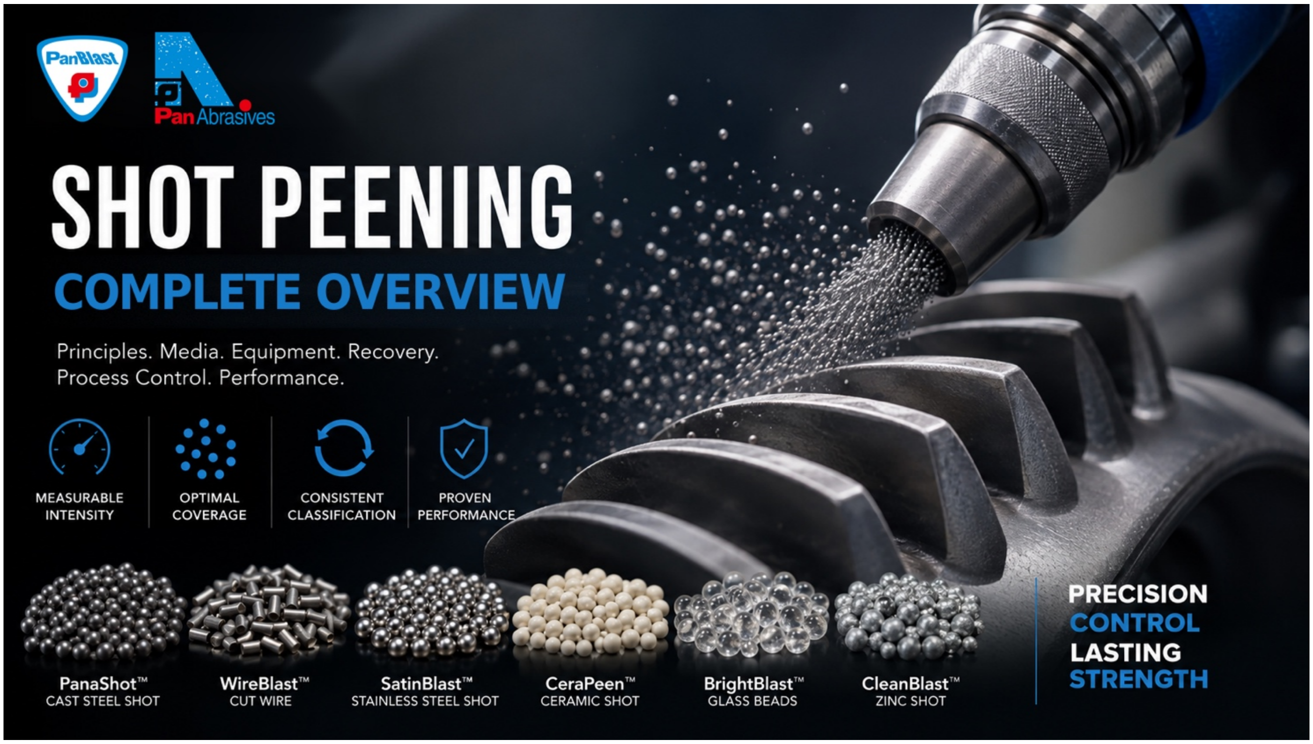
PANBLAST & PAN ABRASIVES · WHITE PAPER NO. 04

SHOT PEENING

Abrasive Media Selection and Equipment Pathways — Air Blast and Airless Wheel Blast

Published: July 2026 **Scope:** Abrasive media & equipment pathways **Applies to:** Air blast & airless wheel blast peening



EXECUTIVE SUMMARY

Overview

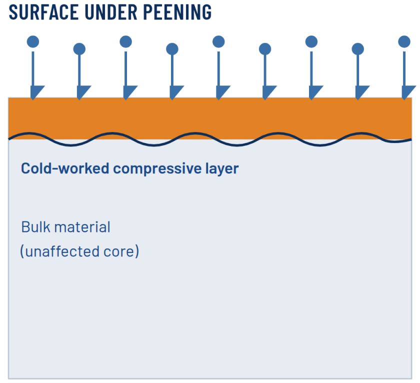
Shot peening is a cold-working process that fires a controlled stream of round media at a metal surface to induce a shallow layer of residual compressive stress. That compressive layer is what delays fatigue crack initiation and resists stress-corrosion cracking — not a cosmetic finish, a measurable, repeatable mechanical treatment governed by international standards (SAE J442, SAE J827, AMS 2431, AMS-S-13165).

Pan Abrasives supplies six media families suited to peening duty, each occupying a distinct niche defined by hardness, density, ferrous contamination risk and breakdown rate: **PanaShot™** cast steel shot (the industry-standard ferrous peening media), **WireBlast™** cut wire (the most dimensionally uniform particle of any peening media, available in carbon steel, stainless, aluminium and zinc), **SatinBlast™** stainless steel shot (non-ferrous-safe, self-hardening in use), **CeraPeen™** ceramic shot (the aerospace peen-forming standard where ferrous contamination is disallowed), **BrightBlast™** glass bead (compressed-air only, the gentlest option for thin sections and critical tolerances), and **CleanBlast™** zinc shot (the softest metallic impact, for delicate non-ferrous parts).

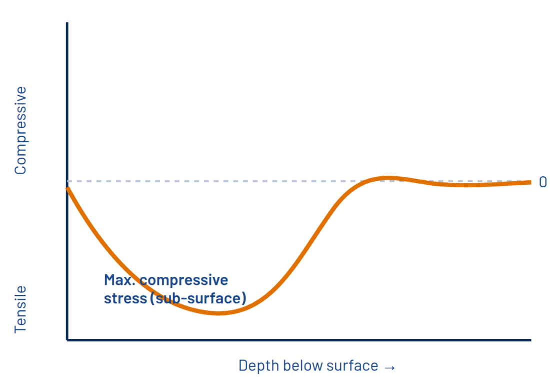
PanBlast™ offers both compressed-air and airless wheel equipment pathways for these media. On the air side, the standard **PB-series blast cabinets** (PB500/1000/1500/2000HD and PB500/1000/1500/2000P) give a complete compressed-air pathway for all non-ferrous peening and ferrous peening up to the size equivalent of S170 steel shot. On the wheel side, the **RotaMini** and **RotaMax** centrifugal wheels cover production peening from 60 kg/min up to 450 kg/min of media throw, with continuous air-wash classification keeping the working mix within the round-particle purity peening quality demands.

Process control is what turns any of this equipment into a qualified peening operation: Almen strip intensity measurement, saturation-curve coverage verification, and the rule that at least 85% of the shot in the system must remain full-sized and rounded. Section 1 covers this control framework; Sections 2–3 cover the peening media and the standard equipment pathways; Section 4 covers custom-engineered systems built around specific parts; Section 5 covers abrasive recovery and classification; Section 6 gives a pathway decision framework; and Section 7 documents every place this paper reconciled a discrepancy between two internal sources.

SURFACE UNDER PEENING



RESIDUAL STRESS vs. DEPTH (SCHEMATIC)

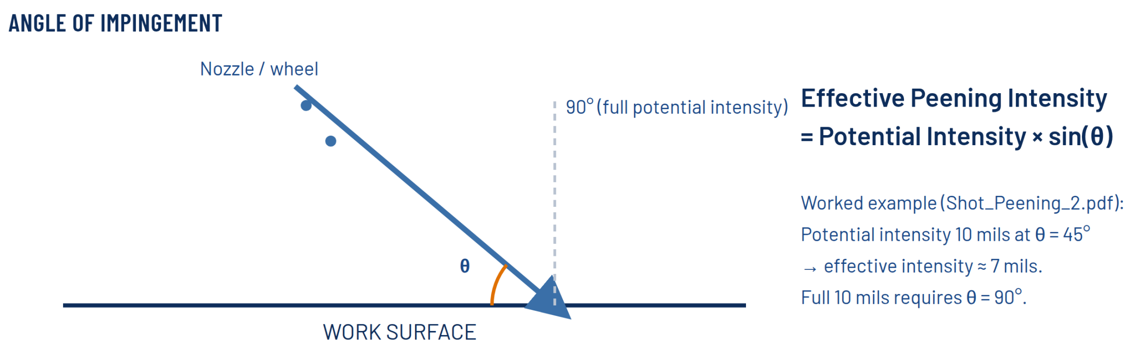


1 Process Control Fundamentals

Shot peening is only as repeatable as its process controls. Four concepts govern every peening operation regardless of whether it runs on air or wheel equipment: the distinction between potential and effective intensity, Almen strip measurement, coverage/saturation, and shot condition (breakdown) control.

1.1 Potential vs. Effective Peening Intensity

Potential peening intensity is an instantaneous property of the blast itself — governed by shot velocity, shot hardness, and the size/weight of the individual particles. It does not depend on how many particles are in the blast or how long the part is exposed. **Effective peening intensity** is what the workpiece actually receives: potential intensity scaled by the angle at which the shot strikes the surface.



Because effective intensity falls with the sine of the impact angle, geometry that forces a shallow impingement angle (a deep bore, a tight fillet, an internal corner) can only be compensated by increasing shot size or velocity — the angle itself cannot be recovered.

1.2 Almen Strips and Arc Height

Peening intensity is measured, not estimated, using the Almen strip system (SAE J442): a flat spring-steel strip of standard hardness is bolted to a test block, peened on one face only, then removed. The peened face's cold work causes the strip to curve; the arc height of that curvature, measured on a dedicated Almen gauge, is the intensity figure quoted for that peening operation (e.g. ‘12A’).

Strip	Thickness	Intensity range
N	0.031 in	low intensity, below 0.004 in A
A	0.051 in	average intensity, 0.004–0.024 in A
C	0.094 in	high intensity, above 0.024 in A

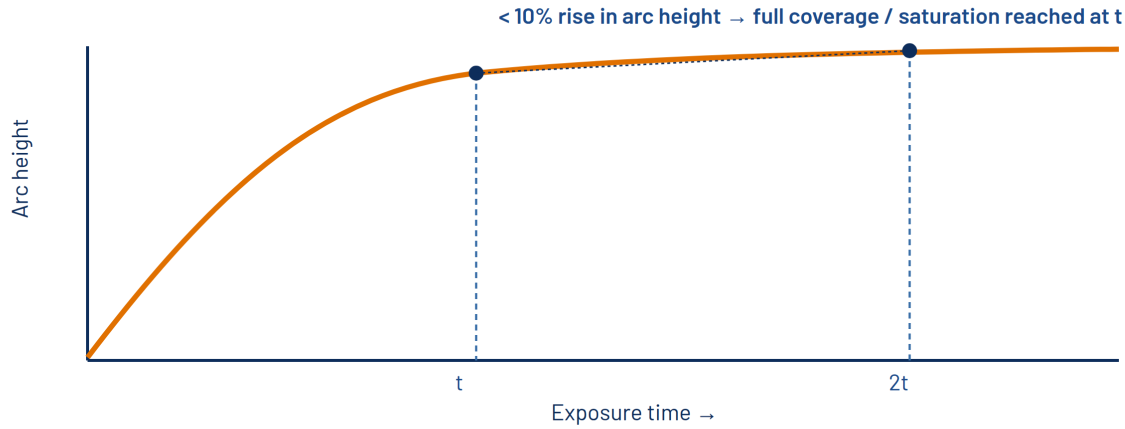
All strips: 3 in long × 0.75 in wide. Source: Shot_Peening_2.pdf pp.6–8 (Pan Abrasives training reference, SAE J442 basis).

The three strip types correlate: **C-strip deflection × 3.5 ≈ A-strip deflection at the same intensity; A-strip deflection × 3 ≈ N-strip deflection at the same intensity (e.g. 10C ≈ 35A; 10A ≈ 30N).** For critical parts, only premium-grade Almen strips certified to AMS-S-13165 or SAE J442 should be used.

1.3 Coverage and the Saturation Curve

Coverage is the proportion of the target surface actually struck by shot. Without effectively full coverage, the fatigue-life benefit shot peening is used for is simply not obtained — unpeened gaps remain full-strength tensile-prone surface. Coverage is verified either by visual inspection at 10× minimum magnification (a continuous pattern of overlapping dimples) or by fluorescent tracer: a coated, then peened surface is inspected under black light, and complete coverage shows no fluorescence.

SATURATION (COVERAGE) CURVE



Coverage is considered full at time t if doubling exposure to 2t produces less than a 10% increase in arc height (SAE J442).

To find the saturation point for a new job, an Almen strip is exposed at a series of increasing exposure times, arc height is plotted against time, and the point where doubling the exposure time increases arc height by less than 10% is taken as full coverage. If the specified intensity is reached *before* that saturation point, blast velocity must be reduced; if it is reached *after*, or not reached at all, velocity must be increased and the curve re-run.

1.4 Shot Condition and the 85% Rule

- **Hardness rule:** peening media should be the same hardness as, or harder than, the workpiece. Media softer than the workpiece measurably reduces achieved intensity.
- **Fillet rule:** when peening a fillet radius, shot diameter should not exceed half the fillet radius, or full coverage of the root cannot be achieved.
- **85% rule:** a continuous separator must remove broken and undersized shot so that at least 85% of the media in the system remains full-sized and round at all times. Sharp-edged broken particles scratch a stress riser into the very surface peening is meant to protect — the opposite of the intended effect. On high-throughput wheel machines, a continuous screening system handling roughly 15% of total shot flow is typically required to hold this line.
- **Shape rule (AMS-S-13165):** only spherical or near-spherical particles are an acceptable peening media shape; deformed and broken/angular particles are explicitly non-conforming.

1.5 Almen Gauging Equipment

Sections 1.2–1.4 define what Almen intensity, coverage and shot-condition control require; this section names the physical items Pan Abrasives supplies to carry that measurement out on the shop floor. All four are gauging and verification hardware rather than peening media; each carries an AIR/WHEEL tag here since Almen strip testing works identically regardless of which equipment pathway produced the peening being measured.

Almen Strip Holder Test-Strip Mounting Fixture [AIR] [WHEEL]

Standard	Industry-standard SAE J442 Almen holder
Hardness	Rockwell C 58 or higher (internal ref.: Rockwell C 62–65 — see Data Note, Section 7)
Dimensions (internal ref.)	3 in long × 1½ in wide × ¾ in high steel block
Fasteners	Four round-head screws supplied per holder; additional screws sold separately
Configuration	Alternate holder configurations available on special request

The fixture the Almen strip (below) is bolted to for peening (Section 1.2). It can be used stand-alone for a single test run, or fastened into work fixtures at various positions to approximate the critical peening locations on the actual part.

Source: Pan Abrasives website — Shot Peening / Gauges & Holders (product listing, captured 13 Jul 2026); cross-checked against Shot_Peening_2.pdf p.16 — see Data Note, Section 7.

Almen Gauge Jr Analog Arc-Height Gauge [AIR] [WHEEL]

Type	Analog dial indicator
Height / weight	4 in tall; under ½ lb
Dial	1¾ in dial, 0.0005 in graduations
Recommended use	General-purpose shot peening and blast-cleaning verification

The lightest gauge in the range, reading Almen strip arc height directly off an analog dial. Suited to general-purpose peening and blast-cleaning verification where SPC data logging (Almen Gauge, below) is not required.

Source: Pan Abrasives website — Shot Peening / Gauges & Holders (product listing, captured 13 Jul 2026).

Almen Gauge Digital Arc-Height Gauge, SPC-Capable [AIR] [WHEEL]

Type	Digital, rotating base — readable standing or sitting
Display	English / metric convertible
Standards	SAE J442, AMS 2430
Data output	SPC data port for computer data transfer

The SPC-capable member of the range. The rotating digital head lets Almen strip testing be read standing or sitting, and the built-in data port feeds arc-height readings directly into a computerized SPC system — the natural choice where aerospace documentation (SAE J442, AMS 2430) requires a retained, auditable measurement record rather than a hand-logged reading.

Source: Pan Abrasives website — Shot Peening / Gauges & Holders (product listing, captured 13 Jul 2026).

Almen Strips N / A / C Test Strip — Aero & Industrial Grades [AIR] [WHEEL]

Aero specification	HRC 45–48; conforms to SAE J442, SAE AMS 2432, AMS-S-13165 (listing shows “AMS-S-13165” — see Data Note, Section 7)

Industrial specification	HRC 45–48; conforms to AMS-S-13165 (listing shows “AMS-S-13165” — see Data Note, Section 7)
Thickness / intensity range	N / A / C — see Section 1.2 table
Stock (internal ref.)	SAE 1070 cold-rolled spring steel; square edge No. 1 (3 in edge); blue-temper or bright finish

The consumable strip itself, bolted into the holder above and peened per Section 1.2. Pan Abrasives stocks two certification tiers — an Aero specification for aerospace-documented work and a lighter Industrial specification for general production peening — across each of the N, A and C thicknesses.

Source: Pan Abrasives website — Shot Peening / Almen Strips (product listing, captured 13 Jul 2026); cross-checked against Shot_Peening_2.pdf pp.16–17 — see Data Note, Section 7.

2 Peening Media — Comparative Analysis

Selecting a peening media starts with two questions: **can this substrate tolerate ferrous contamination**, and **what hardness does the media need relative to the workpiece** (media should be the same hardness as, or harder than, the part being peened). Pan Abrasives' six peening-rated media families answer those questions across a wide hardness and density range, summarised below and detailed individually on the following pages.

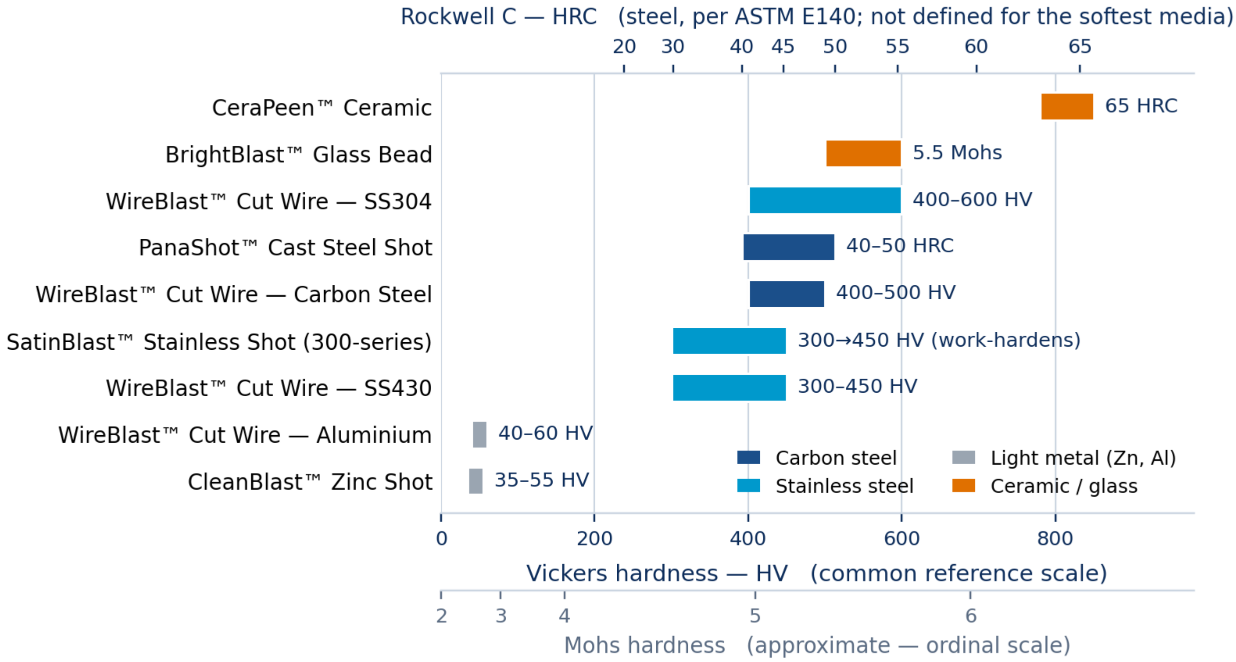
Media	Ferrous?	Hardness	Bulk density	Air	Wheel	Useful life (cycles)
PanaShot™ (Cast Steel Shot)	Ferrous	40–50 HRC (SAE standard grade)	4450 kg/m³	✓	✓	80–100
WireBlast™ (Cut Wire (Carbon Steel, Stainless Steel, Aluminium, Zinc))	Mixed — see note	Aluminium 1070: 40–60 HV · Carbon steel: 400–500 HV · Stainless SS304: 400–600 HV · Stainless SS430: 300–450 HV · Zinc: 35–55 HV	Carbon steel / SS304 / SS430: 4400 kg/m³; Aluminium: 1500 kg/m³; Zinc: 4100 kg/m³	✓	✓	300–400 (carbon steel)
SatinBlast™ (Stainless Steel Shot (300 Series Cast))	Non-ferrous	New/unused: 300 HV → approx. 450 HV after ~2000 cycles (work-hardens austenite → martensite in use)	4500 kg/m³	✓	✓	150–225
CeraPeen™ (Ceramic Beads and Shot)	Non-ferrous	65 HRC	2300 kg/m³	✓	✓	70–90
BrightBlast™ (Glass Beads (Soda Lime Glass))	Non-ferrous	5.5 Moh	1500 kg/m³	✓	—	9–12
CleanBlast™ (Zinc Shot)	Non-ferrous	35–55 HV	4200 kg/m³	✓	✓	n/a – not in the Pan Abrasives breakdown-rate reference table

Air / Wheel compatibility cross-checked against Airless_Wheel_Blasting.pdf p.34, Abrasive_Media_Types__Final.pdf pp.27–38, and AbrasiveMediaGuide.pdf product pages (Section 5.2 has the full compatibility matrix). Useful-life cycle counts from Abrasive_Media_Types__Final.pdf p.49 where covered.

Hardness at a Glance — Cross-Scale Comparison

Pan Abrasives specifies these media in whatever hardness unit is conventional for each material — Rockwell C for the cast and ceramic shot, Vickers for the cut-wire and stainless grades, and Mohs for glass — which makes a like-for-like comparison awkward. The chart below places all of them on a single Vickers (HV) scale, with an aligned Rockwell C axis above and an approximate Mohs reference below, so the media can be ranked against one another and against the part being peened at a glance.

Peening Media Hardness — Cross-Scale Comparison



Media	Stated hardness	≈ Vickers (HV)	≈ Rockwell C (HRC)	≈ Mohs
CeraPeen™ Ceramic	65 HRC	780–850	62–65	≈7
BrightBlast™ Glass Bead	5.5 Mohs	500–600	—	5.5
WireBlast™ Cut Wire — SS304	400–600 HV	400–600	41–55	≈5–5.5
PanaShot™ Cast Steel Shot	40–50 HRC	392–513	40–50	≈5
WireBlast™ Cut Wire — Carbon Steel	400–500 HV	400–500	41–49	≈5
SatinBlast™ Stainless Shot (300-series)	300→450 HV	300–450	30–45	≈4.5–5
WireBlast™ Cut Wire — SS430	300–450 HV	300–450	30–45	≈4.5–5
WireBlast™ Cut Wire — Aluminium	40–60 HV	40–60	—	≈2.5–3
CleanBlast™ Zinc Shot	35–55 HV	35–55	—	≈2.5

Native hardness as stated in the media table above (Pan Abrasives data); cross-scale equivalents are approximate — Rockwell C ↔ Vickers via ASTM E140, and Mohs via the standard Mohs–Vickers mineral correlation. Hardness measured by different methods does not convert exactly, and Rockwell C is not defined for the softest media (zinc, aluminium, glass).

2.1 PanaShot™ Cast Steel Shot [AIR] [WHEEL]

Ferrous / non-ferrous	Ferrous
Shape	Round, spherical
Particle S.G.	> 7.4
Bulk density	4450 kg/m³
Hardness	40–50 HRC (SAE standard grade)
Size standard	SAE J444 / AMS 2431

Stock code	ASA-STSXXXY-Z (standard); ASA-STSMLXXXYY (AMS 2431 peening grades)
Packaging	25 kg bags, 1 tonne pallet, or 900 kg drums (peening grades)

Industry-standard peening media. Produced by water-atomising molten steel, then screened, hardened and tempered. 90% of a batch must fall within the stated hardness range per SAE J827. Because it is ferrous, it is unsuitable where ferrous contamination of the peened surface cannot be tolerated.

Source: AbrasiveMediaGuide.pdf pp.49–51; Abrasive_Media_Types__Final.pdf p.27

2.2 WireBlast™ Cut Wire (Carbon Steel, Stainless Steel, Aluminium, Zinc) [AIR] [WHEEL]

Ferrous / non-ferrous	Carbon steel and stainless variants are ferrous; aluminium and zinc variants are not
Shape	As-cut cylindrical → semi-rounded (G2) → fully spherical (G3)
Particle S.G.	Carbon steel / SS304 / SS430: 7.6; Aluminium 1070: 2.7; Zinc: 7.1
Bulk density	Carbon steel / SS304 / SS430: 4400 kg/m³; Aluminium: 1500 kg/m³; Zinc: 4100 kg/m³
Hardness	Aluminium 1070: 40–60 HV · Carbon steel: 400–500 HV · Stainless SS304: 400–600 HV · Stainless SS430: 300–450 HV · Zinc: 35–55 HV
Size standard	Proprietary grade (0.3–2.5 mm); AMS specification sizing available on request
Stock code	AOT-CWXXXX-YYZZ
Packaging	25 kg bags in drum

Cut to a length equal to its own diameter, giving the most dimensionally uniform peening particle of any media class — the trait the source literature identifies as ideal for repeatable peening results. Used where cast steel shot underperforms, where higher hardness is needed, or where the workpiece itself is very hard. Stainless variants avoid ferrous contamination; aluminium and zinc variants give a deliberately 'soft impact' for wheel-blast applications.

Source: AbrasiveMediaGuide.pdf pp.17–18, 23; Abrasive_Media_Types__Final.pdf pp.34–36

2.3 SatinBlast™ Stainless Steel Shot (300 Series Cast) [AIR] [WHEEL]

Ferrous / non-ferrous	Ferrous
Shape	Round
Particle S.G.	> 7.0
Bulk density	4500 kg/m³
Hardness	New/unused: 300 HV → approx. 450 HV after ~2000 cycles (work-hardens austenite → martensite in use)
Size standard	ASTM
Stock code	AOT-OASBXXXX
Packaging	25 kg bags, 1 tonne pallet

Withstands roughly 5000 impacts before replacement and leaves no ferrous residue or staining — the standard choice for magnesium, aluminium, nickel and chromium alloy components and other non-ferrous parts where ferrous contamination is unacceptable.

DATA NOTE

> The Abrasive Media Guide's descriptive text cites approximately 200 HV new, rising to approximately 530 HV after 2000 cycles; the same document's formal Abrasive Properties data table — cross-checked against the Abrasive Media Types training reference, which independently states 300 HV — gives 300 HV new and 450 HV after 2000 cycles. This white paper uses the two independently corroborated data-table figures (300 → 450 HV) as the catalog-verified values.

Source: AbrasiveMediaGuide.pdf pp.45–46; Abrasive_Media_Types__Final.pdf p.28

2.4 CeraPeen™ Ceramic Beads and Shot [AIR] [WHEEL]

Ferrous / non-ferrous	Non-ferrous
Shape	Smooth spherical beads
Particle S.G.	True relative density 3.85 (bead relative density 3.76)
Bulk density	2300 kg/m³
Hardness	65 HRC
Size standard	AMS 2431/7 (Z-series) and NF L 06.824 (B-series)
Stock code	AOT-OAZIXYYY
Packaging	25 kg pails

Crystalline ceramic phase bonded by an amorphous silica phase. Breaks down up to 15:1 more slowly than glass bead, giving tighter, more repeatable size distribution over a production run. Zero ferrous contamination risk — the primary aerospace peen-forming media where steel shot is disallowed.

Source: AbrasiveMediaGuide.pdf pp.5–6; Abrasive_Media_Types__Final.pdf p.37

2.5 BrightBlast™ Glass Beads (Soda Lime Glass) [AIR] [NOT WHEEL-RATED]

Ferrous / non-ferrous	Non-ferrous
Shape	Spherical
Particle S.G.	2.45–2.50
Bulk density	1500 kg/m³
Hardness	5.5 Moh
Size standard	ASTM / MIL grades / AMS 2431 (AGB series)
Stock code	AGB-XXXX (grade); AGB-MILXX; AGB-AMS2431AGBXX
Packaging	25 kg bags, 1 tonne pallet

Clear, chemically inert annealed glass spheres that clean and peen without embedment or ferrous residue, preserving critical tolerances. Explicitly specified for compressed-air abrasive blasting equipment rather than airless wheel systems — the fastest-breaking-down of the peening media compared here, which is why it is not carried in the wheel-compatible media list.

Source: AbrasiveMediaGuide.pdf pp.25–26; Abrasive_Media_Types__Final.pdf p.38

2.6 CleanBlast™ Zinc Shot [AIR] [WHEEL]

Ferrous / non-ferrous	Non-ferrous

Shape	Spherical
Particle S.G.	7.1
Bulk density	4200 kg/m³
Hardness	35–55 HV
Size standard	ASTM
Stock code	AAL-0AZCSXX
Packaging	20 kg bags, 500 kg steel drums

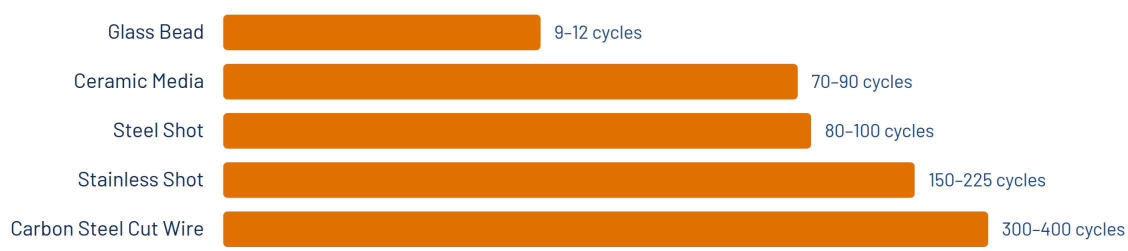
Manufactured from virtually pure zinc, approximately 2.5× denser than aluminium shot, so it removes proportionally thicker burrs (up to 40% of shot diameter) at a fraction of aluminium shot's explosion risk (aluminium shot is roughly 10× more explosive in dust form). Primary use is deburring/deflashing of aluminium and zinc die-castings; included here as the lightest-impact metallic peening option for soft non-ferrous parts.

Source: AbrasiveMediaGuide.pdf pp.43–44; Abrasive_Media_Types__Final.pdf p.29

2.7 Useful Life Before Replacement

Breakdown rate drives per-part media cost as directly as it drives peening consistency: media that survives more cycles needs replenishing less often and holds its size distribution — and therefore its peening intensity — for longer between top-ups.

USEFUL LIFE BEFORE REPLACEMENT (LOG SCALE) — PEENING-ELIGIBLE MEDIA ONLY



Media	Useful life (cycles)	Breakdown per cycle
Glass Bead	9–12	10%
Ceramic Media	70–90	1.2%
Steel Shot	80–100	1%
Stainless Shot	150–225	0.5%
Carbon Steel Cut Wire	300–400	0.24%

Source: Abrasive_Media_Types__Final.pdf p.49 (Pan Abrasives internal training reference, distinct from the customer-facing Abrasive Media Guide). Figures shown are limited to round, peening-eligible media; angular media are omitted as they are not used for peening.

3 Equipment Pathways

PanBlast™ delivers peening media to the work along two distinct equipment pathways: compressed-air (nozzle) systems, where an operator or a manipulator aims the blast stream, and airless centrifugal-wheel systems, where a fixed wheel throws media and the part is moved through the pattern. The two are complementary rather than competing — each answers a different combination of part size, shape, production volume and media type. This section covers PanBlast™ equipment for each pathway in turn, compressed-air peening (3.1) and airless wheel peening (3.2). Section 4 then covers custom-engineered systems built around specific parts, Section 5 covers the abrasive recovery and classification common to both, and Section 6 gives the framework for choosing between them.

3.1 Compressed-Air Peening

PanBlast™ air peening equipment uses one of two propulsion methods: **direct pressure** (a pressurised pot gravity-feeds a continuous air/abrasive stream — highest energy transfer) or **induction/suction** (a venturi draws abrasive up by vacuum — lower cost and energy). Pressure-fed suits steel shot; suction-fed suits lighter media like glass bead.

Both types meter abrasive flow independently of air pressure via the **Fina II** valve (BSP/NPT) or **Corsa II** automatic valve, standard across the PanBlast™ pressure pot and cabinet range — what holds peening intensity steady across a production run.

Source: SECTION04ABRASIVE_METERING_VALVES_CAT07.pdf.

PB500P / PB1000P / PB1500P / PB2000P — General-purpose pressure blast cabinets

`BEC-CA-PB-0009 (PB1000P/AU/NZ) · BEC-CA-0565-00 (PB1000P/SG) · equiv. 1500P/2000P`

Capacity	31 litre (1.1 ft³) integral PanBlast pressure pot
Fittings	—
Weight	600 kg (1322 lbs) — PB1000P assembly

Key features: Cyclone-type abrasive separator · Fina II metering valve · reverse-pulse cartridge dust collector · tungsten carbide nozzle · up to 3× faster than suction

> **PEENING RELEVANCE**
> Standard blast cabinets are suitable for all non-ferrous peening media and for ferrous peening media up to the size equivalent of S170 steel shot. Where ferrous peening media exceeds this size, an engineered project blast cabinet solution is required for compressed-air peening (see Section 4).

Source: SECTION15BLAST_CABINETS_CAT06.pdf

PB500HD / PB1000HD / PB1500HD / PB2000HD — Heavy-duty suction blast cabinets

`BEC-CA-0002-02 (PB1000HD)`

Capacity	— (suction-fed from cabinet hopper)
Fittings	13 mm (½″) suction gun / nozzle
Weight	520 kg (1146 lbs) — PB1000HD

Key features: Tungsten carbide Delta suction blast gun · cyclone separation · reverse-pulse jet filter cartridge · 85 m³/hr (50 cfm) @ 550 kPa (80 psi)

PEENING RELEVANCE

Standard blast cabinets are suitable for all non-ferrous peening media and for ferrous peening media up to the size equivalent of S170 steel shot. Where ferrous peening media exceeds this size, an engineered project blast cabinet solution is required for compressed-air peening (see Section 4).

Source: SECTION15BLAST_CABINETS_CAT06.pdf

3.2 Airless Wheel Peening

Airless wheel blasting propels media using a motor-driven, radially-bladed centrifugal wheel rather than compressed air. Media fed to the centre of the wheel is accelerated along the blades by centrifugal force and thrown at the work in a fixed, concentrated pattern (the "hot spot"), whose position is adjustable via the **control cage** — a sleeve around the impeller that governs where abrasive enters the wheel.

3.2.1 RotaMini & RotaMax Blast Wheels

Wheel	Diameter	Speed	Velocity	Flow rate	Motor	Weight
RotaMini	285 mm (11.2 in)	3000 rpm	approx. 80 m/s (262.4 ft/s)	60 kg/min (132.2 lb/min)	5.5 kW (7.4 hp)	217 kg (478 lbs)
RotaMax	370 mm (14.6 in)	3000 rpm	approx. 80 m/s (262.4 ft/s)	90–450 kg/min (198–992 lb/min) across the motor range	7.5 / 11 / 15 / 18.5 / 22 / 30 / 37 kW (10–50 hp)	312–569 kg (688–1254 lbs), scaling with motor size

Both wheels: bi-directional, 8 machined and dynamically balanced blades hardened to HRC60+. Source: SECTION18BLAST_WHEEL_PARTS_CAT18.pdf.

Both are direct-drive, bi-directional units: RotaMini for smaller-footprint or lower-throughput lines, RotaMax scaling from 90 to 450 kg/min across seven motor sizes for high-volume production peening of items such as springs, axles and gears.

3.2.2 Work-Handling Configurations

The blast wheels themselves are usually the straightforward part of a wheel-blast installation; work handling is where system design effort concentrates. Common configurations include table blast systems, roller-conveyor and pass-through barrel systems, overhead monorail with spinner hangers, and belt or vibratory conveyors for small-parts batch peening.

Source: Airless_Wheel_Blasting.pdf pp.2–36.

4 Custom Engineered Projects

The PB-series cabinets and RotaMini/RotaMax wheels in Section 3 are standard, catalogue-listed building blocks. Many peening jobs, though, are defined by a specific part rather than a general size class: a particular spring, gear, axle, turbine blade or casting, produced in known volumes to a known intensity and coverage specification. For these, PanBlast™ designs and builds engineered-to-order peening systems that arrange the same propulsion, media-metering and process-control elements documented in this paper around the geometry, throughput and handling requirements of the customer's actual component. The pathway, **compressed-air (nozzle) peening** or **airless centrifugal-wheel peening**, is chosen per project against the factors in Section 6 rather than fixed in advance.

Across both pathways the blast generation itself is rarely the hard part. The source engineering literature is explicit that "the work handling is the area of the system which pose[s] the greatest difficulties," and that a system handling a single, known product is far simpler than one asked to cover a family of differing parts. Custom peening projects therefore begin with the part, not the machine.

Source: Airless_Wheel_Blasting.pdf pp.2–36 (work-handling design).

Engineered Project Delivery

Every engineered peening system follows the same PanBlast™ project process, whichever pathway it uses: review of the RFQ requirements; agreement on terms and specifications; finalisation of specifications and site requirements; a general-arrangement drawing; project design and engineering; manufacture and assembly; factory completion and testing; shipping and transport to site; on-site installation and commissioning; and acceptance testing with system-handover training. Because each build is a customised product, the design has to reconcile the customer's peening specification and budget with the physical limitations of the installation site — which is why scoping starts from the part drawings, production targets and required intensity, not from a standard model number.

Source: Engineered_Products_Catalog.pdf (Engineered Products Process Flow); Blast_Rooms__Waffle_Floor_Media_Recovery.pdf.

> **PROCESS CONTROL CARRIES OVER**
> However bespoke the enclosure or the handling, a custom system is only a qualified peening operation if it holds the same controls as any other: Almen strip intensity measurement (Section 1.2), saturation-curve coverage verification (Section 1.3), and continuous classification to keep at least 85% of the shot full-sized and rounded (Sections 1.4 and 5). Engineering to order changes how the part meets the stream — not the standard the result is measured against.

5 Abrasive Recovery, Classification & Quality Control

Peening quality control does not end at the nozzle or wheel — it depends on what happens to the media after impact. Continuous recovery and classification is what maintains the 85% round-particle rule (Section 1.4) over an entire production run rather than just at the start of one.

5.1 Why Continuous Classification Matters for Peening Specifically

General blast cleaning tolerates a broader working mix than peening does: a slightly broken or undersized particle still removes scale. In peening, the same broken particle is a defect generator — its sharp edge can scratch a stress-concentration feature into the very surface the compressive layer is meant to protect. This is why peening operations specifically call for continuous, not periodic, separation, and why the source literature specifies a minimum screening throughput (approximately 15% of total shot flow on high-volume machines) dedicated to holding the round-particle percentage above 85% at all times.

In practice this continuous screening is carried out on a vibratory round separator sitting in the recovery loop. The unit is a circular screen deck that vibrates about its own centre of mass, driven by eccentric weights on the upper and lower ends of a vertical motion-generator shaft. The upper weight throws the returning media horizontally, carrying it across the screen toward the periphery, while the lower weight tilts the deck to add vertical and tangential motion. The angular offset between the two weights — the "lead" — sets the spiral path the media follows across the surface, and with it the residence time and screening efficiency, which the operator tunes to the shot size and flow rate in play:

Weight lead	Media behaviour on the screen	Effect on classification
0°	Thrown straight across the deck	Insufficient separation
15°	Begins to spiral	Separation develops
35°	Full, even spiral across the screen	Maximum screening efficiency
90°	Oversize held on the deck	Maximum throughput of the fine (minus) fraction

A single separator can carry up to four screen decks, producing as many as five size fractions in one pass — enough to strip oversized tramp debris off the top deck and drop undersized and broken fragments through the finer decks below, returning only the in-spec round fraction to the pot or wheel. Screen cloth is available down to roughly 400 mesh (38 microns), fine enough to pull fines from even the finest peening media, and is drawn drum-tight on tension rings so the aperture stays uniform and the cloth vibrates freely rather than whipping against its supports.

The real risk in a peening recovery loop — classification quietly degrading part-way through a run — usually begins as blinding, where near-size particles wedge into the mesh openings and progressively close off screening area. Self-cleaning aids such as ball trays beneath the screen keep those openings clear, so the separator holds its rated efficiency continuously instead of tapering off as a shift wears on. That is what keeps the round-particle percentage above the 85% floor from the first part of a run to the last.

Source: vibratory round-separator manufacturer technical literature.

5.2 Media – Equipment Compatibility Matrix

Media	Compressed air	Airless wheel
PanaShot™	✓	✓
WireBlast™	✓	✓
SatinBlast™	✓	✓
CeraPeen™	✓	✓
BrightBlast™	✓	—
CleanBlast™	✓	✓

Airless_Wheel_Blasting.pdf p.34 (PanBlast™ training reference): commonly used recyclable media for airless wheel blasting — Steel Shot; Stainless Steel Shot; Carbon and Stainless Steel Cut Wire; Aluminum and Zinc Cut Wire; Aluminum and Zinc Shot; Plastic Shot; Ceramic Shot. Glass bead is not on this list.

BrightBlast™ glass bead is the one peening media in this comparison explicitly scoped to compressed-air equipment only, both in its own catalog listing (“compressed air abrasive blasting equipment”) and by its absence from the wheel-blast training reference's recyclable-media list — consistent with glass bead's comparatively high breakdown rate (Section 2.7), which the mechanical recirculation of a wheel system would accelerate further.

6 Choosing a Pathway — Decision Framework

The same production-planning logic PanBlast™ applies across its surface-preparation range applies to peening: work piece size, shape complexity, production volume and required coverage together point toward cabinet (air) or airless wheel equipment.

Factor	Cabinet / Air Blast Peening	Airless Wheel Peening
Work piece size	Very small to medium	Medium to ultra-large
Shape complexity	Simple to ultra-high	Simple to ultra-high
Production volume	One-off to high	One-off to medium/high (fixture-dependent)
Operator control of blast stream	Direct — operator or robot aims the nozzle	Fixed — wheel position is set; part must move through the stream
Typical peening media here	All six media; only air-rated pathway for glass bead	All media except glass bead
Best fit	Precision parts, non-ferrous/contamination-sensitive work, low–medium volume, field/on-site touch-up	High-volume production peening (springs, axles, gears, fasteners) where parts can be fixtured through a fixed blast envelope

Source: Process_Selection__Corrected.pdf pp.4–12; Airless_Wheel_Blasting.pdf p.14.

Building the Blast Envelope

Whether the energy comes from a blast wheel or a blast gun, the design logic is the same: every surface that requires peening must fall within the direct “line of sight” of at least one blast stream for long enough to develop full coverage. For a single wheel or a single hand-held nozzle the geometry is straightforward, but many production parts are too large, too complex, or too numerous on a fixture for one stream to reach everywhere. In those cases the blast envelope is built up from multiple sources whose overlapping patterns are mapped in a blast-envelope diagram before the machine is committed to production.

In airless wheel machines, additional wheels are mounted at calculated angles around the blast chamber so that their combined throw covers the full workpiece as it moves through on a hanger, roller conveyor or turntable. In compressed-air cabinets and blast rooms, the same result is achieved with multiple blast guns — either fixed guns positioned to bracket the part from several directions at once, or guns mounted on a traversing mechanism that oscillates across the workpiece while the part itself rotates on a satellite indexing turntable. Automatic cabinets frequently combine both: fixed guns for the broad faces and a traversing gun that sweeps the harder-to-reach geometry.

The blast-envelope diagram is the verification step. It plots each stream’s pattern against the part geometry and confirms that no required surface sits in a shadow zone between streams. Work handling — the fixture, conveyor speed and part rotation — is then set so that every point on the surface accumulates the dwell time needed to meet the Almen intensity and coverage targets established in Section 1.

Source: Process_Selection__Corrected.pdf pp.4–12; Airless_Wheel_Blasting.pdf p.14; SECTION16BLAST_CABINET_PARTS_CAT12.pdf (Delta GDF/SNH auto blast guns).

7 Data Notes & Sourcing

Every specification in this white paper is sourced from a named Pan Abrasives or PanBlast™ catalog or training document, cited under the relevant table or card. Cross-checking sources surfaced a small number of places where two Pan Abrasives sources gave different figures for the same specification; those are documented here in full rather than silently resolved, consistent with Pan Abrasives' discipline of distinguishing catalog-verified from indicative figures.

SATINBLAST™ — STAINLESS STEEL SHOT (300 SERIES CAST)

The Abrasive Media Guide's descriptive text cites approximately 200→530 HV; its formal Abrasive Properties data table — cross-checked against the Abrasive Media Types training reference, which independently states 300 HV — gives 300→450 HV. This paper uses the corroborated data-table figures (300→450 HV) as catalog-verified.

WIREBLAST™ CUT WIRE — HARDNESS BY MATERIAL

The Abrasive Media Guide gives cut-wire hardness per material; the Abrasive Media Types training deck gives one blended figure (440–500 HV) for the carbon/stainless range. This paper uses the Guide's per-material figures (Section 2, WireBlast™ card) as the more granular, catalog-verified source, cross-checked against each material's own product page (e.g. zinc ties to CleanBlast™ Zinc Shot's 35–55 HV; aluminium ties to WireBlast™ Aluminium/Zinc's 1500 kg/m³ bulk density). The training deck's blended figure is retained in Section 2 as the representative carbon/stainless range.

ALMEN TEST STRIP HOLDER — HARDNESS

The current Pan Abrasives listing states the Almen Strip Holder is hardened to Rockwell C 58 or higher; Shot_Peening_2.pdf's internal spec (p.16) gives a fixed 62–65 RC for the same block — not strictly contradictory (62–65 satisfies a "58 or higher" floor), but with no third source to corroborate either figure.
This paper uses the product-listing figure (58 RC or higher) in Section 1.5, as the as-sold spec, and carries the internal reference's tighter 62–65 RC range here for confirmation.

ALMEN STRIPS — HARDNESS & CERTIFICATION FRAMING

Two differences appeared between the current Pan Abrasives listing for Almen Strips and Shot_Peening_2.pdf's internal spec (pp.16–17).
Hardness: the listing states HRC 45–48 for both Aero and Industrial strips; the internal reference gives a wider 44–50 RC for the strip stock (SAE 1070 cold-rolled spring steel).
Certification framing: the listing pairs "Aero" with SAE J442, SAE AMS 2432 and AMS-S-13165, and "Industrial" with AMS-S-13165 alone; the internal reference instead pairs AMS-S-13165 with government peening and SAE J442 with industrial. AMS-S-13165 is the current active designation; MIL-S-13165 was the legacy military specification number for the same standard and has since been cancelled.
This paper treats them as the same specification under a variant name, uses AMS-S-13165 throughout — MIL-S-13165 has been cancelled and AMS-S-13165 is the current designation. For hardness, this paper uses the listing's tighter 45–48 HRC in Section 1.5, since it sits inside the internal reference's 44–50 RC allowance and reflects the grade actually sold.

No figures in this paper are estimated, extrapolated, or drawn from outside the named Pan Abrasives / PanBlast™ source documents.

8 Conclusion

Shot peening delivers a specific, measurable mechanical benefit — residual compressive stress at the surface — and Pan Abrasives' six peening-rated media give PanBlast™ equipment a media option for essentially every combination of substrate hardness, contamination sensitivity and production volume: cast steel shot as the ferrous workhorse, cut wire where dimensional uniformity or extra hardness is required, stainless steel and zinc shot for non-ferrous work at two different impact energies, ceramic shot where aerospace-grade peen-forming demands zero ferrous contamination, and glass bead as the gentlest option for critical tolerances on compressed-air equipment.

On the equipment side, the PB-series standard cabinets give a complete compressed-air pathway for all non-ferrous peening and ferrous peening up to the size equivalent of S170 steel shot. Custom engineered projects featuring the RotaMini and RotaMax wheel range covers production-volume peening, and also compressed air cabinets which are capable of handling ferrous peening media sized larger than S170 steel shot — all of it underwritten by the same process controls: Almen intensity, saturation coverage, and continuous classification to hold the 85% round-particle standard that peening, uniquely among blast operations, depends on.

This is White Paper No. 04 in the PanBlast™ / Pan Abrasives technical white paper series. For product selection support or a peening trial, contact your PanBlast™ representative.

Standards Referenced in This Paper

Standard	Scope
SAE J442	Test strip, holder and gauge specification for shot peening (Almen system)
SAE J827	Cast steel shot hardness sampling requirement (≥90% of a batch within stated HRC range)
AMS 2431 (and sub-series /7)	Peening media specifications, incl. cast steel shot (ASR/ASH) and ceramic shot
AMS-S-13165	Shot peening of metal parts — shot number/size tolerances, acceptable vs unacceptable particle shape
AMS 2430	Aerospace Almen gauge specification (digital gauge compliance — Section 1.5)
SAE AMS 2432	Aero-grade Almen test strip specification (Section 1.5)
AMS-S-13165	Cited on current Almen Strip product listings for the same shot-peening specification as AMS-S-13165 above — see Data Note, Section 7

Source: Shot_Peening_1.pdf; Shot_Peening_2.pdf pp.4–13, 24–26. AMS 2430, SAE AMS 2432 and AMS-S-13165 rows: Pan Abrasives website — Shot Peening product listings (captured 13 Jul 2026); see Data Notes, Section 7.