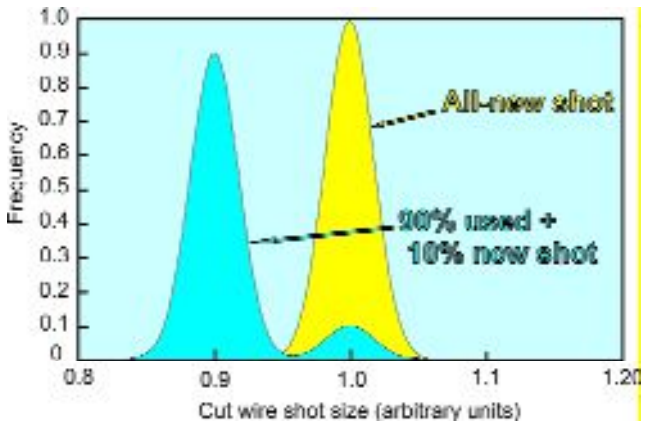


Fig.11 Representation of size distributions for new and used-plus-new cut wire shot batches.

Repeated additions of new cut wire shot will generate a broader, 'multi-modal,' size distribution. If no other peening parameters are changed then the cut wire shot charge will progressively produce higher coverage rates and lower peening intensities.

Wear and breakage of cast shot will produce a corresponding change in the size distribution for a fixed charge (of shot into the equipment). This change can be illustrated using the following grossly-simplified model. Assume (a) that a particular charge of cast shot has a uniform, linear, size distribution with minimum and maximum limits of 0.8 and 1.2 arbitrary units and (b) that there is a uniform 10% loss of size that is replenished with 10% of new shot from the same original batch of shot. The size distribution changes on replenishment. The largest shot fraction (1.16 to 2.0) wears down by 10% so that this size fraction now has zero frequency. The worn fraction replaces the next largest fraction which, in turn, replaces a smaller size fraction. Fig.12 represents the net result of wear as giving a uniform, linear, distribution between limits of 1.16 and 0.8. Shot originally just above 0.8 is assumed to be removed by sieving as it is worn below a size of 0.8.

For the idealized model shown in fig.12 the new cast shot average size is 1.0 which falls to 0.98 after 10% wear (and before replenishment). That is only a 2% reduction - which will have only a marginal effect on coverage rate and peening intensity. The effect of a single replenishment with 10% of uniform shot from the original batch is modeled in fig.13. Size distribution is then no longer uniform. The replenished mixture has an average size of 0.982 so

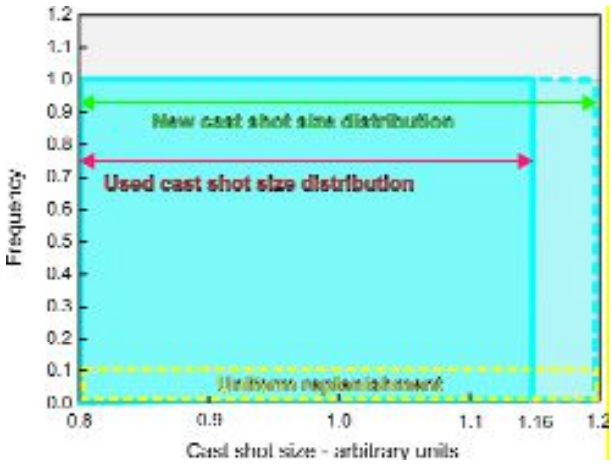


Fig.12 Idealized change of size distribution as charge of cast shot wears down in size.

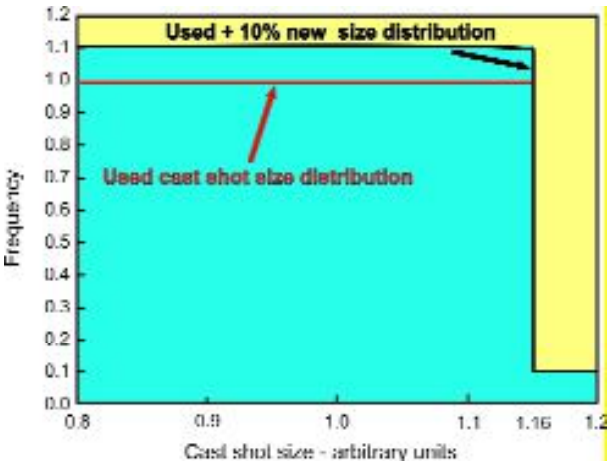


Fig.13 Size distribution after 10% addition of new shot to a used batch of uniformly sized shot.

that coverage rates and peening intensity will be only slightly affected. Multiple replenishments would predict a steady shift to lower and lower average sizes when the effects would become significant. One way to remove/reduce this size reduction effect would be to replenish the used shot with new shot that has a mean size equal to that of the largest original fraction (i.e., 1.18).

DISCUSSION

Carbon steel shot is remarkably efficient as a bulk peening medium. The required combination of hardness, toughness, durability, near-spherical shape and low cost is achieved by controlling chemical composition, heat-treatment and fabrication technique. It is perhaps surprising that the same objective is realized using two radically different production techniques – casting versus conditioning of cut wire.

Cast shot differs from conditioned cut wire shot in almost every respect: carbon content, shape production, size distribution and metallurgical structure. Malleability is essential if cut wire cylinders are to be pounded into near-spherical shapes. This requires the use of hypo-eutectoid compositions. Cast structures are traditionally weaker than wrought structures of the same chemical composition, hence hyper-eutectoid steels are used for cast shot because they are potentially harder than hypo-eutectoid steels.

The models used here for assessing size distributions are very simple and must, therefore, be interpreted with caution. Nevertheless, they serve to highlight potential differences in properties such as peening intensity and coverage generation.

ICSP-11

ATTENDEE AND EXHIBITOR REGISTRATION

Eleventh International Conference on Shot Peening

September 12-15, 2011

Century Center Convention Center • South Bend, Indiana USA

ICSP-11 is the Triennial Conference and Exhibition of the International Scientific Committee for Shot Peening

ICSP-11 BENEFACTORS

- **Electronics Inc.**
- **Metal Improvement Company**
- **Proto Manufacturing**

All fees are in U.S. dollars. Please check appropriate box(es).

FEE SCHEDULE - EARLY DISCOUNT FEES END JUNE 12, 2011

PRESENTER | ATTENDEE

Includes admittance to Presentation of Papers, lunches, break refreshments, banquet, and Proceedings.

Before June 13, 2011	June 13, 2011 - August 12, 2011	After August 12, 2011	
☐ $650.00	☐ $800.00	☐ $1,000.00	$_____

STUDENT

Includes admittance to Presentation of Papers, lunches, break refreshments, and banquet. Does not include Proceedings. Student ID is required with registration, maximum age is 26.

☐ $250.00 $_____

ACCOMPANYING PERSON

Includes lunches, break refreshments and banquet. Does not include admittance to Presentation of Papers or Proceedings.

Before June 13, 2011	June 13, 2011 - August 12, 2011	After August 12, 2011	
☐ $250.00	☐ $300.00	☐ $350.00	$_____

EXHIBITOR FEE

Exhibitor fee is for one 10' x 10' booth and two booth attendants. Fee includes lunches, break refreshments, and banquet for two attendants. Booth space is available on a first-come, first-served basis. See updated exhibit booth availability at www.shotpeening.org/ICSP-11.

Before June 13, 2011	June 13, 2011 - August 12, 2011	After August 12, 2011	
☐ $2,000.00	☐ $2,500.00	☐ $3,000.00	$_____

FEE PER ADDITIONAL BOOTH ATTENDANT

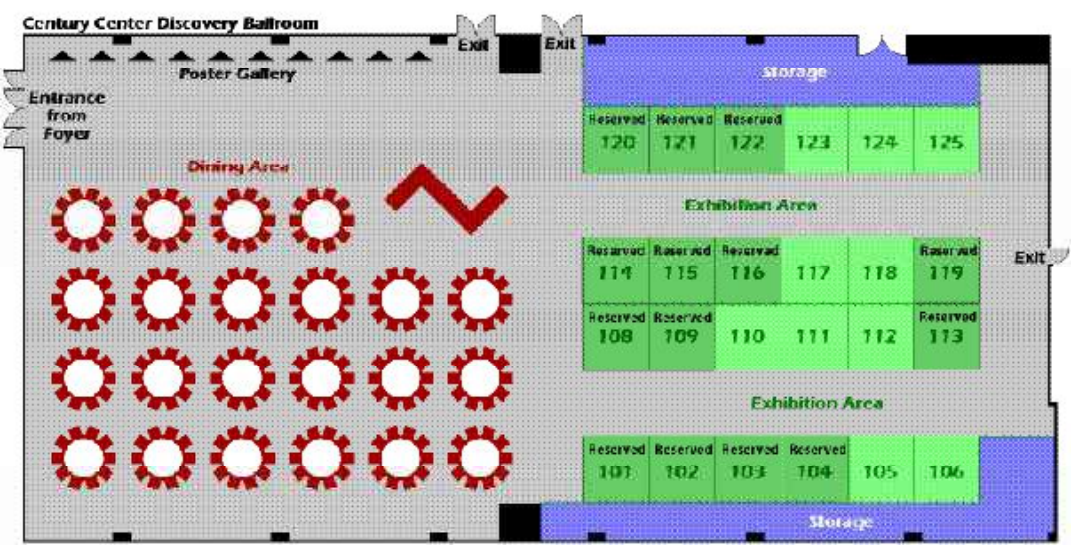
Fee includes lunches, break refreshments and banquet. Does not include admittance to Presentation of Papers or Proceedings.

Before June 12, 2011	June 13, 2011 - August 12, 2011	After August 12, 2011	
☐ $250.00	☐ $300.00	☐ $350.00	$_____

REQUESTED BOOTH NUMBER _____

Booth space is available on a first-come, first-served basis and can't be guaranteed.

EXHIBIT HALL



EXHIBITOR LIST

Booth	Company
101	Progressive Surface
102	Toyo Seiko Co.
103	Roberts Sinto Corp.
104	Peening Technologies
108	Proto Manufacturing
109	Lambda
113	The Shot Peener Magazine
114	Metal Improvement Co.
115	Dafeng Daqi Metal Grinding Material Co.
116	Engineered Abrasives
119	W Abrasives
120	Electronics Inc.
121	Shockform
122	TEC

See updated exhibit booth availability at www.shotpeening.org/ICSP-11



REGISTRATION FORM

(Online registration is available with secure PayPal, credit card, and bank wire fund transfer options at www.shotpeening.org/ICSP-11/registration.php)

Date _____

☐ Mr. ☐ Ms. ☐ Dr. ☐ Prof.

_____

Surname, Given Name

_____

University / Company / Organization

_____

Street Address

_____

City, Zip Code, Country

_____

Telephone Number Fax Number

_____

Email Address _____

_____

Accompanied by (Surname, Given Name)

HOTEL RESERVATIONS

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.

PAYMENT INFORMATION

Payment **must** accompany registration

☐ Check (Payable to ICSP-11 and drawn on a U.S. bank)

☐ Credit card:

__VISA __ MasterCard __ AmExpress

Credit Card Number _____

Expiration Date _____

Cardholder's Name _____

Signature _____

MAIL AND FAX INFORMATION

ICSP-11
56790 Magnetic Drive
Mishawaka, Indiana 46545 USA
Fax: 1-574-256-5222

For more information, call 1-574-256-5001

CANCELLATION POLICY

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**

Industry News

Pellets Now Offers Soft Stainless Cut-Wire Shot

North Tonawanda, New York, USA. Pellets LLC, global supplier of industrial abrasives, is now offering its 4SCW series stainless steel cut-wire shot. Pellets LLC manufactures stainless steel, copper, zinc, aluminum and carbon steel cut-wire shot at its New York manufacturing facility and has been supplying industrial abrasives to the automotive, military, aerospace, and medical industries since 1948.

According to President Mike Deakin, Pellets is having success converting aluminum die casters to the new stainless steel cut-wire shot. Deakin believes their success in converting customers to the new stainless steel shot is due to its long useful life and the low cost of the new series which has less nickel content. In addition, "We are able to produce this stainless in a much softer hardness (Rockwell C 30) which is attractive to aluminum die casters that have a concern about using a shot which is much harder than the aluminum castings they are deburring." He went on to say, "After you convince a die caster that they should be cautious about blasting non-ferrous aluminum castings with ferrous steel abrasives, the new product is an easy sell. Using stainless steel shot on aluminum castings eliminates the risk of contaminating the castings with ferrous material," Deakin said. He also indicated another selling point is that the lower hardness is perfect for aluminum castings because it is not too aggressive.

Pellets is an ISO 9001:2008 certified company that manufactures cut-wire shot and also distributes other abrasive products including aluminum oxide, chrome grit, glass beads, crushed glass, cast steel shot and grit, plastic abrasives and products such as coal slag and copper slag, which are used for cleaning metal prior to painting. (www.pelletsllc.com)

Students Invited to Attend and Submit Posters to ISCP-11

Mishawaka, Indiana USA. The ICSP-11 Organizing Committee is extending an invitation to students to attend ICSP-11 in South Bend, Indiana on September 12-15, 2011. College and university students studying curriculum relevant to shot peening will greatly benefit from the research presented at the conference. Students also have the opportunity to make contact with industrial representatives in shot peening industries who might be potential employers. The student attendance fee is only $250 with valid student I.D. and includes admittance to Presentation of Papers, lunches, break refreshments, and banquet. (The fee doesn't include Proceedings.)

Students are also encouraged to submit posters to the conference. The posters will be prominently displayed in the main auditorium. Poster criteria are as follows:

- Must be on a current research project
- Must cover a novel aspect of peening or related field
- Research must have technical merit
- Research must solve a problem

The poster abstract should include a brief description of the research, and the abstract must not exceed two pages. The deadline for the submission of poster abstracts is July 1, 2011. Abstracts should be submitted by e-mail to the conference chairman at icsp11@shotpeening.org.

The posters should be 36 inches (92 cm) wide by 48 inches (121 cm) high. ICSP-11 staff will have boards and push pins to hang the posters.

For a list of topics, registration, and conference information, go to www.shotpeening.org/ICSP-11.

Deadlines Approaching for ICSP-11

Discounted Fees for Presenters/Attendees
To receive the discounted rate of $650.00, Presenters and Attendees must register and pay for the conference before June 12. The fee includes admittance to Presentation of Papers, lunches, break refreshments, banquet, and Proceedings. Secure and easy registration is available at www.shotpeening.org. Payment can also be made by check but must be received by deadline to receive discounted rate. The fee after June 12 will be $800.00 per person.

Discounted Fees for Accompanying Person
Guest registration fee before June 12 is $250.00. The fee will be $300.00 after this deadline. This fee is for a spouse/significant other of a presenter or attendee and includes lunches, break refreshments and banquet. The guest fee does not include admittance to Presentation of Papers or Proceedings.

Discounted Fees for Exhibitors
To receive the discounted rate of $2000.00, exhibitors must register and pay for booth space before June 12. The fee includes a 10' x 10' booth with lunches, break refreshments, and banquet for two attendants. Fee doesn't include admittance to Presentation of Papers or Proceedings. Secure registration is available at www.shotpeening.org. Payment can also be made by check but must be received by deadline to receive discounted rate. The fee after June 12 will be $2500.00.

Final Manuscripts Due on June 1, 2011
The final (revised) manuscripts must be received by the organizing committee no later than June 1, 2011. All accepted manuscripts will be sent to the book publisher on July 1, provided that the presenting author has submitted registration and payment.

Instructions to Authors are available on the conference website at www.shotpeening.org.

Delta TechOps Receives FAA Approval for Non-Destructive Testing

Results Net Industry Award for Improved Efficiency in Aircraft Part Inspections

Atlanta, Georgia USA. Delta Air Lines' maintenance division, Delta TechOps, has received Federal Aviation Administration (FAA) approval to implement Process Compensated Resonance Testing (PCRT), a method of non-destructive testing that identifies over-temperature conditions in aircraft engines. The PCRT inspection replaces the previous Original Equipment Manufacturer (OEM) sample-based destructive inspection of suspect turbine blades.

Developed by Vibrant Corporation, PCRT is a relatively new aerospace technology that provides environmentally friendly, cost-effective and fast reporting on the structural integrity of components. Specifically, PCRT offers increased sensitivity to defects,

less engine downtime and reduced waste from blades that test negative for over-temperature conditions. Delta was awarded FAA approval as it begins the second year of a three-year agreement with Vibrant as the exclusive commercial aviation supplier.

"This is another example of TechOps applying cutting-edge technology to benefit our MRO operations," said David Piotrowski, principal engineer - Delta TechOps. "PCRT increases reliability on the JT8D-219 engine while keeping maintenance costs competitive." "Delta has been fantastic to partner with in our effort to display the full capabilities of PCRT," said Greg Weaver, director of operations of Vibrant Corporation. " In our tests, we are not only uncovering over-temps in the blades, but also discovering cracking, inter-granular attacks and thin airfoil walls."

Delta TechOps and Vibrant's collective efforts have not gone unnoticed. Recently, the FAA and ATA recognized them as winners of the 2010 FAA-ATA Non-Destructive Testing (NDT) "Better Way" award. The annual award recognizes a government or industry team that has developed and applied a technology, technique, process or policy that results in a more sensitive, reliable or cost-effective process for inspecting and testing aircraft or aviation components and systems. Delta has won this honor six times in eight years.
Delta has expanded its original exploration of PCRT applications from turbine blades and vanes to aircraft wheels, fasteners and engine components, including applications targeting CFM 56-7b and PW 4000 engines.

Vibrant Corporation
Vibrant, a spinoff of Mechtronic Solutions, Inc., has commercialized Process Compensated Resonance Testing (PCRT) in the aerospace and power generation industries. The PCRT technology, licensed from Magnaflux Quasar, is a revolutionary non-destructive testing technology that can determine if a component is structurally sound and fit for service. Vibrant has developed PCRT applications focused on the safety critical components found in the aerospace industry. These applications bring the power of PCRT to bear on new product quality control and in-service product degradation tracking. Vibrant provides testing services for several major aerospace manufacturers and Maintenance, Repair, and Overhaul (MRO) firms under AS9100 Rev. B and ISO 9001:2000 certificate 07-0992. More about Vibrant is available at www.vibrantndt.com.

About Delta TechOps
Delta TechOps is the largest airline maintenance, repair and overhaul provider in North America, generating more than $500 million in revenue in 2009. In addition to providing maintenance and engineering support for Delta's fleet of more than 750 aircraft, Delta TechOps serves more than 150 other aviation and airline customers around the world, specializing in high-skill work like engines, components, hangar and line maintenance. Delta TechOps employs more than 8,500 maintenance professionals and is one of the world's most experienced providers with more than seven decades of aviation expertise. More about Delta TechOps is available at deltatechops.com.

SF Expo China 2011

Guangdong Province, P.R. China. The 9th Guangzhou (China) International Surface Finishing, Electroplating and Coating Exhibition (SF EXPO China 2011) will take place in Guangzhou International Convention and Exhibition Center on May 11-13, 2011. This biennial industry event is jointly organized by China Surface Engineering Association Electroplating Branch, Powder Coating Institute (USA), Guangdong Electroplating Association and Wise Exhibition (Guangdong) Co., Ltd.. Many technical forums and seminars on surface finishing will also be held concurrently.

In order to continually promote the exchange and cooperation within China and with foreign countries, perfectly integrate product, technique and market, as well as advance the status of China manufacturing and surface finishing industry in the world, the organizing committee has devoted itself to improving the surface finishing industry. Based on the experience accumulated from previous exhibitions, they have collaborated with relevant international associations and chambers of commerce as well as over 40 professional domestic organizations. By making good use of the huge resources and professional exhibition organizing forces, they invited the qualified buyers and suppliers to make the expo an effective event for the industry. For more information, go to. www.sf-expo.cn.

Gear Expo 2011

November 1-3, 2011
Duke Energy Convention Center
Cincinnati, Ohio USA

Gear Expo has been the premier event for the gear industry for more than 20 years. In 2011, it will again be held in conjunction with the ASM Heat Treating Society Conference and Exposition.

A New Location in a Modern Venue
The newly redesigned Duke Energy Convention Center in Cincinnati, Ohio is an excellent venue to meet with customers and colleagues. The convention center's amenities include ample parking, updated technology and spacious concourses. Learn from renowned industry experts the best practices for your company, understand industry trends, and prepare your company for success. Get ready to discover new technologies and techniques, the future of the gear industry, and how to utilize your resources effectively and efficiently. No other event provides more gear industry insight in three information packed days. At Gear Expo, you'll form global alliances, marketing agreements, and partnerships with industry experts, buyers, and sellers who can help take your company to the top. For more information, go to www.agma.org/events-training/detail/gear-expo-2011.

In Memory of Dominque Schwab

Charleville-Mezieres, France. Dominique Schwab, the Managing Director of Wheelabrator Charleville Technology Center (formerly Wheelabrator Sisson Lehman), passed away on March 11, 2011. He was diagnosed with an aggressive form of cancer in the past year. Dominique was 53 and survived by his wife and son.

For more than quarter of a century, Dominique was well known in global peening circles and can be credited for creating popular equipment series such as the MP, MPR and CFXs for automated airblast peening. He was widely regarded as one of the world's foremost authority on aerospace and automotive peening applications. More importantly, most colleagues and customers will remember him as the soft-spoken, unassuming professional that was always eager to listen and offer solutions to basic and complex issues in peening processes and equipment.

Dominique's enthusiasm for the business has established Charleville Technology Center as the global hub of technological activity in peening.

So What Are We To Do?

In the past few weeks, we've received letters announcing price increases from several suppliers. The reasons range from increased costs for oil, copper and steel, to new anti-pollution laws in China. You have to wonder if these increases are the start of an inflationary period that will slow the economic recovery.

Price increases were a big topic of discussion among OEMs at the Metal Casting Congress in Chicago this spring. Everyone we talked with at the show feels like they can't pass prices on to the consumer. On the positive side, these same OEMs are busy and have many orders so they aren't being squeezed to raise prices at this time.

Take Control

So what are we to do about the uncertain economy? One of the things we did at EI was to develop a big valve that throws 3,000 lbs. of shot a minute. While that sounds counter-productive, it's really not. Many Asian and European blast cleaning facilities want controlled blasting processes and the WM 3000-24 was built in response to that demand. It will reduce media usage, downtime, and wear and tear on the blast machines. A controlled process cuts costs for our customers in several areas and the valves provide a fast return on investment.

We've also taken a close look at our own engineering and manufacturing programs and made improvements where needed. Because EI is working smarter, we can do things like offer a new value-added Almen strip without price increases.

It used to be that working lean implied that we were skimping on something, either manpower or materials. The irony is that lean processes can yield better results. There's no better example than shot peening. A designer can spec a smaller component if it's been shot peened and the component will be stronger with a longer fatigue life.

Look to the Future

The ICSP-11 Organizing Committee has been very encouraged by the quantity and quality of paper submissions to the upcoming conference. If the paper topics are any indication, we can anticipate that shot peening and related processes will continue to be a viable industry for the future. For example, research will be presented on nano materials, medical implant peening, roller burnishing, laser shock peening, residual stress measurement, non-destructive testing and much, much more.

Get Involved

I know that I bring this up all of the time, but please consider volunteering your time to SAE committees like AMEC. There is no better way to control your own destiny than to actively participate in the development of new specs and updating existing specs. Another benefit is that you'll be working with other industry leaders. Have you ever heard that if you want to improve your game, you play with someone better than you? The people on the AMEC committee are the best of the best and they want you to join them.

In Memory

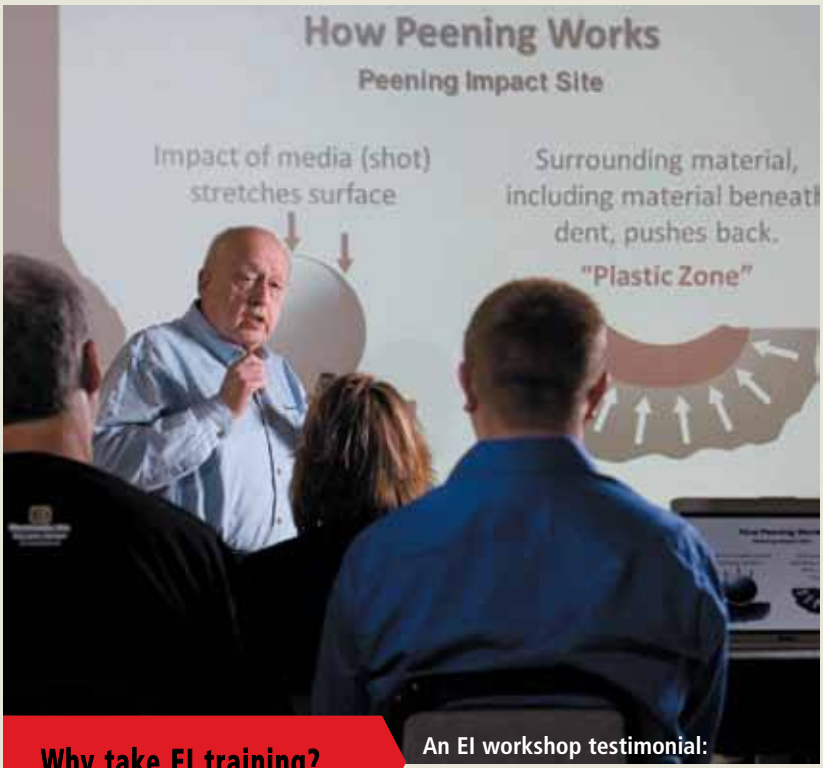
The shot peening community has lost two wonderful colleagues: Bob Gillespie and Dominique Schwab. We offer our heartfelt condolences to their families, friends and business associates.

In Appreciation

We stand in awe of the strength and courage of the Japanese people.

Mastering Shot Peening

2011 Workshops



Why take EI training?

- Improve processes and procedures
- Achieve certification and gain recognition
- Attain job confidence
- Network with industry peers
- Meet industry experts
- Obtain FAA accreditation
- See the latest equipment and products
- Learn in an enjoyable and productive format
- Electronics Inc. pioneered shot peening training in 1991 and remains at the forefront of quality shot peening training
- EI covers all aspects of shot peening and blast cleaning including theory, techniques, applications and equipment
- EI offers certification exams in shot peening and flapper peening
- EI was the first FAA-approved source for shot peening training
- EI's workshops are reasonably priced and a tremendous value

An EI workshop testimonial:

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
Shot Peening Facility

Melbourne, Australia
February 8-9

Tokyo, Japan
February 15

Guanajuato, Mexico
March 8-9

Vancouver, Canada
April 27-28

Singapore
July 19-20

Orlando, Florida USA
October 25-27

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Education Division

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For complete information on all workshops, go to:
www.electronics-inc.com/workshops.html

Our courses are accredited by the FAA.
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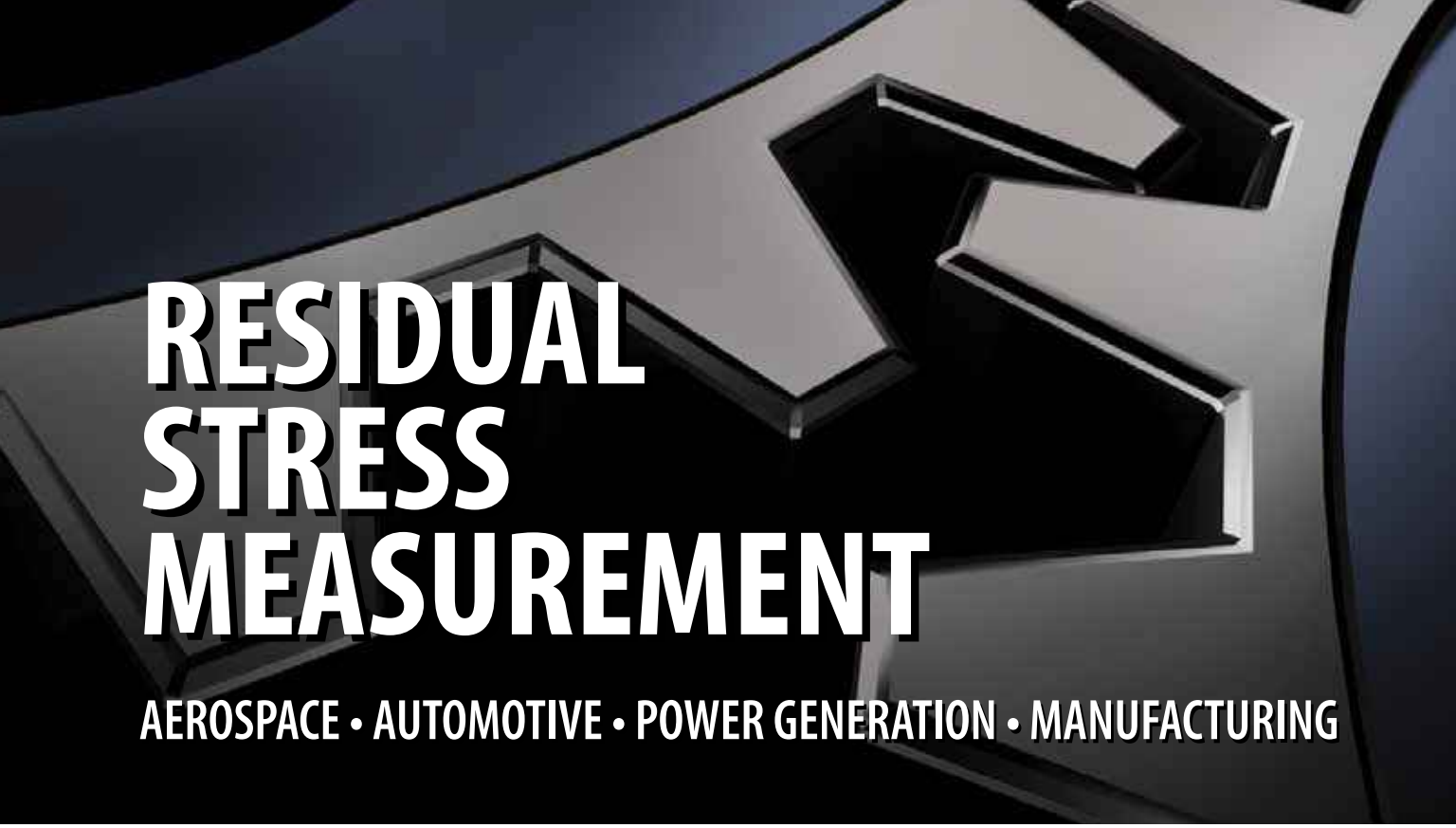

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Residual stress plays such a critical role in the fatigue life, cracking and distortion of components, that its characterization is more important than ever. In today's tough economic times, X-ray Diffraction (XRD) residual stress measurement can both improve quality and help lower component cost by reducing scrap rates, shortening design cycles and ensuring full component life.

Our comprehensive line of XRD residual stress measurement systems and full service laboratories have the accuracy, speed, technology and knowledge to keep your product perfect right from the start.

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