Spring 2022
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The Shot Peener

Sharing Information and Expanding Global Markets for Shot Peening and Blast Cleaning Industries

The Flex Peener™ by Engineered Abrasives®

Peening Innovation

COVERAGE CHECKER

COVERAGE CHECKER

COVERAGE CHECKER the device for easy and precise coverage measurement

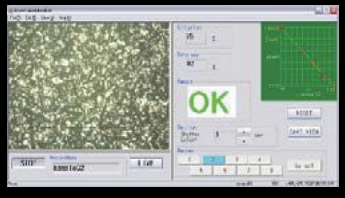
UV Light version

New arrival!

- UV light version Coverage Checker measures coverage by the fluorescent paint peeling rate, using UV light.Therefore, measurement result will not be affected by surface condition.
- UV light version Coverage Checker can measure the coverage even on oxidized surfaces and uneven peened surfaces, which was difficult to measure with normal version.

Coverage Checker (Original)

Easy USB connection to your PC



※PC is not included ※Device image

※Specifications of this device may be changed without notification.

Positron Surface Analyzer

Non-Destructive Inspection

by Anti-coincidence System

US Patent : US 8,785,875 B2

Application

- Shot peening inspection
  (Inspection Depth : Down to 100 micron)
- Evaluation of Fatigue behavior
- Evaluation of sub-nano size defect
- Free volume on Polymer and Glass

Specification

Device size : Type L-Ⅱ W400 X L400 X H358 [mm]
Type L-P W125 X L210 X H115 [mm]
Positron source : Na-22(under 1MBq)
Option : Autosampler function (4 - 8 stage)

Distributor

Country	Company	TEL	E-MAIL
USA	Electronics Inc.	+1 574-256-5001	sales@electronics-inc.com
CANADA	Shockform Inc.	+1 450-430-8000	sales@shockform.com
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THE SHOT PEENER

Sharing Information and Expanding Global Markets for Shot Peening and Blast Cleaning Industries

OPENING SHOT
Jack Champaigne | Editor | The Shot Peener

Survival of the Fittest

SURVIVAL OF THE FITTEST certainly applies to a global pandemic, supply chain disruption, and raging inflation. Some companies cut back on marketing and advertising to "save cash". Other companies move ahead, marketing new products and services so they will have top-of-the-mind awareness and market share when the worldwide economy normalizes. (What is "normal" going to be?)

Engineered Abrasives® is a company that is moving ahead with their new FlexPeener™. "The Flex Peener™ is ideal for automotive manufacturers, including electric vehicle manufacturers, because they don't need to buy a machine for each type of gear. The automated Flex Peener™ provides savings in money and time," said Mike Wern, President of Engineered Abrasives. (Read more on page six.)

Electronics Inc. is also part of the second group. We are bringing to market two next-generation products that have price and usage benefits.

The 600 Series MagnaValve
This new air blast valve series is a Smart Valve with an embedded web page, a built-in sensor that measures flow rate, a built-in servo, and a flow rate jump-to feature that provides accurate and repeatable flow rates. One of the best innovations of the 600 series is it eliminates the need for the companion FC-24 Controller—a cost savings—because the servo is in the MagnaValve. Your PLC can command any number of MagnaValves.

New Low-Profile MagnaValves
The next generation VLPs and LPs will have a lower cost and an interesting advantage. The advantage is a common footprint for each valve, one for 1000 lb/minute and the other for 2000 lb/minute. Both valves have 5" flow path and 5" x 5" bolt hole pattern. The hidden benefit? If you chose the small valve but need more than 1000 lb/minute, the larger valve drops into place easily. No modifications needed. Both of these valves bring enhanced performance to the marketplace.

Survival Isn't Easy
No matter how fit we try to be, we can't control this computer chip shortage. A 2021 article at bloomberg.com stated that the chip shortage has forced carmakers to leave out high-end features to keep production going. Navigation systems and large displays are a few of the features that were deleted from some new cars.

We don't have this kind of leeway as our smart valve is dependent on chips. However, we have a big enough inventory to put the new valve in beta testing at industry-leading OEMs and it's giving excellent results.

Survival in a Global Marketplace
Kumar Balan brings up an excellent point in his article titled "Understanding Changes in Our Industry" (page eight). He questions if the supply chain crisis will end globalization. Don't miss this article—he also address the impact of electric vehicles on our industry.

The Fitness of Our Industry
Despite the headwinds we are facing, we have every reason to be optimistic. Problems are opportunities and I salute all of you that keep this industry strong.

THE SHOT PEENER

Editor
Jack Champaigne

Associate Editor
Kathy Levy

Publisher
Electronics Inc.

For a free subscription of the *The Shot Peener*, go to www.theshotpeenermagazine.com

The Shot Peener
56790 Magnetic Drive
Mishawaka, Indiana, 46545 USA

Telephone: 1-574-256-5001

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PREMIER

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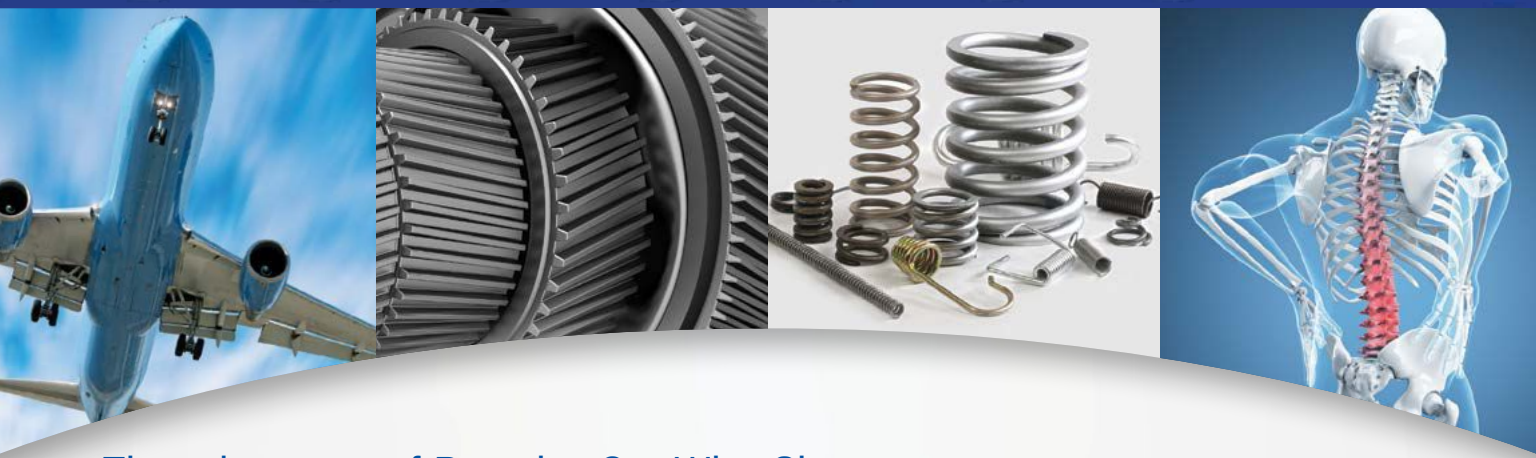
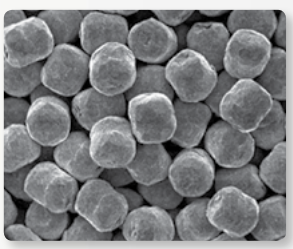
A Cut Above



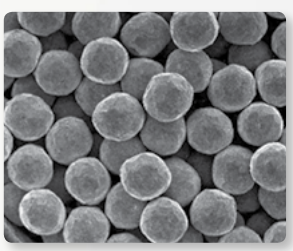
The advantage of Premier Cut Wire Shot

- **Highest Durability** Due to its wrought internal structure with almost no internal defects (cracks, porosity, shrinkage, etc.) the durability of Premier Cut Wire Shot can be many times that of other commonly used peening media
- **Improved Consistency** Highest consistency from particle to particle in size, shape, hardness and density compared to commonly used metallic media.
- **Highest Resistance to Fracture** Premier Cut Wire Shot media tends to wear down and become smaller in size rather than fracturing into sharp-edged broken particles, which may cause surface damage to the part.
- **Lower Dust Generation** Highest durability equals lowest dust levels.
- **Lower Surface Contamination** Cut Wire Shot doesn't have an Iron Oxide coating or leave Iron Oxide residue — parts are cleaner and brighter.
- **Improved Part Life** Parts exhibit higher and more consistent life than those peened with equivalent size and hardness cast steel shot.
- **Substantial Cost Savings** The increase in useful life of Premier Cut Wire Shot results in savings in media consumption and reclamation, dust removal and containment, surface contamination and equipment maintenance.

As Cut



Normal Conditioning



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Mike Wern | President | Engineered Abrasives® | www.engineeredabrasives.com

The New Flex Peener™ by Engineered Abrasives®

ENGINEERED ABRASIVES® (EA®) is a leader in custom shot peening and blast equipment for finishing gears and gear shafts. The company also provides precision shot peening services. Mike Wern, President of Engineered Abrasives, noted two developments in gear manufacturing, "All gears made in the USA for the automotive industry are now vacuum carbonized for greater endurance, and Electric Vehicles will need quality shot-peened gears." He added, "We are still building our Index Units to do high-volume gears, but in smaller batches. This is especially important to the new Electric Vehicle gear programs."

The company recently delivered their new Flex Peener™ shot peening unit to an automotive customer with the high-volume, small-batch requirements. This customer wanted an Index Unit that could shot peen multiple transmission gears at the same time. "The Flex Peener™ is ideal for automotive manufacturers, including electric vehicle manufacturers, because they don't need to buy a machine for each type of gear. The automated Flex Peener™ provides savings in money and time," said Mr. Wern.

The 72" Flex Peener™ unit has four spindles at each station and can process different types of gears with no tooling changeovers. The machine has four stations and can have manual or robotic loading. Additional features include:

- The Flex Peener™ has multiple nozzles with a double chamber pressure vessel for continuous operation. Each pressure vessel has special, customized features built just for high-volume shot peen operations. "EA has developed these pressure vessels over the many years we've been building high-volume index units for the automotive industry," said Mr. Wern.
- EA® machines are made from the highest-quality American steel. They are welded and have ground seams. Roofs are 1" steel plate and side walls are 1/2" steel plate. Machines are lined with EA's special Red polyurethane sheets and durometer material that will outlast rubber 30 to 1. The polyurethane sheets also reduce noise.
- A bucket elevator system for the air blast unit allows the mounting of the Sweco screen separator unit on the floor for easier maintenance and reduced downtime. This is very important when peening 1,000 to 1,500 gears per hour: If no gears are peened, no transmissions are built, and no cars are assembled.
- The Camco index unit drives are designed for precision stopping of robot or gantry loading. The EA®-designed Red solid polyurethane is molded to a 1-1/2" thick aluminum table and will outlast any other table and reduce the sound levels. These machines run at 77 DBA.
- Media specially designed for these machines gives very good KSI at a lower air pressure which is a big energy savings.

In addition, an important benefit to customers with a Flex Peener™ is that a duplicate machine is available in Engineered Abrasives® job shop. "There is no other machine manufacturer in the world with a job shop operation like ours. We peen gears seven days a week. The machines in our job shop allow us to make improvements in machine design through real-life testing," said Mr. Wern. In addition, the in-house facility can meet production schedules over and above the capabilities of on-site equipment. They are able to duplicate production processes and this tandem approach assures high-quality and consistent production runs. Engineered Abrasive® also has a support team and maintains a large spare parts inventory specifically for these machines.

About Engineered Abrasives

Engineered Abrasives® is an ISO/TS 16949, ISO 14001, and Ford Q1 certified job shop. Founded in 1935, Engineered Abrasives® designs and fabricates standard or custom automated abrasive and shot peening systems. Engineered Abrasives® can analyze any situation and design a machine to meet production requirements. Complete turnkey systems are also available.

The 72" Flex Peener™ can shot peen different-sized gears at the same time. (Shown here with Almen strip fixtures.)

AN INSIDER'S PERSPECTIVE
Kumar Balan | Blast Cleaning and Shot Peening Specialist

Understanding Changes To Our Industry

THE ONLY CONSTANT

"Change is the only constant" is no longer just a catchphrase. Though I have often compared the pace of change in our industry to watching paint dry, a multitude of events have transpired in the past few years that have altered this pace. It is irresistibly tempting to use yet another catchphrase, "the new normal"—but I will refrain! Though not as eager to adapt as some industries, we are still a progressive community of blast cleaners and shot peeners. We learn from each other and that is exactly the purpose of this discussion.

The automotive industry of recent past has exposed us to several new terms: EV, ICE, PHEV, etc. This is the first trend that matters to us all. The second point of discussion is the ongoing issue of the supply chain, and what that means to our industry going forward. The third trend relates to component shortages and related cost pressures. The first trend has been on everyone's radar since not only does it receive consistent press coverage, but the underlying concerns it presents could alter our landscape.

Automotive and Aerospace continue to be the largest users of cleaning and peening equipment, more of the former than the latter type. In the automotive world, our machines continue to process engine components, and those related to transmission, suspension, and structure. If a component is cast or forged, it is almost always blast cleaned as a final or preparatory process to coating. If it undergoes cyclical loading such as gears and shafts, it gets processed in a shot peening machine. In an electric vehicle, there is a threat of this volume diminishing or vanishing altogether.

Is this trend going to be limited to automotive, or are we likely to see this influence aerospace designers? We will certainly question, attempt to validate, and address it here.

ELECTRIC VEHICLES – TERMINOLOGY

Let us start by listing some of those catchy acronyms in the following table as copied directly from myev.com[i]:

BEV	Battery Electric Vehicle – a 100% battery-powered Electric Vehicle
EV	Electric Vehicle – Any vehicle that uses electric motors, either in full or in part, for propulsion (motion)
EVSE	Electric Vehicle Supply Equipment – controls safe current flow between the charger and EV
FCEV	Fuel Cell Electric Vehicle – A vehicle that uses a fuel cell, usually hydrogen-based, to generate electricity that runs an on-board motor
HEV	Hybrid Electric Vehicle – A car that integrates a small battery and an electric motor to enhance the efficiency of the IC engine. The engine charges the battery; it cannot be charged by plugging into an electrical supply
PHEV	Plug-In Hybrid Electric Vehicle – configured like a traditional hybrid, but with a bigger battery pack that can be charged by plugging into an EVSE
ICE	Internal Combustion Engine. The technical name for the petrol/diesel-powered engine that powers most cars and trucks

WORKING CONCEPT AND PARALLELS

In simple terms, the car plugs into an electrical outlet and draws electricity from the grid. The electricity is stored in rechargeable batteries that power individual electric motors that turn the respective wheels. In other words, the "engine" does not exist in an EV; it is substituted by an electric motor. There exist several publications on the drawbacks of EVs such as initial investment, range, charging time, serviceability, environmental impacts of additional power generation. All

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	ICE	EV
Energy conversion	Internal combustion engine	Electric motor
Energy transfer	Multi-speed gearbox (Multiple gears, shafts, and other components)	Simple, single-speed device (except a Porsche Taycan with a two-speed gearbox) EVs driven by in-wheel motors (common feature) also do not have differentials
Energy storage	Fuel tank	Li-Ion batteries
Ride comfort	Suspension – leaf and coil springs	Suspension similar to ICE
Braking[iii]	Disc and Drum brakes	Combination of mechanical and regenerative braking systems

that adds little value to our discussions. The attempt here is to be practical about the impact adoption of EV technology could have on our work lives, and not to diminish the value of one technology over the other.

A comparison of the different parts of an ICE and EV vehicle is presented in the table above.[ii] The table reveals some interesting information that we will analyze in terms of vehicle production. Manufacturing data from 2020 and 2021 are not exactly representative of a normal world, so this analysis takes 2019[iv] data into consideration.

With the exception of data not reported from a handful of car and truck manufacturers, the world was populated with an additional 91,786,861 passenger and commercial vehicles in 2019. As per International Energy Agency (IEA), about 4.79 million vehicles produced were purely EVs, which leaves us with about 87 million vehicles that operated with ICEs.

On a very conservative scale, let us assume that the average vehicle has four cylinders and an equal number of wheels. Just for reference, the 87 million does include trucks with more than four cylinders and more wheels. This manufacturing data translates to the following component volumes that were potentially processed in 2019. (See Table in next column.)

Though only a partial list, with the exception of * marked components in the table, production volumes could come under threat with the growing popularity of BEVs. Change is always met with skepticism among everyone, and this change elicits a similar response which I will explain. Another term that has crept into our vocabulary is "range anxiety," much like checking your phone regularly and hoping it will last long enough to allow scanning your boarding pass at the airport after a long day!

To ease into this change, PHEVs offer an acceptable bridge. PHEVs consist of an ICE in addition to a battery pack that can be charged like an EV, but with limited range. This relaxes the load on the ICE and utilizes electric technology as a supplement. Due to the presence of an ICE, this category of vehicle continues to carry all components listed above that will need the services of a blast cleaning and shot peening machine—a smoother transition for the consumer as well as advocates for blast cleaning and shot peening!

Component	Annual volume	Notes	Application
Engine blocks, crank cases, transmission housing and related cast parts	87 million	Assuming a four-cylinder engine	Descaling
Transmission gears	870 million	Assuming ten gears per transmission	Descaling and shot peening
Drive shafts	348 million	Assuming four shafts per transmission	Descaling and shot peening
Connecting Rods	348 million	Assuming a four-cylinder engine	Descaling and shot peening
Valve springs	696 million	Two per cylinder	Shot peening
A, B and C Pillars*	522 million	Six per vehicle	Descaling
Miscellaneous gears and shafts*	435 million	Five additional per vehicle	Descaling and shot peening
Brake drums and discs*	348 million	Assuming four wheels	Descaling
Suspension springs*	348 million	Assuming four wheels, not accounting for leaves	Shot peening

EVs AND SHOT PEENING

Drive components such as shafts and axles, albeit not as prominent as in ICEs, will continue to be present in EVs. "A turning shaft will be subject to torsion and require peening to enhance its fatigue life, just like shear force on a gear tooth is not going to disappear as it engages with another tooth," explains Liam Nother, President of Latem Industries. Latem Industries is a large facility that processes automotive parts for cleaning and peening in Cambridge, Ontario, Canada. "We work with several Tier 2 suppliers that plan far in advance for future car and truck platforms. Though they acknowledge that volumes of components might be reduced in the future due to the growth and adoption of EVs, they expect enough new components in EVs and PHEVs that will balance it out." Companies with long-term strategies proactively seek other industry sectors to insulate their business risk arising from focusing on a single sector, regardless of this emerging trend. A similar sentiment was echoed by foundries in the mid-west United States that focus on engine blocks and other such large castings.

"EV adoption is going to be gradual, and even at that pace, transmission components will continue to show appreciable volumes in EVs," explains Mike Wern, President

WE HAVE THE WORLD COVERED

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

HIGH DURABILITY CUT WIRE SHOT (REDUCTION OF WASTE)
NON-DISTRUCTIVE INSPECTION DEVICE (POSITRON SURFACE ANALYSIS)

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

PEENING PROCESS USING NEEDLE PEENING EQUIPMENT FOR WELDED INFRASTRUCTURE (BRIDGE AND VESSEL)

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of Engineered Abrasives® (EA®) in Alsip, Illinois. EA® is one of the foremost shot peening equipment manufacturers for transmission gears, supplying to big three Automotive and their different tiers. "Though I cannot elaborate under conditions of confidentiality, we can see that the torque generated even at slow speeds with an electric motor is quite high, requiring moderation through a specialized electric drive train, components of which will require shot peening," added Mr. Wern. Other industry leaders manufacturing blast cleaning and shot peening equipment I spoke to though agreeing to the perceived threat, were confident in their strategies to offset production volume with newly introduced components and/or components from other industries.

It is good to see that our seemingly reticent industry has spread its reach to include additive manufacturing and similar advanced sectors. One of the respondents emphasized on their company's plans of focusing on the "finishing" of niche medical implants through not just blast cleaning but also vibratory finishing techniques. This type of cleaning holds the promise of also peening the component to enhance its useful life; a fact we discussed in a past issue of *The Shot Peener* ("Vibratory Peening: Promising Performance", Summer 2019).

SUPPLY CHAIN – END OF GLOBALIZATION?

Our discussions typically are technical in nature, but cabin fever has now led to exploring exactly those issues that have brought us here! I can recall several instances where a customer has called me in complete shock in the past two years to report that a container that used to cost them $5,000.00 to ship to/from Asia is now well over five times that value—if luck prevails to locate one in time! A ship stuck in Suez Canal no longer continues to be an issue, they are all stuck at different ports instead, without labor available to load/unload cargo! Several reasons are cited for this issue of labor, and the problem extends to manufacturing plants that are forced to truncate working hours due to lack of human resources.

But since this is not a lesson in global trade and economics, I would like to focus on the critical issue of the threat to globalization. Can a customer located in Asia, for example, rely on a North American supplier (and vice-versa) if service or part support is needed for a mission critical process? Though troubleshooting of machinery has been conducted remote for quite some time now, the burgeoning cyber-risks have forced corporations to strengthen their firewalls, making remote access all the more challenging.

Will end-users increase their reliance on locally manufactured blast cleaning and shot peening machines? This may well apply to North America and EU since locally manufactured equipment hold more merit than imports, but what about those regions where local products are not seen in good light, or are simply incapable of meeting stringent requirements laid out by automotive and aerospace customers? Will this force the metamorphosis of local equipment design, skills and technology or will it result in subcontracting such processes to overseas vendors?

The supply chain crisis has affected equipment manufacturers much like the microchip shortage has emptied out the parking lots at car dealerships. A large aerospace prime was complaining to me about a sophisticated peening machine that was embroiled by delay in receipt of electronic components, further exacerbated by the current environment preventing travel of personnel to witness machine testing prior to shipment.

Though Zoom and other platforms attempt to bridge that gap, many aspects of custom engineered machines have to be witnessed in person. Engineers spend considerable time in specifying the exact type of equipment and features they desire, and it is difficult for them to verify that the actual machine has in fact been built to specifications without an in-person inspection. Also, modifications, if needed, are best accomplished at the vendor's manufacturing plant, prior to shipment, than at the installation site.

WHAT NOW?

I have often discussed specification conformance, benefits of process control especially in peening equipment, training, and related topics. I feel that the changes that we are experiencing can be engineered to work in our favor. I take the liberty to list some of those areas of opportunities:

1. EVs are still in their infancy as a technology, and there is ample room for new processes to be "built in" within their manufacturing plan. Shot peening has always demonstrated great benefits to enhance component life, and as an industry we need to better explain this to potential users. There will be room between pure EVs and PHEVs where custom-designed rotating components will require surface treatment that may even be different from our conventional cleaning and peening operations. We need to learn more and be open to such possibilities.
2. Composites (and carbon fiber) will gain importance as a material of choice in the automotive industry. Surface texture is critical to maintain in these materials and our knowledge of process control from peening and grit

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blasting aerospace components will benefit these newly added applications.

3. "Quicker," "cheaper" will be replaced with "innovative," "reliable" and "repeatable," with "quicker" underlining every requirement! This will amplify the need to shore up our skills gaps. Material science will be an important knowledge base in addition to pure manufacturing expertise. We are going to be exposed to some new and exotic materials that will perform differently than conventional steel and aluminum.
4. We used to be an industry where equipment pricing remained fairly steady over 5-7 years. This is no longer the case with the above challenges and rising industrial inflation. "Doing more with less" is another catchphrase that we will start hearing in commodity-type products. In other words, operating efficiency will need to be demonstrated along with product quality. This demands a new level of expertise in this field.
5. Though the shelf-life of technology in our industry will continue to be longer than most advanced manufacturing sectors, only those that innovate will thrive. I am sure mere survival is not a goal any of us desire to pursue.
6. Consolidation of technology is a definite possibility. Until now, it was common for a blast machine manufacturer to integrate handling equipment with the machine, but this will now extend to other upstream activities. For example, a finishing equipment company could partner with a parts manufacturer using additive manufacturing technologies. A consumable producer could extend their reach by offering the servicing of equipment that uses their consumables. These do create some inefficiencies and duplication of efforts. However, if we can warm up to an idea of "renting" a stranger's car, we might surprise ourselves with a contemporary style of industrial partnership that could benefit all.

I see opportunity and, to a considerable extent, regionalization of business. Innovation has no boundaries, and I am confident that our industry will look excitingly different in the future years!

[i] www.myev.com
[ii] https://www.innovativeautomation.com/the-electric-vehicle-drivetrain/
[iii] https://getelectricvehicle.com/brake-system-electric-vehicles/
[iv] OICA.net International organization of Motor Vehicle Manufacturers
[v] IEA.org,
[vi] Vibratory Peening, The Shot Peener, Summer 2019
[vii] https://www.nytimes.com/2021/07/17/world/middleeast/suez-canal-stuck-ship-ever-given.html


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Dipl.-Ing. Volker Schneidau | Managing Director | www.sentenso.com

sentenso PeenBots: Machines for Process Excellence

sentenso PeenBots are highly automated, extremely innovative, and user-friendly air peening systems with nozzles manipulated by robots. Efficient and reliable execution of peening processes on a small footprint and with full process control are the core features of the new design.

SENTENSO IN GERMANY has been providing products and solutions for process and quality management in shot peening for more than a decade now. New concepts and technologies for lean, energy-saving and clean peening processes allow for increased efficiency, resource conservation and operational safety. With the development of the new PeenBots, sentenso has put its focus on excellent controllability and reliability in the shot peening process, featuring flux:on Media Flow Management, vector:on Media Speed Management and offline robot programming tools.

Figure 1: The new PeenBot design

Based on the approaches above, several basic principles of advanced shot peening technology can be implemented.

PEEN LEAN

Lean Peening is one of the most important targets in modern peening process management. To implement this principle of optimised process management, the PeenBot process technology is based on an efficient peening system, flexible

Figure 2: Lean Peening of a spring curl

programmable peening nozzle motion and intelligent system control. The PeenBot thus allows lean, fast and yet fully controlled processes with perfect consistency and efficiency.

This opens up a wide field of efficient, cost- and time-optimised process control without, however, restricting flexibility in the process. This orientation includes reliable process management for shot peening within tight tolerance limits according to the requirements of the SAE AMS 2432 and beyond.

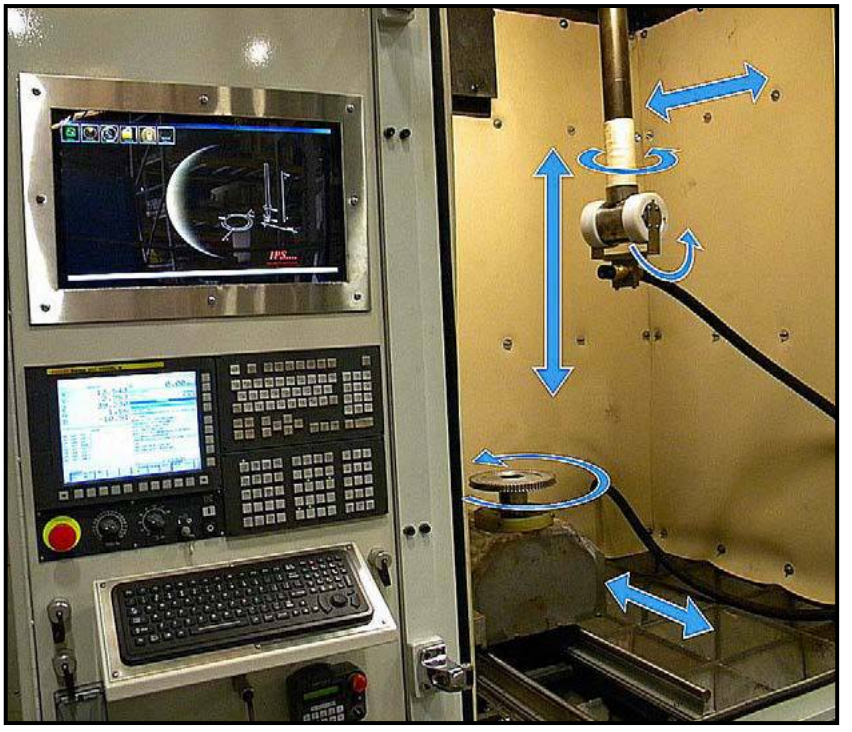
PEEN GREEN

Green Peening is the consistent implementation of the commitment to reduce energy and resource consumption to the necessary minimum. To achieve this, process and machine technology for media acceleration and control must be rethought instead of just uncovering potential savings. Thus, downsizing is a basic principle of the system and process design for the economical use of resources such as compressed air, electricity and peening media.

This ensures an efficient, cost-optimised peening process. In addition, the PeenBots are individually adaptable, flexible in their installation and, due to their small footprint, use the valuable resource of installation space extremely efficiently.

Innovative Peening Systems

High Performance for High Standards



CNC motion allows the nozzle to follow the contour of the part. This motion provides consistent intensities and coverages to occur with optimal speed and precision.

IPS....

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Figure 3: Efficient peening with specified nozzles and peening media

Figure 4: Peening of a turbine disk

PEEN CLEAN

Clean Peening is the concept for ensuring a safe working environment for the system operators, peened components that are as clean as possible, and a peening cabinet largely free of deposits of media grains and dust. The exhaust air from the machine can be returned to the workshop without any worries thanks to the integrated HEPA secondary filter.

This means that PeenBots can be easily integrated into a wide range of production environments.

PEEN SMART

Smart Peening offers the latest Industry 4.0 technologies for digital process management, providing the capture, collection and evaluation of process data for the digital twin of the peened component. From the data, further information can be obtained for effective machine management, including predictive maintenance.

In this way, sentenso PeenBots meet all of today's requirements for flexible system operation. Production can be a quantity of one, or a small or large series. In any case, processes are managed variably, reproducibly, and with the required traceability.

The smart peening features incorporate some of the most advanced systems to control the key parameters for shot peening, media flow rate and media velocity.

FLUX:ON MEDIA FLOW MANAGEMENT

As one of the essential process parameters, the media flow rate for all nozzles of a shot peening system must be kept within close tolerances. The sensors and control valves available for this purpose must be adjusted and calibrated to the respective media types.

With flux:on, sentenso offers a reliable solution for process management of the media flow. The system actively meets the biggest challenge of reliable media flow control—the occurrence of systematic measurement errors with system operation in progress. The crucial advantage: changing media properties or changes to the sensor-actuator system are compensated by performing adjustment and calibration procedures directly on the system. These can be repeated at any time and as often as required.

This system, according to U.S. Patent 10513010 B2 and European Patents, consists of a machine-integrated blast cyclone to directly catch the media coming from the nozzle under real process conditions. The media is separated from the air flow and drops into a weighing bin below the machine cabinet. In here the media flow rate is continuously monitored during the testing cycle. The StreamEasy evaluation software takes care of the correlation between flow sensor data and real flow rate measurements and will thus automatically perform the sensor adjustment. The additional calibration procedure will bring out the system tolerances and document these in a calibration certificate.

The entire adjustment and calibration procedure runs completely automatically and usually requires no intervention by the operator. These procedures can be called up at any time and thus ensure maximum process reliability in media flow management.

VECTOR:ON MEDIA SPEED MANAGEMENT

The media particle velocity is one other key parameter of the shot peening process which cannot be controlled directly. Instead, the operator has to adjust the peening pressure to any value that corresponds with a certain media impact and

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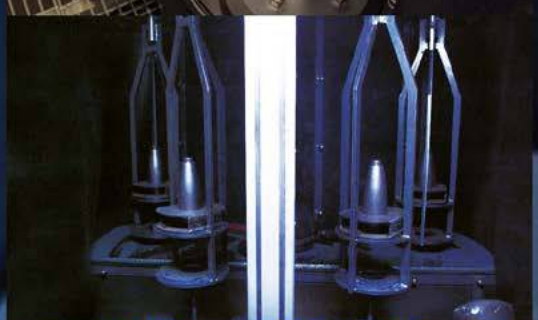

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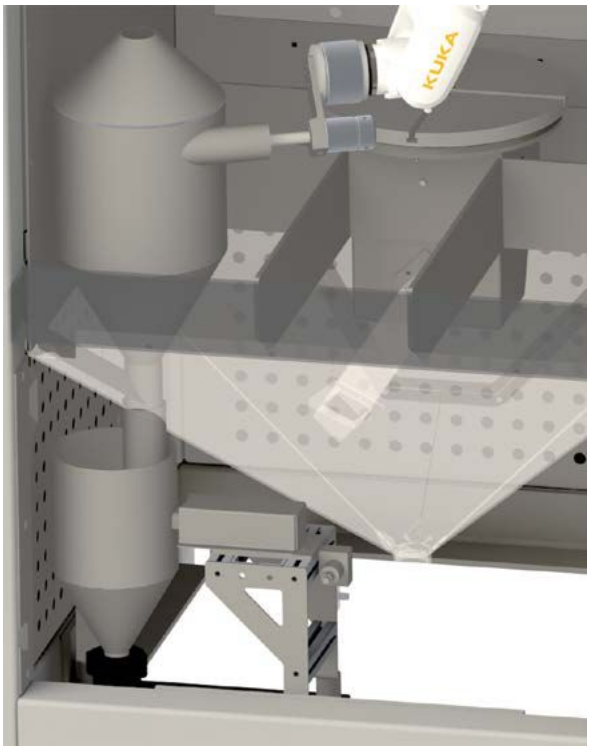

Figure 5: flux:on system components

Figure 6: vector:on system components

thus the Intensity of the media stream. The problem is that peening pressure cannot remain constant as blast hoses and nozzles wear out. Pressure is not a fixed parameter to define the kinetic media energy.

vector:on is a control system which, with the aid of a high-speed camera, a high-power LED illumination unit and the associated sentenso VelocityEasy evaluation software, generates characteristic correlation curves of media velocities depending on different peening pressure settings fully automatically. In this adjustment procedure the respective curves are being stored in the system control.

In the normal peening process, a PLC then takes over the setting of the peening pressure required for the desired media velocity—taking the media flow rate into account, which also influences the media acceleration in the nozzle. All components are integrated into the shot peening machine.

Figure 7: PeenBot design flexibility

Thus the adjustment and calibration can be performed live and directly at the peening machine and under real operating conditions and are repeatable at any time.

FLEXIBILITY AND MODULAR DESIGN

sentenso PeenBots' modular principle allows for an extreme range of system variants without unnecessarily extending the engineering effort. In particular, equipment features such as size, arrangement and design of windows and doors, robot arrangements and types, design of the peening system, component handling, loading and unloading can be varied according to the users' preferences and requirements.

Offline programming tools avoid ongoing teaching procedures and can extremely reduce the time to process, especially for changing part geometries. Control systems can be kept simple or with extended functions for the highest requirements.

For more information and a product video, please scan the QR code or go to https://www.sentenso.com/en/Machine-Technology/Compressed-Air-Peening-Machines/Robot-Peening-Machines/PeenBot.html?force_sid=l7cnek0prc87knrfgka2rc2l07.

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Additional benefits of Wisdom SteelCrete include:

- Wisdom Steelcrete® provides quarterly and annual recycling reports to our customers showing amounts of material recycled.
- Waste streams are used in an environmentally friendly way to make products that are used in a variety of industries.
- SteelCrete® concrete uses by-products as a replacement of natural resources found in typical concrete thus reducing amounts of CO2 emissions required to mine those natural resources.
- Our clients can now combine both Spent Steel Shot and Spent Steel Shot Dust on the same truck. No need to wait for full truckloads of each material, saving valuable floor space at your facility. We check every drum and provide detailed reports to our clients for each truck received.

Wisdom SteelCrete products are sold direct at the company's plant in Warren, Indiana and at their warehouse in Greenfield, Indiana. Mike Wright, CEO of Wisdom Environmental, Inc., said, "We can ship anywhere and we are working with a few generators of the shot dust to make them bunker blocks for use at their plants. Using their waste to create products used at the source of the waste. Now that's circular recycling!"

About Wisdom Environmental

Wisdom Environmental, Inc. specializes in the development of recycling programs for the business, industrial, and manufacturing sectors. Wisdom works with clients to identify, define, and channel recyclable materials, resulting in cost reductions for the client and benefits to the environment. Manufacturers focus on creating high-quality products, and Wisdom focuses on designing efficient and custom recycling programs that makes the most of each waste stream.

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Mike Wright
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The sensors use a charge-coupled amplifier that is connected to a sensing pin (MFD-4 and MFD-250) or a sensing ring (MFD-P1). The pin or ring is inserted into the flow path of the abrasive blasting media. Each particle passing the pin or ring shares a minute charge with the pin or ring. This charge is converted to a voltage that is used to activate an output relay contact.

MFD-4
Media Flow Detector for Suction-Type Abrasive Blasting Machines

The MFD-4 is enclosed in a rugged aluminum housing. It can be attached to the media blast hose at any location and in any orientation via a sensing pin that protrudes from the bottom of the mounting base. A sensing pin is included with the MFD-4. Replacement pins are available from Electronics Inc.

MFD-250
Media Flow Detector for Suction-Type Abrasive Blasting Machines

The MFD-250 is enclosed in a 3.6" x 1.5″ x 1.5" aluminum housing and is attached to a sensing pin in its mounting base. Its 6-pin plug allows for easy connection of the sensor to the power supply and machine controls.

The sensor is placed in the blast hose near the mixing chamber. LEDs on the top of sensor indicate green for "Flow OK" or red for "No Flow". The internal relay is activated during green "Flow OK".

MFD-P1
Media Flow Detector for Pressure-Type Abrasive Blasting Machines

The MFD-P1 is enclosed in a 3.6"x 1.5″ x 1.5" aluminum housing and is attached to a sensing ring in its mounting base. The mounting base is available in various sizes to fit most abrasive blast machine configurations. Its 6-pin plug allows for easy connection of the sensor to the power supply and machine controls. LEDs on the top of sensor indicate green for "Flow OK" or red for "No Flow". The internal relay is activated during green "Flow OK".

Setup is simple for these sensors. The zero and span functions are automatic—pushing the "zero" button acquires zero for the no-flow condition and pushing the "flow" button sets the sensor gain and activates the relay. The relay contact will transfer whenever the flow is 50-100% of the programmed setting.

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Back to Basics
Advances in Shot Peening

INTRODUCTION

Shot peening has advanced steadily since its first introduction. This article concentrates on the advances made in the last forty years. Those advances have allowed shot peening to become the smart technological process that it is today. Most of the advances would not have been possible without the corresponding explosion of computing power and availability of sophisticated computer software.

The overall objective is to present a coherent account of the most important, and relatively recent, advances in shot peening. Every advance can be viewed as satisfying a perceived need. For example, intensity measurement used to be very subjective, with different values being quoted by different individuals. The need was for a technique that reduced this measurement variability. Computer-based methods have satisfied this need.

PEENING INTENSITY

A notable advance has been the realization that a plot of Almen arc heights against peening time can be represented by a mathematical equation. Arc height is given as being a function of peening time. Fig.1 illustrates this feature, using the excellent data presented by Wieland (Proc. ICSP5, 1993, Table 4, page 36). In fig.1, a four-component equation has been computer-fitted. The equation has dominant constants, a, b and c, but also has a small linear constant:

$$\mathbf{h = a\,(1 - \exp(-b^{*}t^{c})) + d^{*}t} \qquad (1)$$

where **h** is Almen arc height, **t** is peening time.

Once the best-fitting constants have been found we can plot the curve. The use of four-component equations does ensure a very close fit. Equation (2) is a simpler exponential equation as it has three, rather than four, components.

$$\mathbf{h = a\,(1 - \exp(-b^{*}t^{c}))} \qquad (2)$$

The three-component equation (2) still gives a close fit as shown by fig.2. For comparison purposes the four-component equation appears as a very faint curve.

Today's specification requirement is that peening intensity is the arc height which increases by precisely 10% when the peening time is doubled. This requirement can

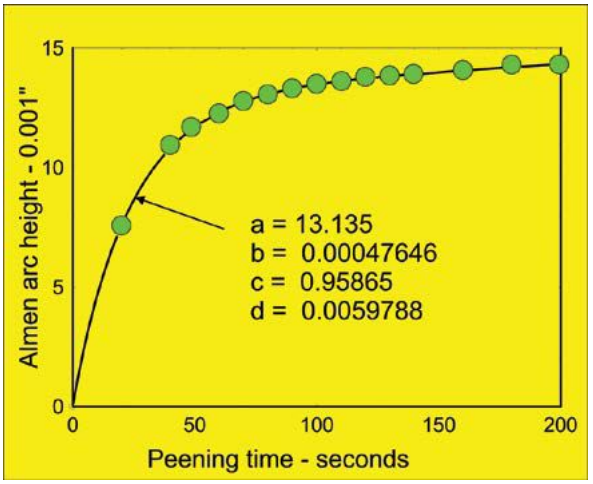

Fig.1 Curve fit of equation (1) using Wieland's data.

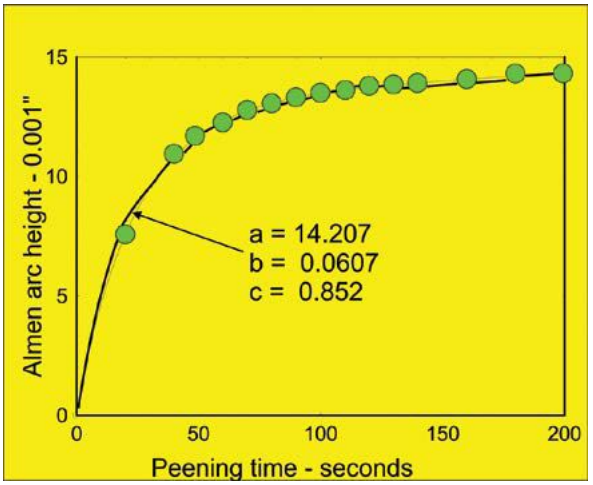

Fig.2 Curve fit of equation (2) using Wieland's data.

be derived mathematically. For equation (2), derivation is achieved by minimising the function **f(t)**:

$$\mathbf{f(t) = 1.1a(1 - \exp(-b^{*}t^{c})) - a(1 - \exp(-b^{*}(2t)^{c}))} \qquad (3)$$

The value of t that minimises the equation is known as **T**. Substituting this derived value into equation (2) gives us the required peening intensity value, **H**. Available computer-based programs do all of the maths for us, thank goodness.

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ALMEN STRIPS AND GAGES

Almen Strips

An important advance in shot peening relates to strip quality. Measurements of arc height induced in peened Almen strips inevitably involves scatter. The degree of scatter depends, to some extent, on the quality of the Almen strips themselves. Fig.3 is a schematic representation of this effect. As strip quality increases, the degree of measurement scatter is reduced. Some scatter must remain, even with the highest quality of Almen strips.

Published variables affecting Almen strip quality include hardness, flatness (prebow) thickness and width. One variable that has not received sufficient attention is the elastic modulus, E, of the strip steel. Induced arc height depends directly on the elastic modulus of the strip. Elastic modulus can vary substantially because of preferred orientation, a.k.a., texture. As a side-line, the importance of preferred orientation in aero engine turbine blades was recognized many years ago. Rotating turbine blades resonate at a rotational speed that depends directly on the blades' elastic modulus. If this speed is allowed to be maintained, the blades become overstressed, due to excessive vibration—often leading to catastrophic engine failure. The solution is to avoid staying at any of the rotational speeds that would induce resonation.

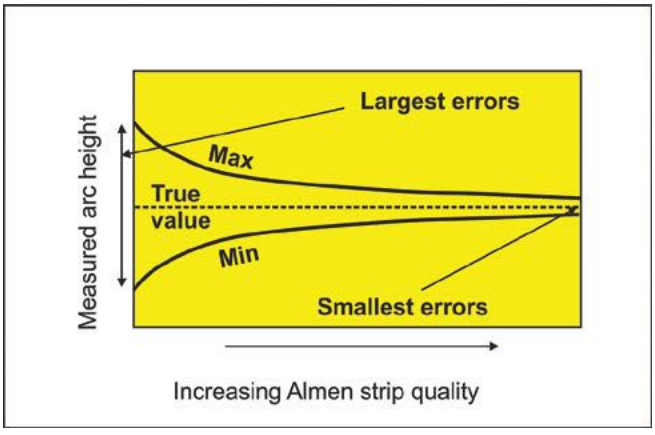

Fig.3. Effect of Almen strip quality on arc height measurements.

Another notable advance has been the introduction of miniature strips—appropriate when dealing with small peened areas.

Almen Gages

Dramatic advances have been made in the range and operational accuracy of Almen gages. Gages are now available specifically for non-magnetic Almen strips and for miniature Almen strips. Operational accuracy has been improved by incorporating end and back stops which enable precise strip location.

The most advanced gages have digital displays, convertible to either metric or Imperial units, magnetic hold-down on support balls and computer connectivity. Simpler and lighter gages are available that employ an analogue monitor. They retain magnetic hold-down but have only back stops.

Digital mini-strip Almen gages are now available that retain the features of the most advanced gages.

Aluminum-based, non-magnetic alloys are common in the aerospace industry. The benefits of shot peening for these alloys have become recognized. The industry therefore now requires advanced, accurate gages for arc height measurements. Aero-Almen strips are very thin and have only a third of the elastic modulus of steel. It follows that standard spring-loaded dial gage indicators can induce deflection. Non-contact sensors eliminate possible deflection.

Alternatives

The standard practice of using a set of Almen strips and post-mortem arc height measurement is somewhat tedious. Advances that have been proposed include using a single captive disc with a sensor positioned underneath, allowing continuous deflection measurement direct to a computer. Another proposal is to use a standard Almen strip with a thermocouple glued underneath— again allowing continuous measurement direct to a computer. Temperature rise caused by peening can be calibrated against standard practice curves.

COVERAGE

Coverage has previously been defined in SAE J2277 as "The percentage of a surface that has been impacted by the peening media. The minimum peening time required to obtain 100% coverage is determined by gradually increasing total peening time until the entire surface being peened exhibits overlapping dimpling. Coverages above 100% are multiples of the exposure time required to achieve 100% coverage." This definition is, to say the least, both vague and misleading!

Thankfully, the latest 2022 version of J2277 addresses some of these issues:

> "Coverage is the extent of peening as shown by the percentage of the surface exhibiting a uniform impact pattern of overlapping indentations. Coverage of exactly 100 percent exists only as a theoretical limit that is neither measurable or achievable. Coverage is considered full coverage (a.k.a. complete coverage) when 98 percent or more of the surface is indented. It is difficult to visually distinguish differences in coverage above 98 percent.
>
> Coverage, up to 100 percent, is defined as the percentage of a surface that has been impacted at least once by the peening media. Typically, coverage estimates are obtained by optically-aided visual inspection of the peened part. Estimates of coverage by visual observation are unavoidably subjective, particularly when full coverage is being approached."

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The advances that have been made relating to coverage can be subdivided into (a) those improving our understanding of coverage progression and (b) those improving the precision and accuracy of our coverage measurements.

(a) Advances improving our understanding of coverage progression

The first significant advance was to appreciate that coverage must be dealt with on a statistical basis. As peening time is increased so the percentage coverage increases but in the form of an exponential curve. This is illustrated by fig.4. The most important points to note are (1) that the rate of coverage reduces rapidly with peening time because of more and more areas being already impacted and (2) that reported coverage is the average of dented and undented areas.

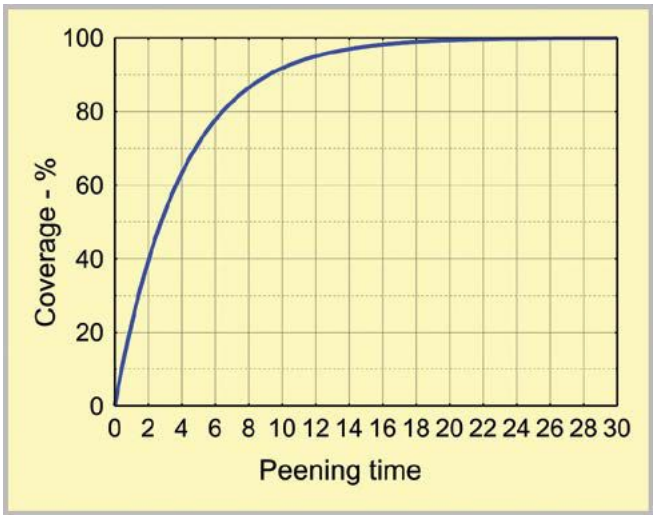


Fig.4. Effect of peening time on average coverage.

Fig.5 illustrates the second point. Scanning Line 1, we have a mixture of dented and undented areas. Deduced percentage coverage will vary with Line number. It follows that we must specify a large enough scan area to obtain an accurate average percentage coverage.

A very important advance was the realization that we should not be aiming at so-called "100% coverage". Fig. 6 illustrates this very important fact. Maximum improvement of component properties is achieved at significantly less than 100%. The optimum coverage to be aimed at depends on several component factors.

(b) Advances improving the precision and accuracy of coverage measurements

The precision of coverage measurement has advanced greatly with the introduction of new techniques. These have largely taken over from previous, highly subjective methods. At ICSP7 in San Francisco, an attendee showed me a peened Almen strip that was claimed to have 100% coverage. Even

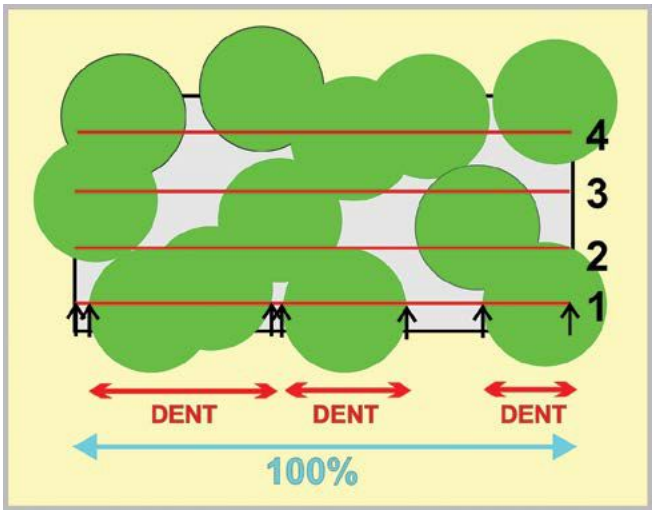


Fig.5. Coverage as a mixture of dented and undented areas.

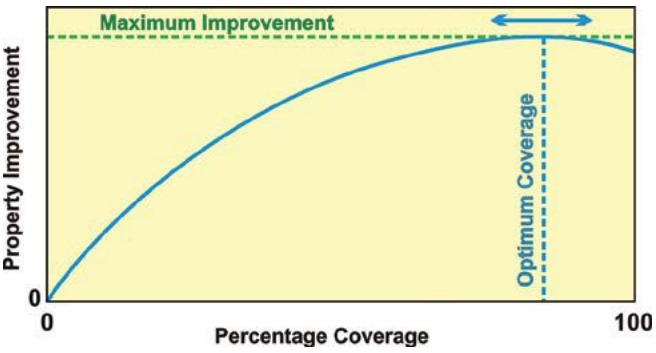


Fig.6. Example of optimum coverage.

with the naked eye it was obvious that coverage was less than 50%! Objective methods are based on the principle involved in fig.5. Coverage can be derived by the ratio of dented to undented lengths along lines marked on an enlarged photograph. Because the coverage varies from line to line, several line estimates have to be averaged. This can be very tedious! Image analysis techniques are now available that remove the tedium. It is even possible to invest in a dedicated, computer-based coverage estimate based on line intersections.

SHOT

Perhaps the most notable advance of shot is the widespread adoption of cut wire steel shot as an alternative to cast steel shot. The General Motor Corporation's Patent No. 667,815 issued 1st February 1950, covers "A new media known as Cut Wire Pellets." Curiously, however, B.C. Tilghman's U.K. Patent No. 3626, issued in 1872, states that he had used "grains made by cutting off short lengths of wire."

The main difference between cut wire and cast steel shot lies in the spread of size. Cut wire has a very narrow spread whereas cast shot size spread is only limited by specified

sieving. As a consequence, dents made by cut wire shot tend to have a much narrower size spread than those made when using cast shot.

With increased awareness of the benefits of shot peening, a variety of chemical compositions of shot have been introduced. These include stainless steel (for peening aluminum as well as stainless steel), bronze (for peening some non-ferrous components), as well as refractory materials based on aluminum oxide (Al_2O_3) and glass.

Shot durability is a very important factor in overall peening costs. Carburized steel shot has been introduced to marry a tough core with a very hard, wear-resistant, surface layer.

SHOT VELOCITY

Advances have been made in quantifying the factors that influence shot velocity. These factors are obviously different for air blast compared with wheel blast peening.

(1) Air Blast Shot velocity

Equation (4) contains the factors that influence air blast shot velocity:

$$\mathbf{v_s = (1{\cdot}5.C_D.\rho_A.s/\pi.d.\rho_S)^{0.5}\ (v_a - v_s)} \qquad (4)$$

where $\mathbf{C_D}$ is the "drag coefficient" (a dimensionless number that depends upon the shape of the object and, for a smooth sphere, $\mathbf{C_D} \approx 0.5$), $\boldsymbol{\rho_A}$ is the density of the **compressed** air (1.2 kgm^{-3} times the compression ratio), **s** is the nozzle length, **d** is the shot diameter, $\boldsymbol{\rho_S}$ is the density of the shot, $\mathbf{v_a}$ is the velocity of the air stream and $\mathbf{v_s}$ is the velocity of the shot particle. $(\mathbf{v_a - v_s})$ is termed the "relative velocity" of the particle compared with that of the air stream.

Equation (4) may look complicated but in fact becomes very simple for a fixed peening setup. For round shot of a given density and diameter, accelerated in a nozzle of a given length, then the only variable is the density of the compressed air! In other words, we control the velocity of shot leaving the nozzle by varying the density of the compressed air in the nozzle.

The factors incorporated in equation (4) have interesting general significance. The drag coefficient, C_D, of a sphere is low, ≈ 0.5, whereas a flat surface has a value of 1.28. That explains why bullets and artillery shells are manufactured with a flat at the compression end—they are accelerated to much higher velocities than if they were cannonball shaped. The nozzle length, **s**, of a rifle is much longer than that of a pistol again allowing generation of much higher shot velocities. As the density of shot, $\boldsymbol{\rho_S}$, increases the shot velocity decreases —dense shot requiring more acceleration work. The same is true for shot diameter, **d**, so that artillery shells compensate by having very long barrels as on warships and tanks.

Fig.7 illustrates the advance made by understanding the importance of air density on shot acceleration. Analogously

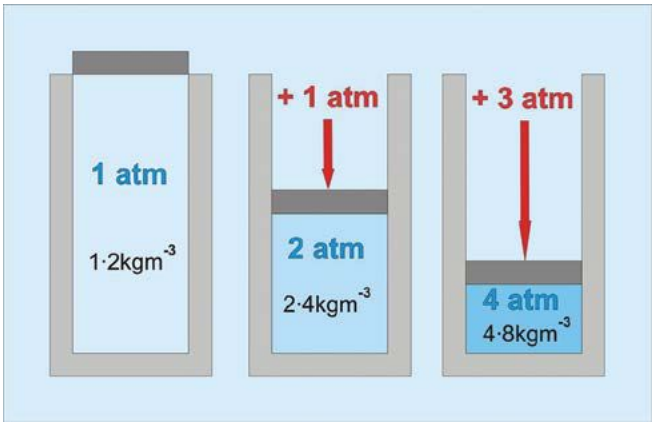


Fig.7. Density of compressed air increased by applied atmospheric pressure.

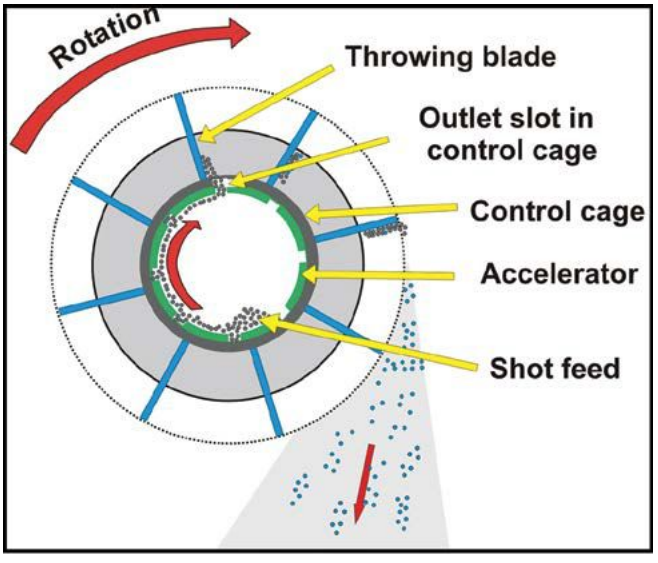


Fig.8. Basic components of a Wheel blast machine.

think of having to withstand fast-flowing fluid. The denser the fluid the more we would tend to be swept off our feet.

(2) Wheel Blast Shot velocity

Fig.8 shows the basic elements of a simple wheel blaster. Incremental advances in wheel blast equipment have been made. For example, Wheelabrator introduced their EZIFIT design in 2003. A major advance in understanding involves an equation that enables wheel blast shot velocity to be predicted and controlled:

$$\mathbf{V_S = 2.\pi.N(R^2 + 2RL - L^2)^{0.5}} \qquad (5)$$

Equation (5) looks complicated, but can easily be employed. For a given machine, the radius of the wheel, **R**, and the length of the blade are fixed, so that **N**, the speed of rotation in ms^{-1}, is the only variable. Hence, for example, when **R** = 0.4 m and **L** = 0.2 m, equation (5) simplifies to $\mathbf{V_S = 2.\pi.N.0.529}$ or $\mathbf{V_S}$

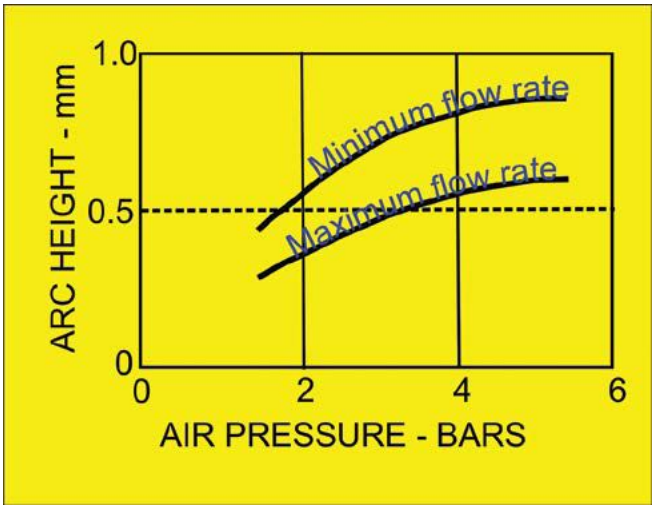


Fig.9. Effect of flow rate on Almen arc height.

= 0.324N. If **N = 300 ms^{-1}** the predicted shot velocity would therefore be **97.2 ms^{-1}**.

SHOT FLOW CONTROL and MONITORING

Great advances have been made in the control and monitoring of shot flow. These are of vital importance because they affect both coverage rate and peening intensity. Continuous monitoring of shot flow rate is now possible—achieved using either inductive sensors for ferrous shot or capacitive sensors for non-ferrous shot. Continuous monitoring goes hand in hand with continuous control of flow rate.

The advantage of being able to control and monitor shot flow is illustrated by fig.9. As the flow rate is increased, the velocity of outgoing shot is reduced. This is because more of the available work has to be done accelerating the shot. The observed effect of shot flow rate is substantial.

DISCUSSION

An attempt has been made to indicate the most important advances in shot peening that have been made in the last forty years. Apologies if any have been missed. Manufacturers always speak highly of new products. As in any sphere, it is a case of caveat emptor (buyer beware). There is no doubt, however, that many important advances in shot peening have been made and should be adopted. Progress is not static; more advances will be achieved in coming years. Tribal knowledge is important in identifying areas where new advances need to be made.

Blast Cleaning Technologies Announces the Acquisition of Coyote Enterprises, Inc.

BLAST CLEANING TECHNOLOGIES (BCT) has announced the acquisition of Coyote Enterprises, Inc. Blast Cleaning Technologies designs and manufactures equipment, components, and system upgrades that offer improved fit, function, and life.

Under the new ownership of Blast Cleaning Technologies, Coyote customers will now have access to North America's largest engineering and field service team as well as BCT's quality and inventory support. The operation will be consolidated and centralized into the Blast Cleaning Technologies 140,000 sq. ft. manufacturing facility located in West Allis, Wisconsin.

Coyote Enterprises Inc. was founded in 1998 by Jim and Cindy Goff to provide cost effective blast equipment and competitively priced replacement parts engineered for increased performance and longevity. Coyote was built on this vision to design a variety of cost effective yet innovative shot blast machines. That vision became Coyote.

"This is an important acquisition for us," Carl Panzenhagen, President and CEO of Blast Cleaning Technologies said. "The addition of this product line compliments and expands our current product line, allowing us to support both current and new customers, positioning us for continued growth in the Shot Blasting Industry."

About Blast Cleaning Technologies

Blast Cleaning Technologies has become the fastest growing shot blast manufacturer over the last several years by investing in engineering, manufacturing, research, and development.

BCT was founded on repairing, rebuilding, and upgrading equipment and offering thousands of competitively priced, quality blast parts. Partnering with industry-leading technology suppliers, BCT provides unmatched equipment, service and support for the foundry, forging, metal fabrication, automotive, aerospace, agriculture, defense, rail, energy and power generation industries, and other special applications.

About Coyote Enterprises, Inc.

Coyote Enterprises was founded in 1998 by Jim and Cindy Goff. Jim is a pioneer in the blast industry beginning in 1965 at Wheelabrator. In 1969 he was hired by R.T. Nelson to design and build the first portable shot blasting machine. Jim accomplished this task and was awarded a patent for this machine named "Bertha" in September 1972. His vision for new and innovative Abrasive Shot Blast Cleaning and Peening Equipment was just beginning. In 1973, Jim founded the Goff Corporation located in Seminole, Oklahoma which he privately owned and operated successfully for 18 years until he chose to sell it in 1991.

Aljaž Molek | Shot Peening Specialist with FAA-Approved Shot Peening Certificate Level 1,2,3 | FerroECOBlast® Europe

Shot Peening Solution for Larger Quantities of Aircraft Constructible Parts

SHOT PEENING technology is an important process, especially in the aerospace industry, where there is no room for error. It requires careful monitoring of all parameters that impact the work process and consequently the final result of the shot peening itself. This is why this process is usually performed on an individual workpiece so as to allow the process to be tracked for each product based on serial number.

But what about products that are installed in an airplane or in other machines in larger quantities? Or products of larger dimensions? For such products, conventional machines are not suitable or do not have a large enough capacity to meet production needs. Multiple machines are needed in such cases, which typically entails high investment costs.

Originating in the heart of Europe, FerroECOBlast® Europe develops solutions and manufactures machines for surface treatment processes; shot peening included. With expertise in this area since 1964, FerroECOBlast® Europe has made a name for itself among aircraft manufacturers and repair shops all around the world. The company's FAA-approved Shot Peening experts provide consultation, testing and solutions for any workshop—whether specializing in engines, landing gear, structural components, or composites—and increasingly for the additive manufacturing industry. Additive manufacturing has become very popular in aviation in recent years.

The company's presence in Europe, the Middle East, Asia-Pacific, the United States, New Zealand and Australia goes to show that distance is no obstacle for their clients when it comes to choosing a reliable solution and quality support. That is why at FerroECOBlast® Europe we have tuned in to one of our customer's needs and requirements and developed and built for them a Shotpeening machine PEENLINE 2000 ECO that delivers high productivity for smaller workpieces and allows shot peening to be performed on larger products of up to 8 meters in length. These are long structural aircraft components that need to be machined with the utmost precision since as much as a single microcrack is enough to cause a disaster. For such workpieces, we have developed a pass-through-type machine which comes with a 2-meter-wide and 8-meter-long conveyor belt installed on either side.

As such, it allows the operator to load a large number of smaller-sized products or several larger ones to be processed simultaneously. It is precisely this functionality that allows the machine to be operated by a single operator. The machine housing features a built-in manipulator, which has four precision-controlled nozzles that cover the entire width of the conveyor belt. Thanks to such configuration, the machine

Shot peening machine PEENLINE 2000 ECO

Manipulator with adjustable nozzles inside the machine

is able to process a surface area of 16 m^2 over the course of 20 minutes. If smaller workpieces are used, a large number of them can be loaded onto the conveyor belt, depending, of course, on the actual workpiece size. This eliminates the need for handling individual workpieces when loading and unloading the machine and the loss of time while waiting for the machine to execute the manipulation. This configuration is the best choice for longer products (up to 8 meters) that require shot peening, since it also allows the simultaneous processing of several workpieces at the same time—so long as these are curved long items of different cross-sections or larger surface areas of sheet metal products.

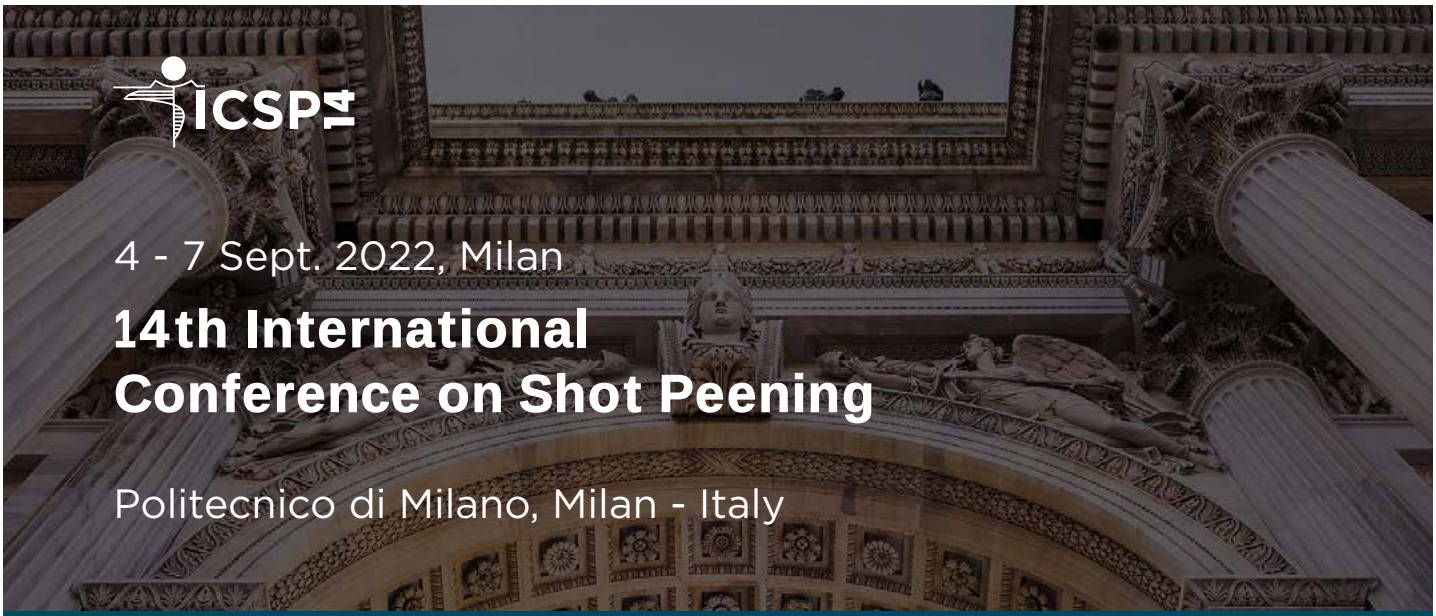
Given the FerroECOBlast® Europe's machine design, a major challenge, of course, is to prevent the shot peening shots from escaping the machine housing. We managed to achieve this by installing cleaning tunnels on either side of the machine. Inside the tunnel there are sealing curtains as well as components for blowing the abrasive off of the products.

Other parts of the machine that apply the abrasive onto the workpiece and take care of the recycling of abrasive—such as dosing valves, vibrating screens, continuous pressure blasting nozzle, and other pressure and flow rate control and monitoring components—make sure the recycling and control of abrasive is performed in accordance with AMS 2431 requirements and in compliance with Nadcap standards. Because shot peening is mainly performed on aluminium products, and especially products made of titanium, the machine is equipped with ATEX anti-explosion ventilation systems, as titanium or aluminium dust is explosive.

Shot Peening training is regularly conducted at the FerroECOBlast® Europe facility under the mentorship of the highest professional authorities, giving FerroECOBlast® Europe staff and their partners the opportunity to receive regular training and obtain certifications in the field of shot peening. Our staff—from sales, development and assembly divisions— have earned the Federal Aviation Administration's course certification in shot peening levels 1, 2 and 3 as it is only by fully understanding the entire process that one can offer a quality solution to valued customers.

Conveyor for long parts and ATEX filter system

Shot peening training for Shot Peening Level 1, 2, 3 at FerroECOBlast® Europe with Aljaž Molek (left) and Dave Barkley (right)



4 - 7 Sept. 2022, Milan

14th International Conference on Shot Peening

Politecnico di Milano, Milan - Italy

THREE DAYS OF FULL IMMERSION IN PROGRESS, CHALLENGES AND OPPORTUNITIES FOR PEENING TREATMENTS

After having been postponed two years later, the 14th International Conference on Shot Peening is finally planned in presence at Politecnico Milano, Sept.4-7, 2022.
ICSP14 is one of the calendar's most important events on the science, technology and applications of mechanical surface treatments. It offers a unique forum for scientists and engineers to deepen and update their knowledge on all aspects of mechanical surface treatments. International representatives from academia and industry will come together to present and discuss the latest developments in shot peening and related subjects. International well known leaders in surface treatments have already confirmed their exciting plenary lectures. In the case the COVID pandemic is still limiting mobility, it will be considered to move on virtual or on mixed-mode conference.

WHY

The conference is a unique opportunity for researchers and industry representatives to present their scientific and technological developments on shot peening and surface treatments.

WHAT

Shot peening and allied treatments offer unique opportunities and are even more attractive when applied to additive manufactured parts.

HOW

Submit your abstract and papers to
submit@icsp14.org
For further info visit:
www.icsp14.org

IMPORTANT DATES

Submission of abstracts	**February 15th, 2022** March 7th, 2022
Notification of acceptance	**March 15th, 2022**
Submission of papers	**April 30th, 2022**
Notification of paper acceptance	**May 30th, 2022**
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Contractor Uses Munkebo Tower Systems Around the World

FOR MORE THAN THREE DECADES, one of the world's largest providers of contract abrasive blasting, steel preparation, and coatings applications has purchased Munkebo equipment for its portable vacuum and recycling needs. The contractor has purchased Vacuum and Recycling Tower Systems, in addition to dozens of other Munkebo equipment, for use in the United States, Europe, and Asia.

OPERATIONAL FLEXIBILITY

The contractor has been happy with the operational flexibility of these Tower Systems and of the ability to secure them on standard-sized trucks with a twist-lock system, similar to how shipping containers twist lock onto railcars and ships.

Furthermore, this twist-lock system allows for simplified setup and breakdown at job sites. Bridges, windmill towers and shipyards, including a shipyard in the San Diego Bay in the United States, are a few of the locations where the contractor uses the Tower Systems.

The contractor also uses the Towers Systems to recover and recycle media used during the blasting of new monopile foundations before they are installed. (Monopile foundations are the concrete and steel support structures beneath offshore wind towers.) The contractor is especially pleased with how easily its maintenance crews can perform routine service on the Tower Systems within the space restrictions at their maintenance facilities.

ALL UNITS STILL IN SERVICE

Munkebo originally custom engineered these Tower Systems to meet the customer's production and flexibility requirements. The modified design was so successful that it became the standard for all Munkebo Tower Systems. In fact, all of the contractor's Tower Systems are still in service, some after nearly 30 years.

MORE BENEFITS OF MUNKEBO TOWER UNITS

The recycling, storage-hopper, and blast-machine refilling components of Tower Systems are housed in stackable, 10 ft x 10 ft cube container frames, while the vacuum units are positioned alongside the tower. The tower design accommodates high-volume jobs where equipment must have a small footprint. These modular, closed-circuit systems also are weatherproofed—they are snow and rain resistant. Because of their modular design, they can be used as a complete vacuum and recycling system or, if the job calls for it, only a vacuum or recycling system.

ABOUT MUNKEBO

Munkebo is a brand of abrasive vacuum and recovery systems. The company is based in Munkebo, Denmark. It was founded in 1963 and acquired by Clemco in 2008.

Munkebo also manufactures mechanical recovery systems, abrasive cleaning systems, ventilation systems, and other equipment for the abrasive blasting and painting industries.

Setting up a Munkebo Tower System in a Singapore shipyard in 2021.

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*** U.S. Patent No. 6,568,239 for Coverage Check Finish**

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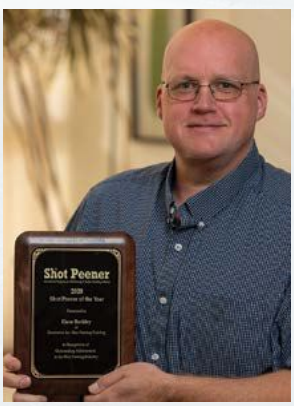

Dave Barkley is the Director of EI Shot Peening Training and one of EI's rotary flap peening instructors. Mr. Barkley was the author/sponsor of AMS 2590 "Rotary Flap Peening of Metal Parts." He is also the recipient of the 2020 Shot Peener of the Year award.

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