The Shot Peener

Spring 2006

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Aircraft maintenance on the move

Plus: ▪ The battle against corrosion ▪ History of shot peening specs ▪ Shot peening basics for the operator

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The Shot Peener (ISSN 1069-2010), in print since 1986, is a quarterly publication from Electronics Incorporated with a circulation of over 4500 readers worldwide. It is dedicated to raising the awareness and appreciation for the shot peening and abrasive blast cleaning industries.

Input is always welcome—send comments and suggestions to:
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Bringing stripping and painting to the deployment site

"We've never met a plane that couldn't be stripped," says Tom Meacham, Vice President of Blast Off Incorporated (Boi).

This is a rightful claim from Boi as the aircraft services company has one of the most comprehensive lists of services in the coatings removal industry. Boi's niche, stripping and painting helicopters for the U.S. Army, led to the development of Boi's newest offering, the Portable Corrosion Control Containment Shelter System (PCCCSS). Boi was approached by the Navy to develop a portable unit and after recent on-site testing, the PCCCSS has been approved for use by the U.S. Navy, Marine Corps and Army. "These portable maintenance shelters will enable aircraft to get back in the field quickly," says Meacham.

The PCCCSS is comprised of several off-the-shelf pieces of equipment including a tension-fabric containment shelter made of a flame-resistant polyvinyl chloride (PVC) material integrated with a dual-use paint and de-paint ventilation system. The stripping is performed using a Plastic Media Blast (PMB) unit. The PCCCSS is also outfitted with painting equipment, explosion-proof interior lighting, operator breathing apparatus and other safety equipment. If electrical power and compressed air are not readily available on-site, the PCCCSS can be equipped with portable generators and air compressors. The PCCCSS can be placed indoors or outdoors on a concrete pad. If placed outdoors, the shelter provides cover from direct sunlight and provides a comfortable work environment. The tension-fabric allows enough light to perform the maintenance tasks.

The shelter was designed to house an H-60 helicopter. The dimensions are 60 feet long, 24 feet wide, and 18 feet high. The air wall ventilation system will provide an airflow rate slightly over 100 feet per minute. This amount of ventilation is needed to evacuate dust or paint vapors and to ensure the safety of the personnel and aircraft. The PCCCSS is transported in three standard 20-foot shipping containers. A four-man crew can erect a helicopter-sized containment in less than three days. The PCCCSS is outfitted with retractable wheels and when not in use, can be rolled out of the way. After use, the system may be disassembled for storage and moved to another location. Boi will deliver the units to the deployment site and get them operational.

"While the initial PCCCSS was designed to accommodate an H-60 helicopter, the shelters can be configured to fit any size helicopter and/or any other equipment the Department of Defense wants to maintain," says Meacham. "The Navy is looking at using the shelters as maintenance facilities for the Navy LCAC hover craft."

The PCCCSS was designed to accommodate H-60 helicopters like this one taking off from the flight deck of the USS WASP. An AV-8B Harrier sits in the background. In the water, a landing craft air-cushion (LCAC) ferries personnel and supplies to the ship. The PCCCSS is being considered by the Navy as a maintenance facility for LCAC, too. Photo by Lance Cpl. Jemssy Alvarez.

Sending a PCCCSS to the deployment site offers numerous advantages over sending an aircraft back to a facility for painting and stripping:

- **Mission readiness.** For the Navy, the PCCCSS overcomes mission readiness problems created by the large number of aircraft returning from Iraq and Afghanistan.
- **Environmental benefits.** The shelter was designed to contain and control hazardous materials and hazardous wastes generated from painting and blasting operations. The shelter will enable deployment sites to be in compliance with environmental requirements.
- **Reduced costs.** A permanent facility can cost from $1.4 to $2.1 million. The cost to send an aircraft to a Naval Depot can exceed one million dollars. The cost of a PCCCSS is under $500,000. The four units recently ordered by the U.S. Navy will save taxpayers about $30 - $50 million over the life of the shelters.

The Navy has ordered four PCCCSS units for forward deployed units in the Pacific Rim. The first fully operational PCCCSS was up and running in March, 2006 at Kaneohe Bay, Hawaii. The goal at this facility is to strip and paint 30 CH-53 helicopters in 24 months. "These units will keep helicopters in the proper maintenance phase during retrofits and corrosion inspections", says Meacham. Additional units will be headed to Japan and Guam later this year.

An H-60 Seahawk is towed into a PCCCSS prototype for comprehensive proof testing at the Marine Corps base in Kaneohe Bay, Hawaii. The PCCCSS met the key safety and environmental requirements of a deployment site. The first fully-functional PCCCSS was up and running in Kaneohe Bay in March, 2006.

Blast Off Incorporated (Boi)

Boi is woman-owned business—Bobbie Maud Meacham is the owner and President of the company. Boi has facilities in Perdido, Alabama and DeKalb, Texas. Boi provides the following services:

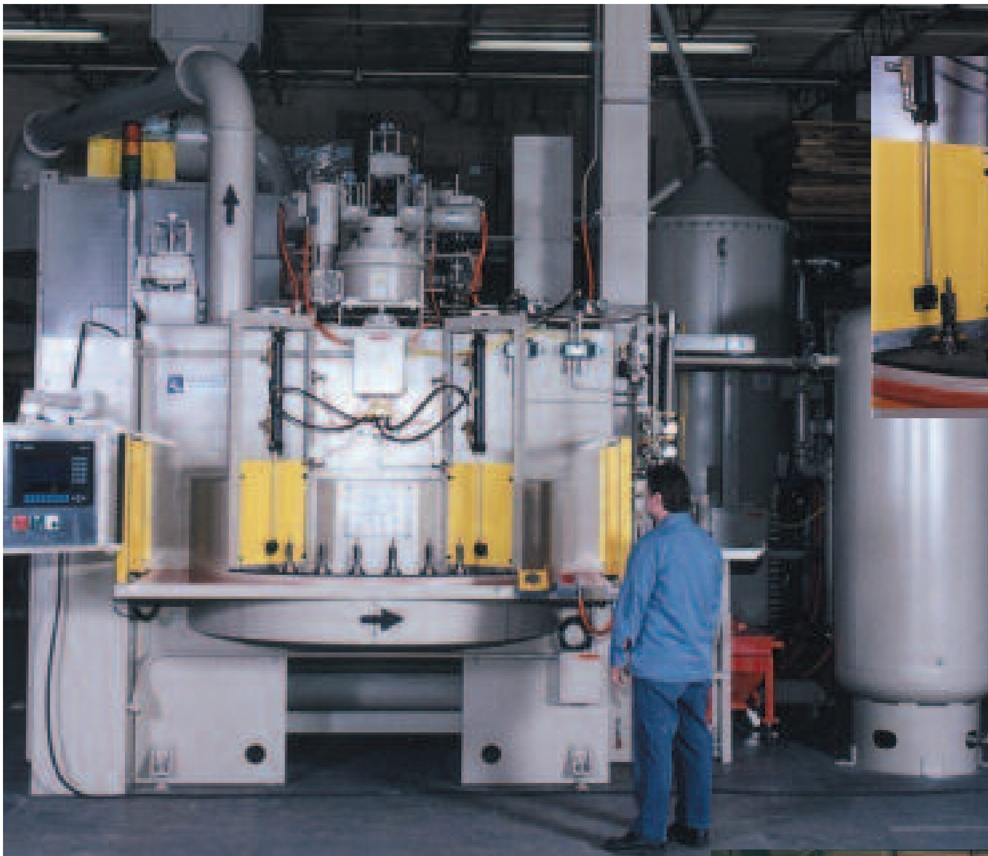
- General Contractor
  Boi can modify a strip and paint facility or design and construct a new turnkey facility from the ground up.
- Aircraft Paint Services
  Boi offers a wide variety of aircraft corrosion control related services from a scuff and paint system to a complete strip, corrosion treatment and paint program. Plus, Boi offers their customers the convenience of stripe and "N" number changes with on-time delivery guaranteed.
- Ground Support Equipment (GSE)
  Boi offers the option of an on-site strip and paint operation. Boi can also support customers' GSE needs at one of their regional strip and paint facilities.
- Specialty Service
  Boi provides on-site services for War Bird restoration and preservation projects. Boi was proud to be chosen to restore the R5D (DC-3 Que Sera Sera) flown by Admiral Byrd—it was the first aircraft to land on the South Pole.
- Drug Enforcement Units
  Boi provides DEA units with special paint configurations for specific airborne projects (Fixed wing or Rotor wing).
- Research and Development.
  Boi offers equipment, facilities, and personnel to research and develop coatings removal and coatings application technology for plastic media, wheat starch, water blast, bicarbonate of soda, chemical strippers or chemical softeners.
- Consulting Services
  Boi offers a variety of consulting services to the aviation industry.
- Training
  Boi was the first company to develop and implement "Aircraft Specific" training seminars. These 40-hour training seminars educate potential plastic media blast operators on all aspects of the plastic media blasting process.
- Environmental Services
  Boi was the first company to offer a Plastic Media Lease Program. Since 1991, the United States Coast Guard has utilized Boi's media recycling program and thereby eliminated the production of hazardous waste associated with the use of plastic media.
- Manufacturing
  Boi is a leader in nozzle technology. Boi and U.S. Air Force engineers have developed a widespray fan nozzle that removes up to 5 times more paint than a conventional number 8 round nozzle, while lowering the amount of residual stress on the aircraft skins being blasted.

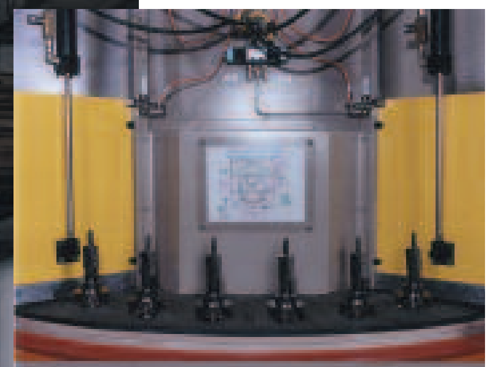
For more information on Boi, contact Tom Meacham by telephone: 1-251-937-5555 or email: tom@blastoffinc.com

The cost of corrosion

Corrosion is the deterioration of metals and other materials due to oxidation (rust), pollution and weather factors. Corrosion costs industries billions of dollars every year in repair costs. Navy and Marine aircraft are especially affected by corrosion—aircraft launched from carriers are exposed to saltwater washing over the deck and salty air. Products and services to combat corrosion include Protective Coatings (Organic Coatings, Metallic Coatings), Metals and Alloys, Corrosion Inhibitors, Polymers, Anodic & Cathodic Protection, Services, Research & Development and Education and Training. New methods for controlling corrosion are being discovered all the time. Industries that provide these products and services have a huge market as evidenced by these numbers from www.Corrosion-Club.com.

Region/Industry	Cost of Corrosion	Reference
Aircraft Industry (North America)	$13 billion per year	IAR Flyer, Spring 2000 Edition, NRC Institute for Aerospace Research (Canada). V.S. Agarwala: "Corrosion Detection and Monitoring - A Review", Paper No. 271, Corrosion 2000, NACE International, 2000.
Aircraft, Military (United States of America)	$3 billion per year	V.S. Agarwala: "Corrosion Detection and Monitoring - A Review", Paper No. 271, Corrosion 2000, NACE International, 2000.
Aircraft (lost revenue when grounded for corrosion maintenance/repairs)	$100,000 per day	IAR Flyer, Spring 2000 Edition, NRC Institute for Aerospace Research (Canada).
Air Force and Navy - Australia	>$50 million per year	Web site of Defense Science and Technology Organization (DSTO, Australia)
Army - US	$2 billion per year related to painting and paint removal (estimate)	M. Youson: "Invisible Enemy", Engineering, September 2003.
Australia	about 2% of GDP	Materials World, December 2001, p.30
Automobiles in Finland	about US $160 per car yearly (about US $300 million in total per year)	Studies conducted in the 1990's by the Finnish Road Administration, published at www.tieh.fi/winter.htm
Automobiles (USA)	0.25% of GNP attributed to motor vehicle corrosion (in 1998)	Materials Performance, March 2002, p.31.
Bridges (USA Highway Bridges)	$30 billion (1999 dollars) to remediate corrosion-induced structural deficiencies	Materials Performance, March 2002, p.31.
Gas Pipeline Industry (North America)	$80 million per year purchased in coatings to coat new pipelines and recoat existing pipelines (1993 reference).	P. Cavassi and M. Cornago: "The Cost of Corrosion in the Oil and Gas Industry", JPCL, May 1999, pp30-40. (Background Section on p.34, with additional references.)
Helicopters - US Army (1998 estimate)	$4 billion spent on corrosion repairs (estimate)	MTTC News, Volume 8, Issue 9 (August 19, 2003), under article "Corrosion costs eat up DOD budget".
Japan	0.8-1.0 % of GNP (1997 estimate of direct corrosion costs)	National Institute for Materials Science (Japan)
Nuclear reactors - a particular problem of voluminous corrosion product formation on in-reactor steel components	£100 million per annum	"Jack Harris column" in the journal Materials World (September 2004 issue)
Oil and Gas (Agip)	about $0.40 per barrel of oil produced, the economic impact of corrosion	P. Cavassi and M. Cornago: "The Cost of Corrosion in the Oil and Gas Industry", JPCL, May 1999, pp30-40.
Power Generation (USA)	$5 billion - $10 billion annually for the U.S. electric power industry (EPRI estimate). In steam-electric generating plants, corrosion costs exceeded 10% of total power cost. Up to 50% of outages attributable to corrosion.	InTech Magazine Online published at www.isa.org, October 1, 1998.
Roads, Sidewalks, Bridges (Toronto, Canada)	$110 million is to be spent by this city on the repair of roads, sidewalks and bridges in 2005... with a backlog of $235 million deferred due to budget constraints.	K. McGran's article "On the road to ruin?", Toronto Star, February 5, 2005, pB4-B5.
Switzerland	3-5% of GNP per year, or 10-15 billion Swiss Franks per year	EMPA web site (dated 1999).





Clemco helps fight the war on corrosion

by Herb Tobben

While most of the articles I submit to The Shot Peener relate to shot peening, surface finishing, and other industrial applications, as a tie-in to other articles in this issue, the editor invited me to talk about Clemco's involvement with corrosion.

Clemco's mission is to develop and market superior corrosion-control and surface-treatment technologies that deliver innovative, high-performance cleaning and finishing solutions to industry worldwide. As corrosion undermines the nation's infrastructure, and has serious safety implications for the world's fleet of aircraft, Clemco takes its role in fighting corrosion very seriously.

Components exposed to the elements eventually sustain damage caused by atmospheric conditions that create corrosion. The severity and the rate depend upon surface-formed electrolytes (moisture), which in turn depend upon levels of atmospheric humidity and pollution. The most common types of corrosion include: general corrosion that is evenly distributed over a surface, galvanic corrosion that results from contact of two dissimilar metals, pitting corrosion that develops in a concentrated area, and crevice corrosion that occurs in small spaces between structural elements (rivets, bolts etc). Crevice corrosion is the most common type of corrosion found on aircraft. It occurs where water is trapped between two surfaces (under loose paint, in the lap joints of aircraft skins, within a delaminated bond-line, or in an unsealed joint). Undetected, untreated corrosion can cause catastrophic structural failure.

More than 50 years ago, Clemco built its business around its first product, a blast machine – a pressure vessel first used for blast cleaning by painting contractors, oil companies, shipyards, and building contractors in construction. These industries adopted abrasive blasting to improve efficiencies when cleaning steel substrates to remove corrosion and prepare these surfaces for coatings.

Through the decades, the uses for abrasive blasting have expanded in part due to an increasingly broad array of blasting media. Blasting began as an unconfined process using whatever media was locally available. The economics of blasting with recyclable media have brought blasting indoors, where the blast process is confined, and where media can be cleaned and reused. Indoor blasting enables the user to trap the dust and debris that result from the process. Small components are blasted in suitably-sized cabinets; larger parts, vehicles, and aircraft are blasted in engineered rooms providing blasting, recovery, recycling and ventilation capabilities.

More than 25 years ago, Clemco's Aerolyte Systems division was created following work Clemco did for the United States Air Force when USAF was looking for coating removal alternatives to toxic chemical strippers for its aircraft. Paint removal is a necessary part of aircraft maintenance to allow surface inspection, to perform repairs, and to keep an aircraft's weight at acceptable levels after several coats of paint have been applied. The unique development began with the employment of plastic grit (the first prototype of the media was made from plastic button holes) as blast media. The medium's characteristics required special process equipment developed by Aerolyte. Since then, Aerolyte has built automated equipment and facilities of all sizes for all types of fixed-wing and rotary aircraft as well as for ground support equipment for the US and many foreign military forces and commercial fleets. Some facilities employ wheat starch media, another lightweight, soft media used on delicate substrates. The military uses plastic or wheat starch or other lightweight media blasting for dry

Aerolyte dry stripping facility for depainting A-10 aircraft at Hill Air Force Base, Utah.

stripping various attack, fighter, trainer, bomber, and transport aircraft as well as for ground fighting vehicles and other support vehicles and equipment.

Blasting with plastic media or other non-aggressive media is an economical and environmentally sound method for depainting. Blasting is done at low pressures (less than 40 psi) to allow coating removal without damaging the aluminum or other delicate substrate. The media is recyclable, 12 to 15 times, until it breaks down too fine to be effective. PMB reduces or completely eliminates the use of chemicals, like MEK, which are toxic to workers and the environment and which create significant waste disposal issues for the users. Facilities include blast machines, media hoppers, floor recovery systems to capture spent media, media cleaners, magnetic and heavy particle separators to remove metal contamination, dust collection for media cleaning and room ventilation, and respiratory protection for the blast operators.

Today, hundreds of government and private facilities fight corrosion everyday with Clemco, Aerolyte, and ZERO equipment. In the United States, blast facilities are in use at Hill AFB, Jacksonville NAS, Pensacola and Cherry Point NADEP, Kaneohe Bay Naval Base, Warner Robins AFB, Tinker AFB, Corpus Christi Army Depot, by Sikorsky Aircraft, American Airlines, and Boeing and by Raytheon in Saudi Arabia, and numerous commercial and foreign military sites in England, Denmark, Spain, Turkey, Egypt, Singapore, and Thailand, among others.

For more information about aircraft corrosion, readers can visit
www.corrosionsource.com/technicallibrary
www.corrosion-doctors.org/Aircraft/Examples.htm#Galvanic
www.corrosion-doctors.org

Herb Tobben, the Sample Processing Manager of the Technical Services Department for Zero Cabinets and Zero Automation at Clemco Industries, creates solutions to customer problems.

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History of Shot Peening Specifications

by Jack Champaigne

The "History of Shot Peening Specifications" was presented by Jack Champaigne at the Ninth International Conference on Shot Peening. Mr. Champaigne has extensive experience with shot peening specifications. He has been a member of the Surface Enhancement Division of SAE since 1985 and currently serves as Committee Chairman of the Surface Enhancement Division of SAE. (SAE International, through the voluntary work of more than 7,000 committee members and participants like Mr. Champaigne, maintains over 8,300 technical standards and related documents.) In addition, Mr. Champaigne is president of Electronics Inc. (EI)—EI manufactures valves, controls, gages and test strips for the shot peening industry that meet spec requirements from standard MIL specifications to rigid aerospace specifications. He also shares his spec expertise at EI's workshops and on-site training programs.

*In future articles, Mr. Champaigne will share what it is like to work within the SAE to create and update specs. We will also discuss the good and bad aspects of specifications: At best, specifications impose much-needed controls and guidelines on the shot peening process. At worst, there are too many specs, many are out-dated, some are poorly written. "The History of Shot Peening Specifications" lays the foundation for **The Shot Peener's** exploration of specs and their impact on your business.*

ABSTRACT

The history of shot peening specifications is presented in a chronological format with prelude of situations existing in 1940. The specifications cited are of US origin and in the public domain (i.e. no proprietary specifications such as GE or Boeing are cited). Some specifications relating to media have been excluded for brevity.

SUBJECT INDEX

History, Specifications

INTRODUCTION

Early application of shot peening in the 1930's and 1940's relied upon proprietary specifications, primarily from General Motors. Efforts to improve fatigue life of critical aircraft components for World War II resulted in creation of specifications by the US Army, Navy and Air Force and also Society of Automotive Engineers. The data is presented in chronological sequence to establish a time-line of events.

PRELUDE:

1940

Zimmerly of Associated Spring (Barnes-Gibson-Raymond Division) wrote an article in 1940 for the 22nd annual convention of ASM entitled "How Shot Blasting Increases Fatigue Life". He stresses the time of shot blasting is important (coverage) and also shows that heating above 500 degrees F will diminish the beneficial effects of the treatment. (1940000.pdf)

1941

In a subsequent article a year later Zimmerly writes: "Shot Blasting and its Effect on Fatigue Life" he mentions the lack of control of the process and suggests that some type of control could be used "The inclusion of a standard test piece in the parts being blasted would form an empirical check upon the process." (1941006.pdf)

1942

A year after that, in 1942, J.0. Almen, working for General Motors, makes application for a US patent which describes the first use of a test strip, holder and gage. The gage, using two knife edges to support the strip, measured the convex curvature of a blasted piece of spring steel "slightly less than .050 inch thick". Other than describing that the curvature is a reflection of the intensity of the shot blast there is no mention of a definitive method to be used to provide consistent process control.(1944011.pdf)

1943

A few months later, in November of 1943, a General Motors document, drawing No. S-200-7, shows a revised gage design referred to as #2 Gage which uses 4-ball support instead of knife edges to recognize the compound curvature of the test strip. When Almen's patent finally issues in June of 1944, it is already obsolete. (I945002.pdf)

1943

Almen describes the merits of his shot blasting test methods in an article "Shot Blasting to Increase Fatigue Resistance" published in July of 1943 in SAE Journal Vol 51 No. 7. The article shows the test strip as mounted on the holder and his special gage to measure its curvature. The test strip is subjected to the shot blast in the same manner as the part being peened. There is no mention of use of a saturation curve. Later, Almen writes in 1943 for Metal Progress Magazine "Peened Surfaces Improve Endurance of Machine Parts" and he shows a flat test strip of tempered (stress free) steel held down to stiff block by screws so only one surface is exposed to cold working. He also shows the dial gage and knife edges for measuring curvature on the test strip. (1943003.pdf)

1945

General Motors then makes additional refinement of process control in a memorandum report S-200-9C written in 1945 by R. L. Mattson and H. E. Fonda of Research Laboratories Division, entitled "Peening Intensity Measurement". It introduces the concept using a series of test strips, each for a different exposure time. The Almen #1 gage is not to be used since it has been superseded by the Almen No. 2 gage. A drawing dated 11-231943 shows the standardized dimensions of the gage. A correlation chart between the #1 and the #2 gage is included for reference. It is interesting to note how the Almen strip quality was to be controlled. The material specification is purposely omitted because the method of rolling and possibly other factors may influence the response of the strip to the blast of shot. It is considered more dependable to approve separately each source of supply. From 5 to 12 test points were deemed necessary to construct the intensity curve. "The gage reading corresponding with the point A where the curve flattens out is taken to be the intensity of the particular blast." Furthermore, the "C" strip is to be used for intensities above .024A. There is no mention of a "B" strip or indication of why the letters "A" and "C" have been chosen. (1945002.pdf)

1949

The recognition of the benefits of stress peening, mechanically stressing a part during the peening operation, is discussed by Straub and May in article published by The Iron Age magazine, April 21, 1949. Since this imparts a much deeper compressive stress, later specifications emphasized that stress peening was not to be used unless authorized. (1949003.pdf)

1960

H. J. Noble of Pratt & Whitney Aircraft publishes article "An Evaluation of Fine Particle Abrasive Blasting and Other Methods of Surface Improvement" wherein he introduces the more sensitive "N" strip with approximately the same ratio of response to the "A" strip as between the "A" strip and the "C" strip, which is ratio of 3½. (1960002.pdf)

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CHRONOLOGY:

1944

The Ordinance Department of the U S Army, in August of 1944, circulates a tentative specification AXS-1272 titled "Shot Peening of Metals, General Specification For". It carries the notation "This specification covers shot peening of metal parts for the purpose of increasing the endurance limit of the part." Only five sizes of shot are recognized and they are qualified by use of four sieves for each size. Up to 10% of the shot in use may be substandard. It does discuss process control by saying: "The shot peening intensity shall be determined by subjection of one side of a flat steel strip to the shot peening procedure used in production. The magnitude of the curvature of the strip after treatment measures the shot peening intensity. For intensities in the designation of which the letter "A" appears the test 1 strip shown in Figure I shall be used. For intensities in the designation of I which the letter "C" appears, the strip shown in Figure 2 shall be used. The gage depicted is the #2 gage developed by General Motors in 1943. Intensity is evaluated as the point on the curve where it flattens out.

The following discussion on coverage introduces the mixing of concepts, namely visual examination of the peened surface in one method and then another method of observing the saturation of the Almen strip. "The time of exposure should give complete coverage. The coverage is frequently gaged by eye. A more reliable method is to expose a series of test strips for varying lengths of time under a given set of shot peening conditions, then plot a curve of gage reading against time of exposure. The curve should flatten off at a time which gives complete coverage." (author's note: This coverage concept was probably relevant since the Almen strip and automotive components (valve coil springs) were of similar steel alloy and hardness.)

1949

MIL-G-851 (Ships) is issued by US Navy to describe Metal Grit and Shot for Blast Cleaning and Peening. This is later (1950) renamed MIL-M-851 and then (1965) MIL-S-851.

1948

The Society of Automotive Engineers, SAE, introduces aerospace materials specification AMS 2430 on September 1, 1948. Its preamble states: 'Application: To impose compressive stresses on specified surface layers of metallic parts, primarily for increasing fatigue strength but may be used for other purposes such as testing for bond of plated materials." The "A" strip is to be used for intensities up to .020 inch then the "C" strip is to be used. Both Almen Gage No. 1 and Almen Gage No. 2 are described but preference is given to Almen Gage No. 2, Test specimens shall be included with every batch of parts during peening, or at the beginning of each production run and at intervals not longer than every four hours thereafter for continuous peening, or at other intervals as stipulated by the purchaser. Such specimens shall show an intensity within the range specified for the parts." And, "The time, the shot, the shot velocity, the positioning of the parts which will produce satisfactory peening intensity on the part shall be established, and the test specimen described in 4.4 shall be used to control the required conditions in production. The specimens to be peened shall be attached to suitable blocks or fixtures or pilot parts in such a position as best to represent production parts to be peened. " Also, "Unless otherwise specified, variation from the specified peening intensity shall be -0 to +5 (-0.000 to + 0.005 in. arc height)."

1952

The first specification to control the dimensions and attributes of the strip and gage is by SAE in document J442 published in January 1952. It has specifications for material as SAE 1070 cold-rolled string steel with square edge No. 1 (on 3-in. edges) with blue temper or bright finish uniformly hardened and tempered to HRc of 44-50. Flatness is ±.0015-in. arc height as measured on standard #2 gage. Three intensity determinations are to be made-each (work) shift.

1952

A companion document, SAE J443 "Procedures for Using Standard Shot Peening Test Strip published in January 1952 states "The gage reading corresponding with the point A where the curve flattens out is generally taken as the measurement of the intensity of that particular peening. In some cases, this point is difficult to pick out and requires some judgement."

1953

MIL-S-13165 (ORD) (author's note: I have not found copy of this document.)

1961

A revision to J442 published in June of 1961 introduces the "N" strip and reduces the flatness tolerance to ±0.001-in for the "A" strip and leaves the tolerance at ±0.015-in for the "C" strip.

1972

MIL-R-81841 (AS) "Rotary Flap Peening of Metal Parts" is introduced by government. Developed in cooperation with 3M Corporation to provide a portable peening system suitable for in situ applications, primarily helicopter repair.

1972

MIL-W-81840 (AS) "Wheels, Peening, Rotary Flap" describes equipment requirements to meet MIL-R-81841.

1974

MIL–81985 "Peening of Metals" introduced by government to meet needs and objectives of Naval Air Systems Command. It includes media requirements as well as qualifications of peening operators.

1984

January 1984 J443 describes "Saturation has been attained when the *knee" of the curve is passed and increasingly longer periods of peening time are required for a measurable increase in test strip arc height. The location of the knee, point A shown in Figure 1, can be defined as that point on the curve beyond which the arc height does not increase more than "X" percent when the peening time is doubled. An arc height increase of 20% for doubled peening time may be adequate for some applications, An increase of 10% for doubled peening time defines the knee for critical applications. A smaller percentage increase than 10% requires longer peening time reach this "knee" in the curve."

1987

US Navy introduces LPS/JX 341-149-87 "Peening of Metal Parts Local Process Specification". This document is self-contained including all requirements for strips, holder, gage, media size and shape. It includes the 10% rule but then refers to it as criteria for full coverage. It goes further in establishing peening coverage time as a ratio of area of Almen strip to area to be peened.

1988

SAE AMS 2431 publishes "Peening Media, General Requirements" as a collection of individual documents for various media types.

1990

SAE 2432 was first issued in 1990. Strip attributes referred to J442 except thickness and flatness tolerance is ±0.0005 inch and hardness 45-48 HRc for A and C strips and 73.0-74.5 HRa for N strips. Gages to have accuracy of ±0.0001 inch and must be able to read thickness of Almen strips. A flat gage block is mentioned but without requirements. Sub-size strips are allowable. (author's note: The strips referenced in J442 are described with metric dimensions but AMS 2432 alters the tolerance using inch dimensions.) Media is to comply with SAE AMS 2431.

1990

NAVAIR Instruction 48.70.2 establishes requirement that AMS 2432 must be used for aircraft components during rework repair format.

1995

US Navy introduces LPS 500 "Peening of Metal Parts". This document is self-contained including all requirements of strips, holder, gage and media size and shape. It includes written and practical

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The DRS-TAMSCO (Technical & Management Services Co.) artisans received roto peening training from the New & Expanding Training (NEIT) industry program through the North Carolina Community College System—it's part of an innovative program to build a world-class workforce in North Carolina.

Attracting and training a skilled and motivated workforce is crucial to any new or expanding company. No state has more experience helping companies with these important issues than North Carolina. The state pioneered free customized job training for new and expanding businesses in 1958 and continues to provide the nation's most recognized customized job training service. Comprised of 58 colleges across the state, it is the third largest community college system in the United States. Typically, the services provided are based on the number of new jobs created, their skill and wage levels, and the level of total capital investment. Services are made available to companies that create 12 or more new jobs in any one community in North Carolina during a one-year period.

The decision by DRS-TAMSCO to build a facility in Elizabeth City, North Carolina made the company an ideal recipient of the training programs available from the College of The Albermarle (COA), a part of the North Carolina Community College System.

In 2005, DRS-TAMSCO, a military equipment and logistics supplier, broke ground on its expanded operation at the airport in Elizabeth City. DRS-TAMSCO's repair and supply operation, which employs about 135 people in Elizabeth City, is expecting to add additional jobs in the next two years. The new 110,000-square-foot heavy-lift, fixed-wing maintenance hangar cost over $8 million and is capable of housing four C-130 Hercules aircraft. DRS-TAMSCO's motivation to locate in North Carolina can be attributed to a long-standing relationship with the Coast Guard in Elizabeth City. DRS-TAMSCO designed, developed, tested, and implemented the initial computerized maintenance system (ACMS) used throughout the Coast Guard's fleet of fixed and rotary wing aircraft today.

COA and DRS-TAMSCO worked closely together to plan a comprehensive training program for new employees that to-date has covered several OSHA and related safety subjects, roto peen training, Taperloks and ADS fasteners, and flight line operations. DRS-TAMSCO's artisans received roto peen training at the College of The Albermarle since their new hangar was not operational at the time of training. COA opens its classrooms to these training programs on a regular basis. The college's program also allowed DRS-TAMSCO to bring in professional trainers, Electronics Inc., for the roto peen training. "We received exceptional assistance from COA," said Sam Overman, the Policies and Procedures Program Manager for Elizabeth City Operations. "Our company has had many changes during this program and both COA and Electronics Inc. rolled with the punches."

DRS-TAMSCO's artisans receive roto peen training from Electronics Inc. as part of a customized training program from the College of The Albermarle in North Carolina.

The College of The Albermarle makes its classrooms available to companies that participate in its training programs.

"What COA is doing for DRS-TAMSCO is what we would attempt to do for any manufacturer relocating to or expanding within our service area", says David Merrick, COA's Associate Vice President for Business and Workforce Development. "A major part of our mission is to assist businesses by helping train individuals to fill their new jobs and to assist incumbent workers to keep their jobs by upgrading their skills."

Shot peening basics for the operator

by Ron Wright

Over the years many articles and discussions have centered on the merits of controlled shot peening. Some of these discussions refer to the continuing progress being made on understanding the metallurgy at the surface of the part and in the sub-layer. As the technology available to analyze the results of our peening effort evolves, we tend to focus on factors such as microstructure, X-Ray diffraction, shot shape, shot hardness, part distortion and stress analysis to name a few.

All of the above are very significant and necessary studies, but what about the novice shot peener or the company that may have recently obtained its first shot peening machine? Highly technical discussions can be confusing and intimidating for those who have just entered the field of shot peening.

The truth is that the new peening machine operator does not need to understand the subtleties of metallurgy and microstructure. Over time, this type of information will become an integral part of learning. Such discussions will be of paramount importance in an operator's quest to become an accomplished shot peener, no matter what type of equipment is used.

For the novice, a good foundation will follow a methodical, common sense approach to the task. The key point at this stage is for the student to understand the relationship between the equipment and the outcome of the peening cycle.

Wheel Speed/Air Pressure = Shot Velocity = INTENSITY
Shot Flow x Time = COVERAGE

Grasping the relationships between these elements will enable the operator to predict the outcome of each cycle accurately and reduce set-up time. This is also critical when a different INTENSITY or COVERAGE is required warranting adjustments to the technique.

With this fundamental understanding, an operator can follow a basic procedure for developing a shot peening cycle, involving these four steps.

1. Establish velocity required to reach the target INTENSITY by adjusting wheel speed or air pressure.
2. Find optimal Shot Flow rate corresponding to wheel speed/air pressure required in Step 1.
3. Develop saturation curve and set intensity.
4. Determine time required to achieve 98%-100% coverage on part.
5. Expose parts to shot stream to achieve % coverage requested (100%, 150%, etc.)

Once an operator understands this procedure and becomes familiar with the reaction of the Almen strips when the machine parameters are adjusted, he/she feels empowered. At this point, the operator is well on the way to understanding the technology of peening and the relevance of the more in-depth analyses.

Discussions on the mechanics, analysis, and development of shot peening techniques will hold an entirely different meaning to the newly informed technician. It is only now that we can go forward to explore and understand the numerous facets of the constantly expanding techniques of Shot Peening. ●

Ron Wright is an Engineering Technologist who has been involved in the industry for over 20 years. Ron is responsible for Wheelabrator's Automated Airblast and Peening Products.

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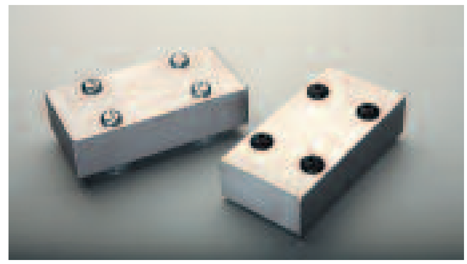
(Liquid form available only in the United States)



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EI manufactures test strip holders in two designs: threaded or non-threaded.

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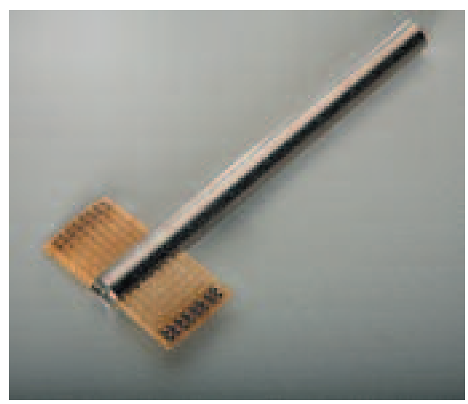

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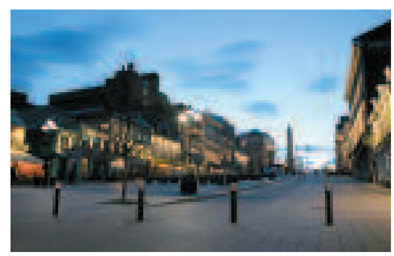

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Group discounts are available - see registration forms in this newsletter.

Ductility and strength properties of shot peened surfaces

by David Kirk

INTRODUCTION

It is an apparent paradox that peening, which requires a large degree of ductility, can readily be applied to high-strength, low-ductility, engineering components. A single indentation may induce plastic deformations of more than 100%. This is illustrated in fig.1 where it is assumed that the depth of the deformed zone is twice that of the indentation itself. A column of length AC has been compressed to half of its height BC. The deformed column therefore has an average compressive plastic deformation **equivalent** to a tensile deformation of 100% (using engineering strain calculation). That deformation varies from 0% at C (the boundary of the plastically-deformed zone) to a maximum at B. Assuming a simple linear variation, that will equate to 200% at B.

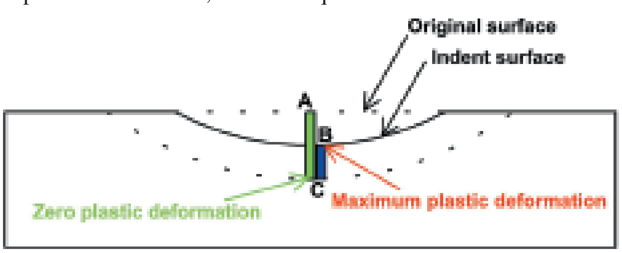


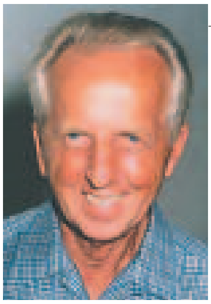
Fig.1 Schematic representation of plastic deformation range in peened surface.

Ductile metals have a **tensile** ductility of about 40% and high-strength alloys generally have a **tensile** ductility of less than 10%. With coverages approaching a nominal 100%, peened surfaces have to have withstood multiple indentations giving plastic deformations of the order of about 1000%! This article is a simple account of the factors that account for the apparent ductility paradox, together with a discussion of the strength changes that accompany ductility changes.

It is obvious that shot peening involves very high deformations. We must, therefore, use appropriate definitions. Fig.2 illustrates the difference between 'engineering strain' and 'true strain' for large tensile extensions. At the very small extensions encountered with **elastic** straining (less than 1%) there is very little difference between engineering strain and true strain. With massive extensions the difference becomes very large. The significance is that we should expect properties to change on the scale of true strain rather than engineering strain. For example we might anticipate a 1000mm extension to increase strength by a factor of two or three – rather than by an order of magnitude.

DUCTILITY

There is a profound difference between the ductility of a material measured in tension and that measured in compression.



Dr. David Kirk, our "Shot Peening Academic", 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 a member of their Faculty of Engineering and Computing. He is currently writing a book "The Science of Shot Peening". We greatly appreciate his contribution to our publication.

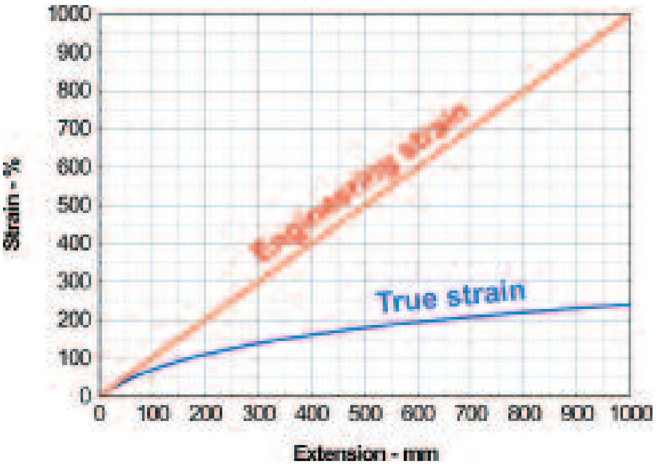


Fig.2 Comparison of engineering and true strains for extensions applied to 100mm long specimen.

As engineers we are generally familiar with **tensile** ductility values for materials – because they are easy to measure and are readily available. Ductility values in compression are not readily available. This is not a problem for most engineering situations as failure is generally related to tensile, rather than compressive, strains. Some materials however, such as gray cast iron, are so brittle in tension that they are best suited to situations involving compressive strains. That is because the ductility in compression is up to twenty times that in tension, see fig.3. Failure occurs in tension at point **T** with a strain of about 0.0035 (0.35%). That contrasts with failure at point **C** in compression at a strain of about –0.07 (7%). The corresponding failure strengths are about +150 and –900MPa respectively. It is worth noting that ductility in compression is an order of magnitude greater than that in tension for virtually all metallic materials.

In the specialized situation of peened surfaces it is the compressive ductility that is relevant – not the tensile ductility. The order-of-magnitude difference in ductility goes a long way to

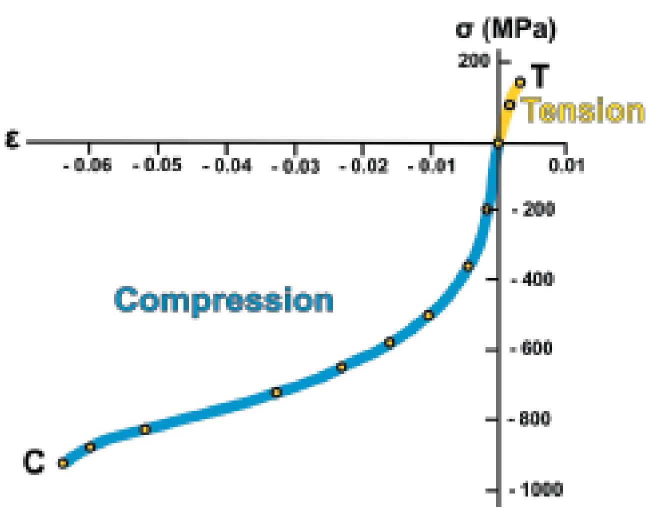


Fig.3 Comparison of stress/strain behavior of gray cast iron in compression and tension.

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explaining the ductility paradox. One familiar example of compressive ductility is that of Brinell hardness indentations, which do not induce cracking in either gray cast irons or in other brittle materials.

Compression testing is generally based on squeezing cylinders of material between polished platens – as illustrated in fig.4. A compressive stress, σ**c**, is applied to the end faces of the cylindrical sample. Friction between the end faces and the platens restrains lateral movement so that bulging occurs. Eventually cracking will occur on the walls of the bulged cylinder – as indicated in fig.4. That situation is inhibited by the lateral restraint offered by continuous surfaces – as in shot peening. This restraint adds a hydrodynamic compressive component to the applied stress system. Fig.5 shows a model of the situation where a cylinder of material being compressed under an applied stress, **-c**, is restrained by a surrounding annulus of surface material. The constraining annulus imposes a compressive stress, **-r**, on the deforming cylinder.

Hence we have a stress system that can be expressed as **(-c+r, 0, 0)** + **(-r, -r, -r)** where **(-r, -r, -r)** is the hydrostatic compressive component. Hydrodynamic compression is the reason why it is possible, for example, to roll to large extensions and to extrude metal cylinders to enormous extensions. It follows that the ductility of peened surfaces is much higher than that predicted by simple compression tests on cylinders of material. The author is not aware of any standard ductility test for peened surfaces.

STRENGTH PROPERTIES

It follows from the massive ductility available during shot peening that work-hardening will raise strength properties by large amounts. Hence the yield strength, for example, may become several times the ultimate tensile strength recorded during tensile testing. That in turn means that surface residual stresses can reach values well in excess of the nominal tensile U.T.S.

An important design problem is to be able to relate applied stress to failure. If a material is ductile, failure is usually defined by the yield strength. A brittle material, on the other hand, is usually defined by its fracture strength. The difference between ductile and brittle materials is illustrated in fig.6 for **tensile** applied stress. With a ductile material the yield strength is well below the fracture strength of the same material. As an applied stress increases we first reach the yield stress so that yielding is induced. After large amounts of work hardening have been applied the yield strength is raised to that of the fracture strength. Fracture can then take place. For a brittle material the fracture strength is already very close to the yield strength. With increasing applied stress, yielding (and therefore work hardening) quickly raises the yield strength to that of the fracture strength. No more work hardening can be then be induced because fracture propagation takes over.

With compression failure there is an order of magnitude increase in the **difference** between the yield strength and the fracture strength. The changed situation is illustrated in fig.7.

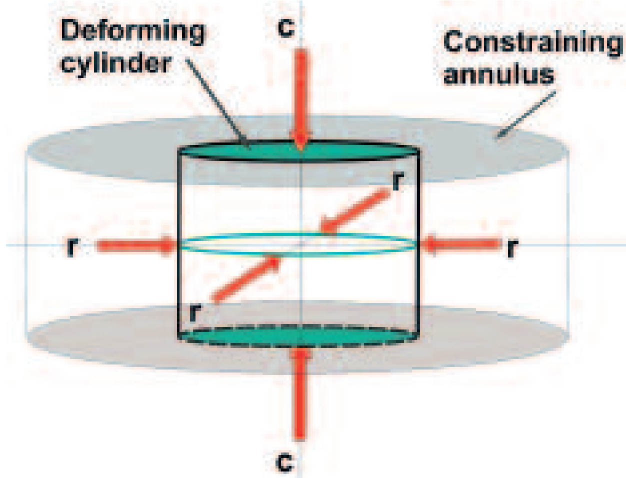

Fig.5 Schematic representation of surface constraint of material being compressed during impact.

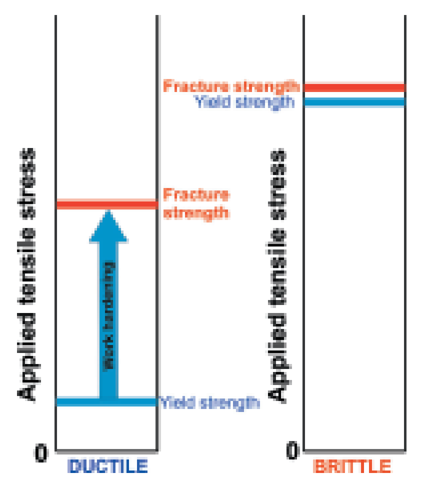

Fig.6 Schematic representation of ductile versus brittle ***tensile*** *failure strengths.*

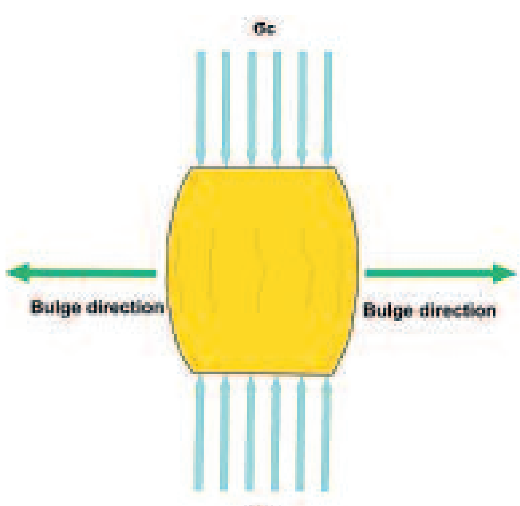

Fig.4 Schematic representation of a compression test.

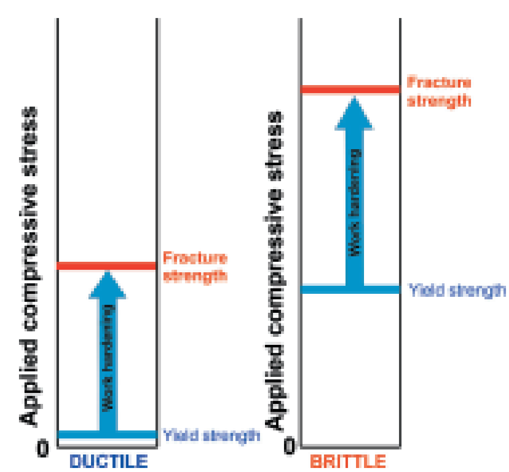

Fig.7. Schematic representation of ductile versus brittle ***compressive*** *failure strengths.*

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The elevation of strength properties induced by shot peening the surface can be explained in terms of the corresponding structural changes. Dislocation theory was introduced more than fifty years ago to explain why real crystalline materials had much lower yield strengths than would be predicted for perfect crystals. Dislocations explained the transportation of material along slip planes at observed applied stress levels. A rough, but informative, analogy is the use of automobiles to transport people on a city's grid system of roads. If we have only a handful of automobiles on the roads then travel is virtually unhindered. Imagine, however, if every automobile cloned itself every few metres of travel. Very quickly we would have monumental congestion with pile-ups at every intersection. The 'stress' required for further vehicle movement increases rapidly. When a shot particle strikes the component surface the dislocation content is multiplied by a factor of about one million giving more than one trillion dislocations per square centimetre! Dislocations have 'cloned' themselves millions of times in a microsecond.

The structure of the cold-worked peened surface is quite different from that of textbook pictures of crystalline materials. Peened material has a structure that can be described as "regions of very high dislocation density surrounding sub-grains which have a high dislocation density". The sub-grain size becomes smaller with increased amounts of cold work. Eventually the stress required to force dislocation movement is less than that for crack generation so that the fracture strength is reached.

DUCTILITY AND STRENGTH PROPERTY ASSESSMENT

The ultimate test of peening effectiveness is the improvement induced in properties such as fatigue strength. This test is well established and will not be discussed here.

Compression testing gives the best available guide to potential ductility on peening. One simple procedure that accommodates the high strain rates of shot peening is to employ drop forging. Cylinders cut from turned bar material are placed on an anvil and subjected to impact by a tup dropped from different heights. The maximum strain that can be withstood without side cracking gives us a measure of compressive ductility. Measured ductility levels should, however, be regarded as under-estimates - given the hydrodynamic constraint imposed by a continuous surface during shot peening.

The yield strength of material subjected to large amounts of plastic strain cannot be assessed using conventional tensile testing. One classic modification involves carrying out tensile tests on strip material that has been previously subjected to known amounts of extension by cold rolling. This 'envelope' technique invokes the fact that rolling has a substantial hydrostatic compression component and can therefore impart extensions an order of magnitude greater than those obtained in simple tension. Fig.8 illustrates the principles of the 'envelope' technique. With this example six tensile tests have been carried out. Test 1 corresponds to the 'as-received' state of the material. Tests 2 to 6 correspond to material that has been cold rolled to extensions of 20, 40, 60 100 and 150% respectively before tensile testing. The green line is the envelope representing the change of strength up to large amounts of plastic deformation. For this example the yield strength at 150% prior elongation is some three times that of the U.T.S. for the as-received material. Rolling extensions can be applied at 10% per pass through high-speed four-high rolls to give strain rates approaching those obtained with shot peening.

The level of strengthening induced into peened surfaces can be assessed indirectly. X-ray line broadening and micro-hardness are commonly-applied indirect methods. X-ray line breadth and micro-hardness increase with cold working (and hence yield strength). Both methods can and should be calibrated using material that contains known large amounts of plastic strain (induced by cold rolling, compression or extrusion).

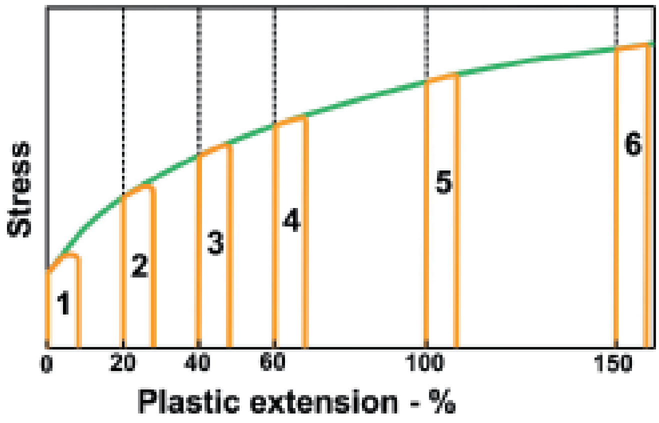


Fig.8 The 'envelope method' of determining high-strain strength.

DISCUSSION

Assessment of ductility and strength changes during peening requires the use of techniques other than conventional tensile tests. The large values involved mean that true stress and true strain definitions should be employed. Strength changes can be measured indirectly by using procedures such as X-ray line broadening and micro-hardness testing. Those procedures can be calibrated against heavily cold-worked reference specimens. Ductility changes during peening are difficult to assess. The author uses a simple technique to test for the onset of cracking. This involves dropping a carbide cylinder having a hemispherical nose from different heights. With relatively brittle materials cracking is induced above a critical drop height.

The essence of this account is that very large ductilities reign during shot peening with corresponding large increases in yield strength properties. These very large ductilities are due to a combination of the compressive nature of the deformation and the hydrostatic compressive element that is present. As a consequence of the large yield point increases imposed by shot peening it is possible to sustain residual stresses that are greater than the unpeened U.T.S. The ready availability of ductility should not, however, be abused because high levels of cold work equate to high levels of stored energy. This stored energy becomes a driving force for thermally-activated changes - such as stress-relief.

How (proper) blast cleaning averted a Naval conflict

by Michel Cardon

Michel Cardon puts a humorous spin on an incident that gained his company a work project with the French Navy.

What do John Paul Jones, the founder of the U.S. Navy, and Georges Clemenceau, a French politician (1841 - 1929), have in common?

Both of these famous names in history have been given to ships. The Clemenceau was a French aircraft carrier and the USS John Paul Jones was a U.S. Naval Destroyer.

Moreover, in the 1960's, they were docked together at Toulon, the French Navy base in Provence in the south of France.

The French Navy needed to upgrade the Clemenceau's flight deck coating. The coating was a mixture of resin and alox that formed an anti-skid surface for landing aircraft. However, it was damaged and relatively fragile. The Navy was concerned that the alox particles might enter the catapult rails. A new type of rubber-based coating was selected, but the 8,800 square meters (about 95,000 square feet) of original coating had to be removed first.

Test were conducted and the removal process needed to be efficient, quick and, as much as possible, dust-free.

I was the manager of the vacu-blast department for my family's company, SATEM, at that time and was on the Clemenceau with my company demonstrators in hopes of securing a Naval contract. We were demonstrating our closed-circuit blast equipment—we had a high-efficiency gun that was powered by a "crawler unit".

My competitors had a pneumatic multi-hammer. Unfortunately for them, Toulon harbor receives a north wind named the "Mistral" (i.e. the Master). The particles of coating and alox loosened by the hammer were fiercely blasted on the John Paul Jones' downside. The U.S. Navy did not appreciate this free-of-charge blasting process and I saw several of their crew coming out and yelling. The multi-hammer test was stopped immediately.

We got the order and the job was done without international dispute. ●

Michel Cardon is retired from the vacu-blast industry and resides in Paris, France. During his career, he was the manager of the vacu-blast department of his family business, Satem. He formed Matrasur which was later purchased and became Wheelabrator. Some of his career highlights include being a guest of the U.S. Capitol in 1982 and a meeting with Jacques Chirac.

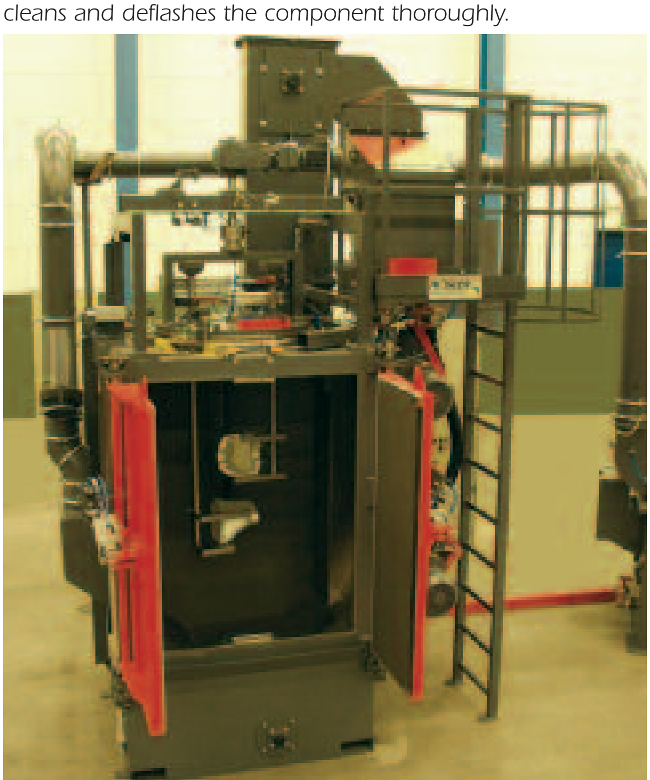
Custom shot blasting system for delicate diecast parts

Reducing costs while increasing precision

A supplier of aluminum diecast parts for a Tier 1 automotive manufacturer in the United States faced the question of how to use automation to deflash diecastings and improve the consistency of the surfaces of sensitive components. Rösler Oberflächentechnik's solution: A custom shot blast system with a fully-automated handling system with a precision grip.

Save costs! Increase precision! These are common demands made upon system developers. Rösler Oberflächentechnik combined both in the RHB 9/13 – a special shot blast system with a product-specific handling system. The standard-design system model is designed to process components up to 900 mm (35 in) in diameter, and up to 1,300 mm (51 in) in height. The handling system was designed to handle specific components with dimensions of up to 250 mm by 250 mm by 250 mm (10 in by 10 in by 10 in), weighing up to 30 kg (66 lbs). What makes this system special is the integrated parts transfer into the shot blast chamber.

The cast part must be gripped precisely so the robot can put it in and remove it from the shot blast chamber. In order to ensure a safe, continuous and consistent process, Rösler's engineers achieved tolerance ranges of 0.5 mm. During the actual processing, the parts in the shot blast chamber are guided from above and rotated, so that all areas and all sides can be shot blasted. This creates the required surface finish, cleans and deflashes the component thoroughly.



Aluminum diecast parts are deflashed in seconds.

Reducing cycle times

In order to meet the required specification for cycle times, it was necessary to equip the two blast wheels with 11 kW drive motors. When the chamber door opens, bulkhead plates automatically move to block the abrasive from entering the chamber. This allows the blast wheels to keep rotating, avoiding downtime that would occur if the blast wheels started and stopped between each cycle. In order to ensure production safety, an automatic cleaning mechanism was integrated to separate fine flash from the abrasive. These innovative solutions reduce the shot blast time to 45 seconds, and reduced the pass-through times to half. The total cycle time, as predefined by the feeding/discharging robot, is 78 seconds.

The extra mile

The operator can make changes by a remote control analysis system. This allows them to interrupt the operation of the system at any time and perform a remote diagnosis, and optimize the programming at any time.

A fully automated shot peening solution

RBD system shot peens 1.5 million disk springs a year.

A disk spring every 10 seconds

ZF Sachs, one of the world's leading manufacturers of drive and chassis components is involved in a joint venture with a Chinese supplier, and needed a partner in shot blast technology. They brought their requirements to Rösler Oberflächentechnik and Rösler engineers developed a continuous-flow system to shot peen disk springs.

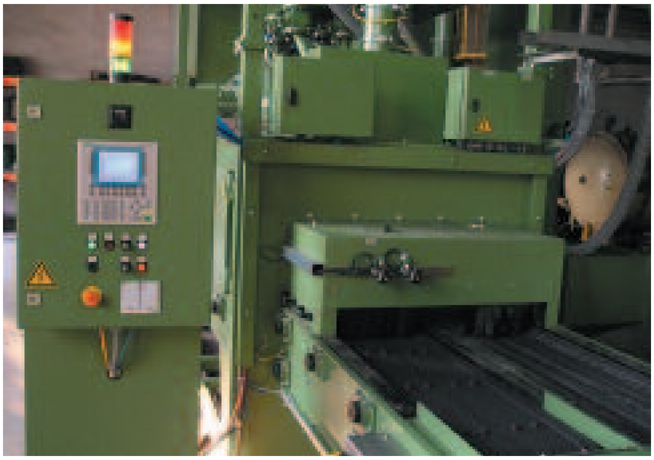
Performance specifications for shot blast systems often provide information gained from detailed tests carried out in order to prove the functioning of a work process, and how to treat the most unique geometries. In Shanghai, performance specifications were used to select the RBD 600-2 continuous-flow system to peen disk springs. According to the Almen measuring method, deflection values between 0.1 and 0.25 mm (equivalent to a shot blast intensity of 4 to 10 A) as well as a 98% degree of overlap, were to be achieved by the system.

The pre-defined dimensions for the disk springs in this application range from 110 mm (4 in) to 300 mm (13 in) in diameter. Another objective for the system was that it be fully automated.

In order to meet these specifications, a system concept incorporating two parts conveyors (each with a working width of 300 mm (13 in)) was developed, where one of the conveyors transports the disk springs continuously underneath four blast wheels. These are arranged at an angle facing towards one another to achieve an even shot blast result. After the springs have been shot blasted on one side, they are conveyed to a turning station, where they are automatically rotated by 180° and conveyed back to the blast wheels by the conveyor running parallel in the opposite direction.

In order to achieve optimum contact on parts of different dimensions and geometries, as well as to prevent the parts from being blown out of shape, it was necessary to equip the conveyors with different component guide rails. In addition, two component recognition systems ensure the pass-through process runs smoothly. The required cycle time of 10 seconds per spring was realized easily and consistently with this system.

The system is operated in two shifts, resulting in an output of 1.5 million disk springs annually. The system also incorporates sound absorbing measures, keeping the noise level below the required maximum of 75 dB (A).



Two parts conveyors ensure the springs are shot blasted on both sides.

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311 Media, Cast, Aluminum Oxide
312 Media, Cast, Steel, Carbon Shot
313 Media, Cast, Steel, Stainless Shot
314 Media, Cast, Zinc Shot
315 Media, Cast, Steel, Ferrite Shot
316 Media, Cast Iron (Chilled Iron)
317 Media, Cast, Steel, Grit
318 Media, Cast Aluminum
320 Media, Ceramic
325 Media, Coal Slag
331 Media, Cut Wire, Aluminum
332 Media, Cut Wire, Steel, Carbon
333 Media, Cut Wire, Steel, Stainless

MEDIA con't.

334 Media, Cut Wire, Zinc
335 Media, Cut Wire, Copper
336 Media, Cut Wire, Steel, Stainless Grit
340 Media, Glass Bead
343 Media, Crushed Glass
345 Media, Cut Wire, Nickel
350 Media, Balls, Steel
355 Media, Black Silicone Carbide
360 Media, Plastic
365 Media, Misc for Paint Stripping
370 Media/Media, Reclaim (Shot and Fines)
380 Media, CO2

PARTS

410 Parts, Masking tapes. molded forms etc.
420 Parts, Air Nozzles
425 Parts, Suction Guns
440 Parts, Wheel Parts, Blades, Liners, etc.
450 Parts, CO2 Blasting Accessories

SERVICES

510 Services, Computer Software and Programming
521 Services, Consultants, Machine Design
522 Services, Consultants. Tooling & Fixture Design
525 Services, Contract Job Shop Blast Cleaning
526 Services, Contract Job - Site Blast Cleaning
530 Services, Contract Job Shop Shot Peening
531 Services, Contract Job Shop Aircraft Paint Stripping
532 Services, Contract Job Shop Aircraft Painting
533 Services, Contract Job Shop Peen Forming
534 Services, Cryogenic Deflashing
535 Laser Peening
536 Services, Contract Job - Site Shot Peening
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Industry news

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Rosler signs definitive agreement to acquire the assets of Jet Wheelblast Equipment and Kleiber & Schulz

Battle Creek, Michigan. Rosler Metal Finishing USA, LLC and B&U Corporation, global suppliers of surface finishing equipment and consumables, announced the signing of a definitive agreement for Rosler to acquire the B&U business.

Says Stephan Rösler, Chief Executive Officer of the Rosler Group: "The acquisition of the B&U facility and its product line by Rosler USA allows the Rosler group to continue its aggressive growth in the worldwide blasting business, with special emphasis on the North-American market."

Mr. Rösler went on to say that another benefit of this acquisition is that Rosler will be able to utilize the fully equipped B&U manufacturing facility along with our existing lining facility, located in Marshall, Michigan, to manufacture select blasting and vibratory finishing equipment from the Rosler product range in the United States.

He further remarked, "By combining the sales organizations of both companies into a single sales network, Rosler will have a much wider distribution and customer base, making us more competitive and allowing us to achieve our long term growth target in North America."

Rosler Metal Finishing USA, LLC a wholly-owned subsidiary of the Rosler Group, is committed to providing the Total Process Solution, a single-vendor surface finishing solution, to businesses who manufacture, process or recondition metal parts. Rosler designs and manufactures all of the components of the Total Process Solution, including mass finishing machines, shot blasting machines, media, compounds, automated loading and unloading devices, waste water treatment systems, and dryers, in addition to providing aftermarket parts, on-site service, overhauls and relines. Rosler process engineers, using a process analysis and development methodology we call "finding a better way...", analyze customer requirements and develop comprehensive process-based solutions focused on lowering manufacturing costs while increasing product quality. Learn more about Rosler at www.roslerusa.com

B&U Corporation is the manufacturer of a complete line of shot blasting, shot peening, wet blasting systems, and air pollution control systems under the trade names of Jet Wheel Blast, Kleiber and Schulz, and Jet Air Technologies. Its products enjoy an excellent reputation in the market. These products and a philosophy of high quality and customer–orientated service are a perfect match with Rosler's way of doing business. Headquartered in Adrian, Michigan, B&U Corporation has customers located throughout the world. Learn more about B&U at www.bucorp.net

Wheelabrator Group announce new owner to back expansion into growth markets

Altrincham, England. The world's leading surface preparation and finishing equipment specialist Wheelabrator Group is pleased to announce new ownership. Mid Europa Partners (MEP), through its Emerging Europe Convergence Fund II, L.P. has completed the acquisition of all outstanding WG equity from an investment group led by Bard & Company.

"This is a major milestone in our development," commented Robert E. Joyce Jr., chief executive officer, Wheelabrator Group. "Central Europe has a key role in our growth strategy and MEP brings to the Group investment and geographical expertise in the market segments we have targeted in the region. In line with this strategy we are significantly increasing our main manufacturing activities in Poland, to further strengthen our position in these markets. Central Europe is also at the very heart of MEP's investment philosophy, making them the perfect partner for us to achieve our next level of growth."

"Our desire to support Wheelabrator Group is a clear vote of confidence in its business, employees and growth prospects. We look forward to working with the management team to achieve the growth potential of this great company," said Zbigniew Rekusz, a director of Mid Europa Partners who led the transaction.

This change of ownership will not affect Wheelabrator's current strategy. The Group will continue to pursue the action plan it developed over the last three years following its spin off from Veolia Environment. As a result of the new investment, Wheelabrator Group's corporate functions (currently located in Golden, Colorado, USA), will transition to Altrincham over the course of the coming year.

Mr. Joyce said: "The message to all our existing stakeholders, including staff and customers, is that it's very much business as usual. Our customers will continue to receive a very high quality of service in all respects, delivered by the same people who provide it now. Where change will be evident is through our expansion into new markets and improvement in the solutions we can provide our customers. "

About Wheelabrator Group. Wheelabrator Group is the world's largest provider of surface preparation solutions. It sells, designs, engineers, and manufactures trusted and established products in virtually every strategic area of surface preparation, across many industries, including the automotive, construction and rail transport sectors. WG employs 1,200 people worldwide and has sales, service and manufacturing locations in seventeen different countries. For more information on the Wheelabrator Group, its products or services please visit: www.wheelabratorgroup.com.

About Mid Europa Partners. Mid Europa Partners is the largest private equity firm investing in Central and Eastern Europe. Operating from London, Budapest and Warsaw, Mid Europa Partners advises and manages funds with committed capital in excess of ?1.1 billion.

The Mid Europa Partners team has been investing in Central and Eastern Europe since 1999, initially as part of Emerging Markets Partnership ("EMP Global"), but since 2005 independently as Mid Europa Partners.

Current investments include Invitel (Hungary's second largest fixed line telecommunications company) Karneval (the second largest cable TV operator in the Czech Republic) and Estonian Railways. Previous investments include Orange in Slovakia, Aster (the Polish Cable TV operator), Mobifon (the largest mobile telephony operator in Romania) and Oskar Mobil in the Czech Republic.

MEP employs an active, hands-on investment approach and applies the sector knowledge and operating experience of its people to deliver long-term value creation together with the management teams of portfolio companies.

For additional information on Mid Europa Partners please visit: www.mideuropa.com.

Continued on page 38

INDUSTRY NEWS
Continued from page 36

Electronics Inc. signs new distributor – Mec Shot Blasting Equipments

Mishawaka, Indiana. Electronics Inc. (EI) announced the signing of a distributor in India. Mec Shot Blasting Equipments will distribute Almen gages, strips and other EI peening products.

Mec Shot Blasting Equipments Pvt. Ltd. was established in 1990. The company focuses on surface finishing technology for standard and custom build Air/shot Blasting Machines, Shot Peening Machines, Dust Collectors, Blast Rooms and intermediates. Mec Shot works closely with its customers to develop new applications to improve their product quality and manufacturing efficiencies and reduce overall costs. Mec Shot currently serves customers in automotive, aerospace, ship building, foundry, casting, electric, and electronic industries.

The Company has been accredited with ISO 9001:2000 by BVQI and the company is planning for ISO:14001 & OHSAS 18001. Mec Shot's products are CE marked. The company has a technically proficient team of professionals, backed with continuous R&D and a highly motivated skilled workforce, and is the largest manufacturer of thermal spray equipment in India. Mec Shot's corporate office is in Jodhpur, India and the company has branch offices in New Delhi, Mumbai, Sec'bad, and Bangalore. A branch office in Chennai will be opening soon.

"Mec Shot understands the shot peening and blast cleaning market and is well-positioned to take advantage of the tremendous industrial growth that is developing in India. We are pleased to be partnered with them," said Jack Champaigne, President of Electronics Inc.

Mec Shot's vision is to enter into the export market and achieve global recognition with international quality products.

For more information, please contact Mec Shot at
E-279, MIA, Phase-II, Basni, Jodphur-342 005(Rajasthan),
India Phone: 0091-291-2740609/2744068
Fax: 0091-291- 2742409. E-mail: info@mecshot.com
Website: www.mecshot.com

New Nadcap primes – Ball Aerospace & Technology, Heroux Devtek Inc and Spirit Aerosystem

Ball Aerospace & Technology Corporation currently accepts Nadcap accreditation for Chemical Processing, Electronics, Heat Treatment, Materials Testing Laboratories and Nonconventional Machining & Surface Enhancement from their Americas sector suppliers. Heroux Devtek Inc. (Landing Gear division) is currently accepting Nadcap accreditation for Chemical Processing, Heat Treatment, Non-Destructive Testing and Nonconventional Machining & Surface Enhancement from their Americas sector suppliers.

Spirit Aerosystems, formerly part of The Boeing Company, currently accepts Nadcap accreditation from all its suppliers in the following special process & products areas: Composites, Chemical Processing, Fluids Distribution Systems, Heat Treatment, Materials Testing Laboratories, Non-Destructive Testing, Non-conventional Machining & Surface Enhancement and Welding.

Arshad Hafeez of PRI commented "The addition of these new subscribers to the Nadcap program reinforces the diversity and strength of the program. It is encouraging that ever greater numbers of major aerospace companies recognize the importance of supplier special process and product quality and are committed to working together to continually improve it."

HISTORY OF SHOT PEENING SPECIFICATIONS
Continued from page 14

examination for operator qualification.

1997
SAE introduces AMS-S-13165, "Shot Peening of Metals" as a verbatim successor to MIL-S-13165. This is part of the government regulation reduction program to encourage industry to develop and maintain specifications.

1998
MIL-S-13165C is cancelled by the government and users are directed to AMS-S-13165 as a suitable replacement.

2000
SAE introduces J2441 "Shot Peening" which is similar to MIL-S-13165C with relaxed requirements for media using the SAE "J" series of media.

2001
SAE introduces AMS-R-81841 "Rotary Flap Peening of Metal Parts" as a verbatim successor to MIL-R-81841.

2003
SAE introduces J2277 "Shot Peening Coverage" to emphasize that coverage is independent of Almen strip performance.

2003
J443 is revised to by removing discussions of coverage.

2003
SAE cancels AMS-R-81841 to avoid confusion with the Department of Navy. (author's note: apparently the Navy never abandoned the spec but it was nevertheless adopted by SAE)

DISCUSSION

The evolution of peening specifications reveals a desire to control the process and an appreciation of the benefits to be derived from peening but a major difficulty is introduced early with control of peening coverage. While coverage is almost always referred to as complete denting of the surface it was also related to the "saturation point" on the Almen strip response curve, often labeled "full coverage point".

Intensity of peening was initially described as the point on the Almen strip saturation curve where it "flattens out". This was often accompanied with a notation that this can be difficult to determine and some judgment may be required. The concept of assigning a numerical value to saturation using the 10% rule was introduced in 1984.

SAE Surface Enhancement Division of Fatigue Design and Evaluation Committee eventually created an entirely separate document for peening coverage to emphasize that coverage is not related to Almen strip performance.

CONCLUSION

The proliferation of so many specifications suggests that there is little consensus on appropriate process control. SAE had endeavored to make AMS 2430, the earliest recorded peening specification, an acceptable replacement for AMS-S-13165 but several issues of technical equivalence impede the transition. It appears that both specifications will continue as separate and active requirements.

ACKNOWLEDGMENTS

All of the research material for this project has come from the library of Electronics Inc. and most of it is available on-line at www.shotpeener.com.

REFERENCES

References cited are accessible at shotpeener.com in pdf format. SAE documents may be obtained at SAE.org

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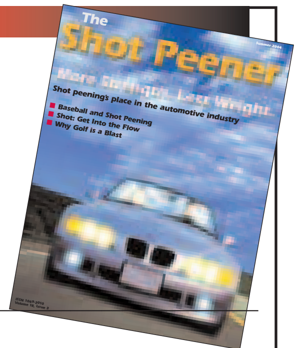

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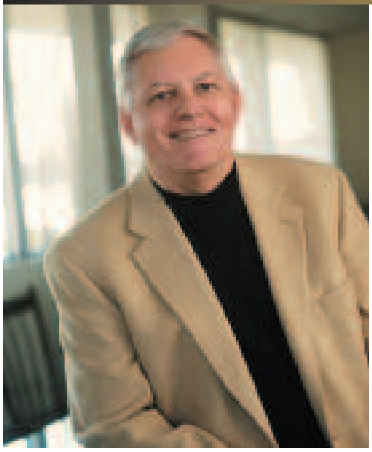

The Parting Shot
Jack Champaigne

What specs say about our industry

Shot peening's ancestor, hammering, can be traced back as far as 2700 B.C. to a gold helmet in Mesopotamia. As city-states began to develop in ancient Mesopotamia, conflicts developed among them. Warfare often arose as the result of wealth, control of the Tigris and Euphrates for transportation and irrigation, boundary disputes, and the need to acquire luxury goods such as timber, stone and metals. The almost constant occurrence of war among the city-states of Sumer for two thousand years spurred the development of military technology and technique far beyond that found elsewhere at the time.[1]

Localized wars were likely the impetus for many of the first hammering/peening projects, and the techniques were developed in isolation due to the lack of communication channels and the craftman's desire to protect his trade secrets. Car manufacturers in the 1930's began using shot peening techniques similar to ours today and they developed proprietary specifications. It took a world war to provide the impetus to improve, quantify and standardize the process. Shot peening became so widely used to improve fatigue life on high-performance metals in World War II that specifications were needed to provide a structure for the control and quality of the process. (See page 12 for a look at the history of specifications.)

Today, even though the innovators in our industry must still protect their trade secrets and patent their inventions, we have never distributed information so freely. Workshops, tradeshows, on-site training programs, publications, the internet, and even manufacturers, share information on proper shot peening processes and spec conformance.

Specifications are under the magnifying glass more than ever due to the increased emphasis on FAA and Nadcap audits in the aerospace industry. At the EI Asian Shot Peening workshop in Singapore this February, specifications and audits were a big topic in and out of the classroom. Daryll McKinley, an engineering consultant, gave a class on audit preparation and inspections and Kumar Balan, Wheelbrator Group, presented information on machine design and spec conformance. These topics will be presented again at the EI workshop in Canada in May and the USA workshop in Indianapolis in late October.

To me, it is critical to appreciate that the reason we have specifications is because shot peening is a viable metal treatment process with a big future in automotive, aerospace and medical fields. Our specifications, while not a perfect system at this time, will support the growth of quality shot peening practices in a global community. That's why I'm so committed to the specification development work of the Surface Enhancement Division of the Society of Automotive Engineers (SAE) and the sharing of information through training, the internet and this magazine.

[1] http://joseph_berrigan.tripod.com/id46.html

The EI Asian Shot Peening workshop in Singapore this February attracted many companies from the aerospace industry. The workshop offered a full curriculum on shot peening processes and the classes on audit preparation, inspections, and machine design and spec conformance were especially well-received.