

Of Audits and Artisans

by Daryll McKinley

This past February, I had the opportunity to present a lecture on shot peening audits at the Electronics, Incorporated Asian Workshop in Singapore. It was a wonderful workshop held in a beautiful city and I relish the experience. In Jack Champaigne's Parting Shot column in the previous issue of the Shot Peener, Jack mentioned the Asian Workshop and my participation. Upon showing the column to a friend of mine, the friend asked, "That's cool, but what is shot peening?" This is not an unusual question as I typically hear it from the majority of my acquaintances outside of the shot peening world.

As I began to describe shot peening to him, he interjected with other questions like: "so, shot peening is like sand blasting?", "so, shot peening is a way of cleaning the surface of the part?", "so, are you buying lunch today, Mr. Singapore?" My singular answer to all of his questions was, "no." It's really not very easy to describe the process and benefits of shot peening without getting a bit technical and scribbling on a napkin. But I finally was able to quench his thirst for a simple understanding of shot peening by saying something along the lines of "shot peening is a surface treatment process for metallic components typically used in aerospace or automotive applications that experience fatigue stresses or stress corrosion cracking. Proper shot peening can and will significantly extend the life of parts in these service environments."

I recently took a quick survey and 100% of those questioned had not even heard of shot peening and were certainly not aware of its benefits (I asked my two kids). Along that line, I now have a few questions for you. Does the artisan in your shot peening shop really know what peening is? Does he understand the benefits gained by proper shot peening? Does he understand the necessity of performing proper shot peening? Does he know what is required of him to ensure that his peening process is correct and effective? Lastly, has he received proper training? (By proper training, I mean training with the correct content, good delivery, good reception, and ending with testing to ensure knowledge has been gained).

You see, I believe that the shot peen artisan is the key element in the shot peening process. Certainly the media is an important aspect in peening, as is the peening machine, and the Almen gage, and the Almen fixtures, etc. But really, these are merely the tools used by the artisan to produce the desired peening effect. Proper shot peening begins and ends with the man who performs the work!

So, what gives you the assurance that your artisan is well prepared to perform his important job? Well, you could start by asking him a few questions. Ask him if he feels properly equipped to do his job. Ask him who certified him to be a shot peen artisan. Ask him what type of training he received and where did he receive it. Ask him about his periodic recertification. Ask him the difference between an A, C, and N Almen strip. Ask him if he can calculate 10% of a number. If you get nothing but blank stares or a steady stream of "I don't know", then you have a problem with your shot peening process.

My early days as a shot peening auditor and process monitor at an aircraft rework facility were very enlightening, and commenced the process of my hair turning grey. One day my boss walked into my office and said, "Daryll, I need for you to take over the shot peening processes". Of course, the first thing I did was grab my metallurgy textbooks and looked up

a definition of shot peening and commenced to train myself on the many aspects of the shot peening process.

After gaining a respectful confidence, I walked into the shot peening shops to gage the condition of the process. When I asked the artisans the questions I mentioned above, they either laughed at me or kept very quiet. Apparently, my predecessor had not closely monitored the peening process or the knowledge of the artisans. So, I started at square one and developed an artisan training and certification program. (Well, square one was shutting down the peening shop and taking a lot of heat from the shop supervisors). Back then, third-party training and certification sources were not available, so I developed and administered a curriculum with the following content:

- History of Peening
- How Peening Works
- Peening Benefits
- Peening Applications
- Peening Equipment
- Peening Media
- Almen Strips and Almen Gages
- Almen Fixtures
- Peening Intensity and Saturation
- Intensity Curve Generation and Interpretation
- Coverage and Inspection

The training consisted of several classroom lectures and shop demonstrations. Subsequent to the training, the certification process included written tests as well as practical tests, in which the artisan had to demonstrate his newly-acquired peening prowess in the peening shop. Pass/fail criteria were established and retesting limits were established. The certification process also included levels of certification, such as Level 1, Level 2, etc., which were based on cumulative peening experience and further in-depth testing.

After a period of intense training and testing, all of the shot peen artisans were trained, certified, and able to prove that they were properly performing their tasks. It was a long road, but one that had to be taken. The artisans found new respect for themselves and the work they were performing. They also received pay raises due to their efforts and their certifications.

Shot peening is one of a few metal treatment processes in which the end result cannot be measured or quantified to ensure that what was specified was actually accomplished on the part(s). Certainly the coverage can be inspected, but what of the intensity? If I were auditing a heat treat shop, I could easily check the furnace calibrations and test the hardness of the processed parts. If the measured hardness meets the part's specified hardness, then everyone is happy, especially the design engineer. The design engineer has performed calculations that tell him how strong (i.e., how hard) the part needs to be in order to perform its function without failing prematurely. Well, guess what? He has done the same thing for shot peened parts. He knows that in order to achieve the required life from the part, then the shot peening that he has specified must be done as specified, and without error. He realizes the criticality of shot peening and trusts that the peening shop performs its job properly. He trusts that certified, qualified artisans will be processing the part that he designed; the part that will end up in the user's trusting hands. *Continued on page 16*

However, there currently is no "hardness" test or any other method of quantitatively determining if the part was peened with the correct shot stream intensity. To achieve high-quality shot peening, a high-quality process must be established and this process must be performed by a certified artisan.

So, now... don't you agree with me that the shot peen artisan is the key element in the peening process? It is the properly trained artisan who knows how to test an Almen strip for flatness prior to use. He also will know how to test the media for proper size, shape and consistency. If the peening equipment shuts down midstream in the peening of a part, he will know the corrective actions to take. It is the properly trained artisan who knows the shot stream intensity that has been established and is being applied to the part. He will create and control the needed documentation to attest that the parts that have been processed in his shop meet the specified design requirements.

If I were to walk into your shot peening shop today, I would first ask to speak to the artisans who perform the work. On my clipboard would be a list of various questions about the peening process. I would anticipate correct answers from your artisan for every one of my questions. You may have a very expensive computer-controlled peening booth, and some very pretty Almen gages. You may have the best available peening media and well-constructed peening fixtures. But it all has to come together when the shot stream hits the part. The peening artisan is the one who brings it all together — that's his job. And it's your job to ensure that he has been properly prepared to do his job.

If you have an in-house artisan training and certification program, then you are steps ahead in having a process that will survive the scrutiny of an auditor. If you don't, then establishing one should be of high priority. Smaller peening shops likely cannot support the time or expense of establishing a formal program for artisan training, certification, and recertification. There are third-party resources that can provide training, certification, pre-audit inspections, etc. for small shops as well as large ones. Regardless of the method you use to certify your artisan(s), the ultimate goal is an accurate, consistent peening process that meets the design requirements on each and every part that gets processed. Your customer is depending on it, and your auditor will be looking for it.

Happy Peening! ●



Daryll McKinley has a Bachelor's degree in mechanical engineering, a Master's degree in materials engineering, and he is a Registered Professional Engineer. During his career, he has developed and conducted shot peen artisan training and certification programs for the U.S. Navy, which were later adopted by private industry. During his employment with the Department of Defense, he conducted shop audits, authored

peening process specifications, and wrote equipment specifications.

Mr. McKinley's background includes mechanical design and testing, hardware failure analysis, aircraft accident investigation, materials processing, and corrosion control.

He has experience in the aerospace, automotive, military, and litigation fields. His past employers include the Department of Defense, General Dynamics, and a forensic consulting firm. Mr. McKinley now works as a consulting engineer performing failure analysis, mechanical design, and shot peening training.

You may contact Mr. McKinley by phone: 850-449-2528 or e-mail: mcengineering@hotmail.com

ADS

Always Dependable Service Ltd.
Shotblast Machines, Parts & Service

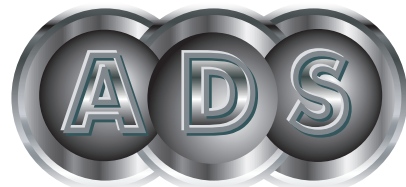
www.ads-shotblast.com



One Source for all your Shotblast Needs

BECAUSE...

- Over 25 years of Experience
- Distributors of O.E.M. Products & Replacement Parts
- Manufacturers & Fabricators of Machined & Manganese Parts
- Quality Trained Service Technicians
- Preventative Maintenance Programs
- Exclusive Trademark & Distributor of Dustchaser
- Cleaning Facility Visit www.peenandcleanltd.ca



AND...New & Used Equipment Div.

- 38 000 sq. ft., 3 Ten-Ton Cranes with 28 ft. Clear Under the Hook
- Comprehensive Onsite Rebuilds or in ADS Shop
- Design & Fabrication of New & Rebuilt Shotblast Equipment
- New O.E.M. Technology Wheels & Electrical Upgrades
- Pre-Start Review Upgrades
- Largest Re-Builder of Shotblast Machines in Canada

Experts Who Believe in Customer Satisfaction

340 Hatt St. Dundas, Ontario, Canada, L9H 2J1
Ph. (905) 628-0765 Fx. (905) 628-0642
info@ads-shotblast.com www.ads-shotblast.com