Wheelabrator Impact

www.wheelabratorimpact.com

wheelabrator
impact shaping industry

Contents

Who is Wheelabrator Impact?

Wheelabrator Impact is the specialist subcontract shot peening supplier to industries requiring expertly outsourced shot peening services. With over 50 years experience, Wheelabrator Impact utilises the latest controlled and automated equipment to provide a comprehensive project management process, adhering to high quality standards, in line with the latest international civil and defence industry approvals.

The company's expertise includes shot peen forming, correction peening, saturation fatigue and all aspects of fatigue enhancement, automated aesthetic shot peen and glass bead finishing as well as surface preparation.

The industries we serve, include but are not limited to: Aerospace, Architecture, Automotive / Motorsport, Oil & Gas and general engineering sectors.

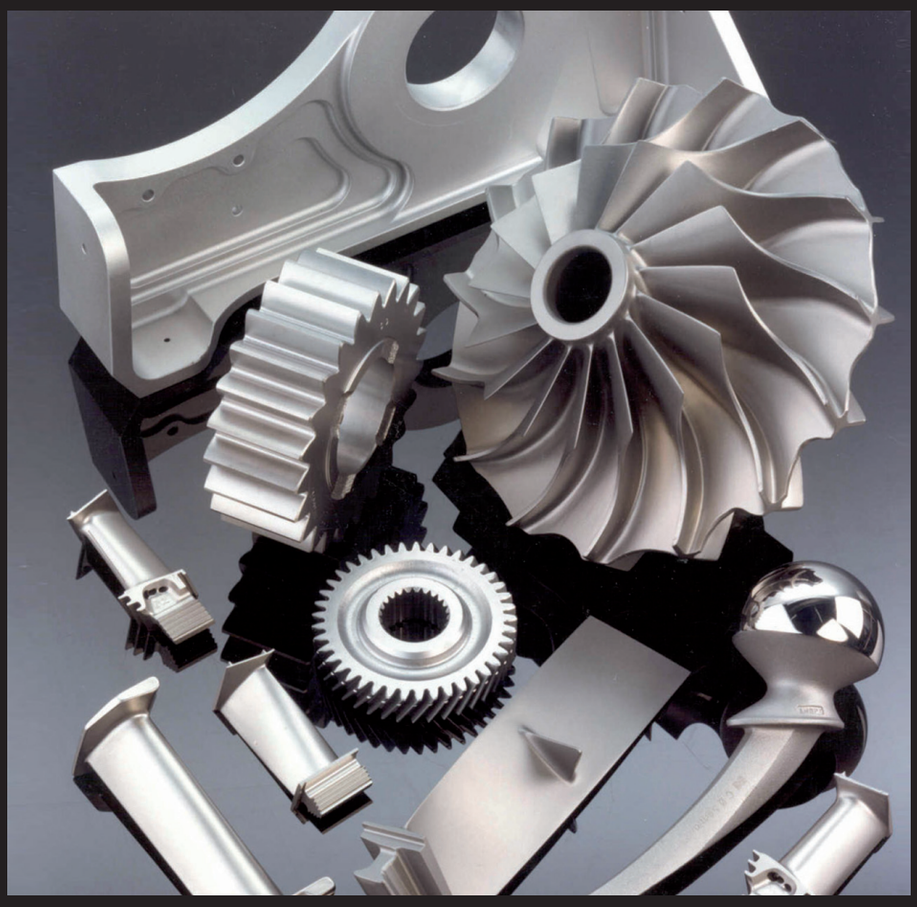
Being part of Wheelabrator Group enables the latest technologies, design, knowledge and innovation to be utilised for shot peening. We invest in our people, to ensure our workforce has an in-depth technical knowledge of the intricacies of the shot peening process.

The company also provides complete supply chain management of the treatment processes including all management of the wet treatments, NDT or coatings applied, subsequent or prior to the surface preparation process.

Why subcontract shot peening?

Shot peening is a highly skilled process which often requires approvals and accreditations. By outsourcing and using the expertise of Wheelabrator Impact, this allows you to achieve your shot peening treatment requirements whilst:

- Having peace of mind that your components will be delivered on time, to budget and to the correct specifications without any project management from you
- Ensuring all your industry approvals and accreditations are met without the need for investment on your behalf
- Minimising your capital investment
- Requiring a smaller workforce
- Having a smaller factory footprint
- Saving time, resource and expense to achieve the high standards
- Allowing the complete flexibility of your process demands for new components
- Benefiting from our standard short turnaround times and importantly our very flexible and admired Aircraft On Ground (AOG) service
- Having the convenience of the shot peening process being carried out at the Wheelabrator Impact premises
- Keeping abreast of the latest industry advice and technology



Quality control

The service, technical experience and quality of the Wheelabrator Impact business is backed up by our long list of aerospace and quality approvals. In the field of Quality Assurance, all of our UK sites achieved ISO 9001 in 1999.

Process control

Wheelabrator Impact's expertise lies in the application of shot peening through effective utilisation of controlled automated equipment and comprehensive quality management systems. This approach enables the process to be accurately repeated by controlling vital and variable process parameters.

Peening media

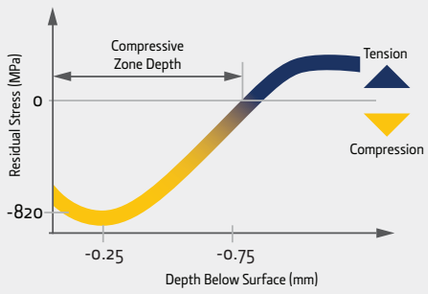
Utilising a whole range of shot peening media to deliver the right application for our customers is very important and Wheelabrator Impact constantly develops new processes incorporating both traditional and more uncommon materials in the peening processes; these materials include ceramics, glass bead, various steel shot and also stainless steel shot.

Service

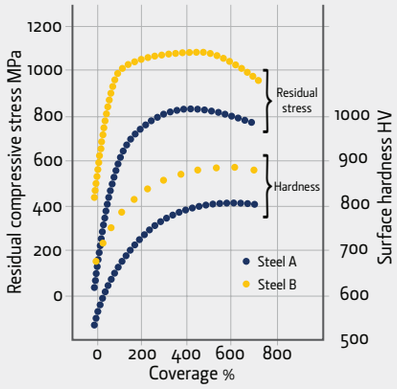
The high level of service so often demanded by the industries we serve is well catered for by Wheelabrator Impact. We offer a range of subcontract shot peening service levels including our premium 'while you wait' service and next day Aircraft On Ground (AOG) service. Additionally, Wheelabrator Impact offers advice, development partnerships and maintains absolute confidentiality.

What is shot peening

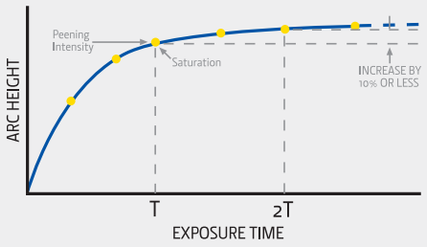
Typical shot peening data curve



Effects of coverage on residual stress and surface hardness



The control process



The mechanics of shot peening

Shot peening is a cold working process used to produce a compressive residual stress layer and modify the mechanical properties of metals. It entails impacting a surface with shot (round metallic, glass, or ceramic particles) with a force sufficient to create plastic deformation. Peening a surface spreads it plastically, causing changes in the mechanical properties of the surface.

The main benefit of shot peening is the delay or prevention of cracks in highly tensile stressed alloy components.

We can alter these undesirable manufacturing and operational tensile stresses to life enhancing residual compressive stresses therefore extending component life.

The process works by introducing the residual compressive stress in the surface of the component. The compressive stress helps to prevent crack initiation as cracks cannot propagate in the compressive environment generated by peening.

Compressive stresses are generated when the impact of each particle of shot on the component produces a small indentation. It follows that if the surface has been dented, then the material beneath the dent has been compressed. Peening generates not just one dent but many thousands over the surface. Eventually the component becomes encased in a compressively stressed layer.

The benefits of the process have been well proven, both with components operating in a highly stressed but relatively short lived environments, such as in Formula 1 motor racing and for critical parts with a much longer and more measured operating life in aero engines and structures for example.

Controlling the process

The value of the residual stress is dependent on a number of variables including the parameters of the peening process and the hardness of the component material. As the process is often used to improve the performance of safety critical components, it is important to ensure that the correct intensity of stress is being achieved, with high repeatability.

The guesswork is taken out of the process by the use of a system that indicates the energy being imparted by the shot. This is achieved with the 'Almen' strip testing procedure. The Almen strip, manufactured in spring steel to strict tolerances of hardness and flatness, is peened on one side only. The effect of the induced compressive stress on the strip results in it bowing or curving. The extent of the curve is proportional to the energy imparted by the shot and is measured on an 'Almen Gauge'. The Almen strip arc height varies according to both the velocity and mass of the shot i.e. the amount of energy imparted by the stream of shot and absorbed by the strip.

Saturation of the component is deemed to have been achieved if, when peening exposure time is doubled, the arc height or deflection of the Almen strip increases by 10% or less.

This control process is shown above in a chart form.

Subcontract shot peening in the Aerospace industry

With the need today to produce lighter, more fuel efficient aircraft, designers are employing lighter and stronger alloys. Shot peening has been identified as playing a significant role in increasing the fatigue life of highly stressed critical airframe components, allowing the further reduction of weight by using parts designed with less mass but the same, if not enhanced, fatigue properties.

Components processed in the aerospace sector at Wheelabrator Impact range from very large wing ribs, spars, wing skins and undercarriage components such as gear ribs, linkages, hydraulic cylinders and bolts, as well as landing gear wheels, down to a very small spring or fixing. In addition, aero engine compressor blades, fan blades, drums, spinners and supporting components are fully catered for.

With ever increasing aircraft build rates and demands on lead times, Wheelabrator Impact is focused on how quickly our customers demand their components to be turned round. Wheelabrator Impact offers a fast 'standard' lead time and also an envied AOG service for those regular unforeseen emergencies that occur often in the aerospace industry.

There are three main elements to the aerospace shot peening processes carried out at Wheelabrator Impact:
1. Saturation fatigue enhancement peening
2. Correction peening
3. Peen Forming

The relevance of peen forming & correction in aerospace

All aspects of the disciplines of peen forming and correction tasks are carried out at Wheelabrator Impact. The forming of complex structural aerospace components by pressing or rolling, whilst effective, can introduce harmful tensile stresses that can result in the initiation and propagation of cracks. An alternative and more commonly used method of shaping or flattening aero structures or skins is to utilise the shot peen process to straighten or shape a component. Since it is possible to form components through shot peening, the process can therefore be used to correct or flatten distorted parts without inducing undesirable tensile stresses. This results in a component of the correct form but with inherent compressive stresses present, thus also introducing the benefit of fatigue enhancing properties.

Turbines

Wheelabrator Impact shot peens many turbine engine components. Components which often require the shot peen process include: spinners, drums, shafts, blades and stators.

Due to the delicacy and thin section of turbine blades, glass bead or ceramic bead peening is often used to reduce the risk of distorting these critical areas. However, the root of the blade is more substantial and more highly stressed allowing higher intensities to be imparted. In this case the higher intensities are usually achieved with the use of a heavier steel shot as is also often the case with other more substantial turbine components.

The range of machines available at Wheelabrator Impact to process the many complex turbine components requiring the shot peening process is extensive, ensuring capabilities and capacity are matched to customers' requirements.

Spinners, blades and shafts often require complex masking and tooling which is regularly designed and manufactured by Wheelabrator Impact.

Aerospace, marine and land based turbine engine component treatments are all part of the Wheelabrator Impact portfolio.

Surface preparation for coating treatments

Surface preparation for coating treatments is another process carried out at Wheelabrator Impact for its aerospace customers. Wheelabrator Impact provides controlled aluminium oxide and shot peening surface preparation for all wet treatments, chrome and anodize coatings.

Plastic media paint removal: a non intrusive process

Cleaning with BIP plastic media is a fast, environmentally acceptable and cost effective alternative to traditional chemical and hand stripping. Unlike chemical strippers, plastic media is biodegradable, non-toxic, non-polluting and the process is now accepted as the optimum method of coating removal for a wide variety of materials and components.

Plastic Media is used in the stripping and maintenance of airframe structures and components. In other words, it does not generate a surface profile as with common blasting processes; the substrate is completely undamaged, and even soft alloys, such as aluminium, are unaffected.

Wheelabrator Impact carries out this process on many delicate substrates both in aerospace, where it is an approved method of coating removal, and in other sectors where the integrity of the surface is paramount.

UK Aerospace certification and approvals

Specifically within the aerospace sector, our UK production sites in Birmingham, Coventry and Slough achieved AS 9100 accreditation in 2009. Additionally, our Wheelabrator Impact businesses in Coventry and Slough have held Nadcap accreditation since 2005. The latest higher level and advanced AS 9100 Revision C accreditation has now also been gained by our UK production sites. This level of accreditation and therefore the agreement to use the Nadcap logo is an achievement we are very proud of.

The site in Slough, which handles mainly large, pocketed airframe components, has been accredited for manual, automatic and peen forming processes. The plant in Coventry, which undertakes work on mainly rotational parts, has been accredited for automatic processes. We have facilities available in France, and from these locations are able to service customer requirements from all over the world.

Wheelabrator Impact is dedicated to maintaining international approvals and accreditations.

Slough shot peening approvals	Coventry shot peening approvals	Birmingham vibratory approvals
NADCAP	NADCAP	ISO 9001:2008
ISO 9001:2008 (FM12623)	ISO 9001:2008 (FM12623)	AS 9100 – Revision C
AS 9100 - Revision C (FM12623)	AS 9100 - Revision C (FM12623)	A E Turbine Components Ltd
Airbus - (10163)	A E Turbine Components Ltd	Alstom
Augusta Westland	Boeing Aircraft (577276)	GE Power
BAE Systems – (BAe/AG/10780/MAA)	GE Power	Goodrich Actuation Systems
BAE Systems Regional Aircraft – (RALOA/00283/1)	Goodrich Actuation Systems	Martin Baker
Boeing Aircraft (653189)	Honeywell	Praxair
Bombardier Shorts SB/VC/178	Meggitt (62073)	Rolls Royce
Dowty Aerospace Propellers Ltd	Messier Dowty	
GE Aerostructures Hamble Ltd (AHL890)	Messier Dowty (Bedos)	
Goodrich Electrical Power Systems	Rolls Royce plc - (81280)	
Hawker Beechcraft HBIFSAS/Part1/0753	Smiths Aerospace	
Lufthansa Technik		
Martin Baker		
Messier Dowty		
Messier Services Ltd		
Ryanair		
Sonaca (Dassault F7X Airbus)		
Spirit Aero Systems Europe Ltd (0235)		

We have a wealth of other customer approvals, please contact us for more information.

Full treatment management service for aerospace products

Full treatment management service for aerospace products

As the aerospace manufacturing sector has become more global, Wheelabrator Impact has developed its services to deliver to a global audience. In particular, we have expanded our critical and finish processes.

One example is after final machining, we can provide a complete treatment process from NDT, anodize and final paint. The finish protective treatment processes in the aerospace industry demand a high standard of quality and conformance. Our high level of certification and exhaustive list of approvals gives comfort to machinists that they will deliver to their customers.

A case study example of our full treatment management service follows.

Customer's problem

A French aircraft component manufacturer had won a large package of work, where they had to machine components and provide full finish treatments. They had no one locally that was approved or capable to provide the treatment processes that they needed to deliver to their customer.

Our solution

We managed all of their wet treatment processes from logistics to and from UK, providing full processes of NDT, Shot Peen, Anodise and final painting. For some processes, we worked in partnership with other companies who have similar aerospace experiences and approvals as Wheelabrator Impact.

With our partners in this project we worked together to ensure we achieved the delivery times, and maintained a consistent quality and price, which enabled our customer to focus on their core competence of machining and assembly.

An ongoing relationship

Our relationship with this French aircraft component manufacturer has been working very well and the feedback from the customer has been very positive. Since this first project, we are now taking on other packages of treatment work where they have the option of local suppliers with approvals and capability, but are choosing to use Wheelabrator Impact due to our consistently better delivery times and quality. This is because they are now gaining extra work as we have helped them improve their own performance to their customer. We are now planning to provide small assembly activity where we can deliver components to the customer in kit form.

Summary

By working in partnership with a number of good quality surface wet treatment companies that have similar aerospace experiences and approvals as Wheelabrator Impact, we can deliver the full management of protective treatment services, including the logistical requirements, ensuring that manufacturers provide a consistent high quality complete service to their customers.

Subcontract shot peening in the Architecture Industry

Wheelabrator Impact provide a full range of modern non ferrous ceramic and glass bead peened finishes on stainless steel and aluminium. The range of shot peened finishes is known as 'Peen Plus'. Architectural shot peen finishing is now the preferred finish solution for the cosmetic finish on stainless steel cladding, skirtings, doors and hand railing on underground and mainline railway stations, airport terminals as well as public and commercial buildings and sculptures.

The Peen Plus range of finishes is ideal for heavy pedestrian traffic areas and the finishes offer the following benefits:

- Completely non ferrous process resulting in no rust spots or inclusions
- Increased surface hardness of the material
- No need for additional coatings which are expensive to maintain, have a short shelf life and have a greater impact on the environment
- A proven lifetime guarantee finish
- Increased resilience to anti social behaviour.
- Increased resistance to corrosion
- Environmentally friendly as the material is fully recyclable
- A pleasing contemporary aesthetic look
- Low reflectivity
- Work hardened surface resulting in increased resilience to scratches

The architectural finishes are achieved utilising our expertise and fully automated shot peening equipment, ensuring a consistent and repeatable finish even on large surface areas and high volume projects.

The Peen Plus finishes can be seen at many London Underground stations. There is also a handy presentation pack of Peen Plus swatch size samples available which is ideal for architects and fabricators' libraries, if you would like a sample pack, please contact impact@wheelabratorgroup.com

Architecture case study
Giant's Causeway Visitor Centre

The new visitor centre at the Giant's Causeway in Northern Ireland is a bold architectural design that mirrors the dramatic basalt formations of the Causeway with its raw and minimalist aesthetic. To realise the architects' vision of "quiet monumentality", shot-peened steel surfaces played a key role in the composition.

A pure design for raw nature

A UNESCO World Heritage Site, the Giant's Causeway in Northern Ireland is a natural wonder – an area of around 40,000 interlocking basalt columns, most of which have a distinct hexagonal shape and are the result of a volcanic eruption 60 million years ago.

The tops of the columns, some up to 12 metres high, form stepping stones that lead from the foot of the cliff into the sea. The most visited attraction in Northern Ireland, the Giant's Causeway's new visitor centre opened in July 2012 and is now set to become a landmark in its own right thanks to its stunning architecture.

The Centre was designed by the leading architects Heneghan Peng. The architects' vision was to craft a building that nestles into the landscape, mirroring the bold material and geometric lines of the Causeway itself. The panel that awarded Heneghan Peng the project described the winning design as "exuding simple and quiet monumentality".

Inside, the building is dominated by polished concrete, glass, steel and oak – all crafted with absolute precision. The result is a composition that looks simple and clean, yet was full of technical challenges.

Raw stainless steel, exposed to nature

Wheelabrator Impact met with the architects at the Design stage to advise on specification and treatment needed for this application – especially considering the environment of the object in situ. We worked closely with a number of companies on the project, to marry an ambitious aesthetic vision with what is technically possible.

One of these challenges was the creation of a raw stainless steel finish on a number of dominant features across the open building – which had to be engineered to withstand the salty wet air of its coastal location.

The most striking of these steel objects is a 5 metre high, 1.5 metre wide steel column in the entrance area of the centre. Half-exposed to the weather, it marks one end of a long glazed slit in the ceiling through which light pours in on the sculpture-like steel structure.

Made up of six sheets, each 30mm thick and 5 metres long, the column weighs three tonnes and is made of duplex stainless steel, a material most commonly used for offshore structures due to its extreme-weatherproof qualities. The shot peening process delivers a lustre finish with a reflectivity that can be subtly varied to suit the individual environment. The process can also prevent the initiation of pitting corrosion, a huge benefit in the hostile saltwater environment.

Another stainless steel surface shot-peened for the Centre was steel wall cladding in two areas of high-traffic and exposure to open air, for which softer, cold-rolled steel in much thinner sheets could be specified. But here too, a uniform and even finish across a large area was key.

The visually stunning roof top of the Centre, which blends into the environment, is also framed by the balustrades which sit atop of the basalt columns, again, these stainless steel items needed to be shot peened in order to withstand the salt water exposure of the Irish Sea.

A technically challenging shot peening project

Wheelabrator Impact delivered the majority of the surface finishing at the Centre. Durability and straightforward maintenance were key requirements for the client, and shot peening delivers a finish that will stand the test of time without further maintenance apart from cleaning with soap and water.

With large flat areas of material such as the stainless steel column and cladding sheets fitted at the Causeway, it is very important that the shot-peened finish is even and consistent right across the sheet. To achieve this the shot-peening process has to be carried out in an automated environment. Wheelabrator Impact use the highest standard multi-functional automation to achieve the necessary standard of process control. The result is the extremely even lustre you can see across large sections of the architectural sculptures.

Comment from Tony Grammauro, General Manager, Wheelabrator Impact

"As one of the few shot-peening experts in the UK who can handle objects of this size and to this specification, Wheelabrator Impact provided advice and expertise from the initial discussions with the architects. We have been involved in this project for nearly two years prior to completion in July 2012. We have worked with different lead parties as a key partner in achieving the architect's vision. We are delighted that the level of detail and care that has gone into all the deliverables can now be enjoyed by all the visitors to this World Heritage Site."

Subcontract shot peening in the Oil and Gas (offshore) Industry

Wheelabrator Impact specialise in providing shot peening services for critical engineered components in the oil and gas and exploration industries. The industry is a heavy user of duplex stainless steels which often require shot peening processes.

Common component examples are:
- Collars
- Agitators
- Pumps
- Pipelines
- Structures
- Manifolds
- Turbo Expander Sets
- Safety Valves

With components, welds and threads under such extremes of stress loading, shot peening methods are employed to maximise the durability of these parts. Costing millions to deploy, prevention of field installation, breakages and down time is essential.

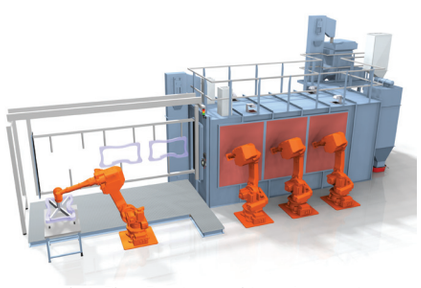
Shot peening has proved its effectiveness in extending the service life and enhancing the performance of metal components in this sector by protecting them against fatigue failure. Wheelabrator Impact offer a shot peening sub contract solution in the oil and gas industry for:
- Fatigue failure issues
- Fretting fatigue
- Stress corrosion cracking
- Weld failure issues
- Other failure mechanisms.

The oil and gas industry is heavily dependent on short lead times for shot peening services and Wheelabrator Impact is very well suited to provide the necessary support to this industry and ensure customers' inventory is kept to a minimum.

Shot peening equipment

In addition to subcontract shot peening, Wheelabrator Group also offers a range of shot peening machines to meet the requirements of all industries.

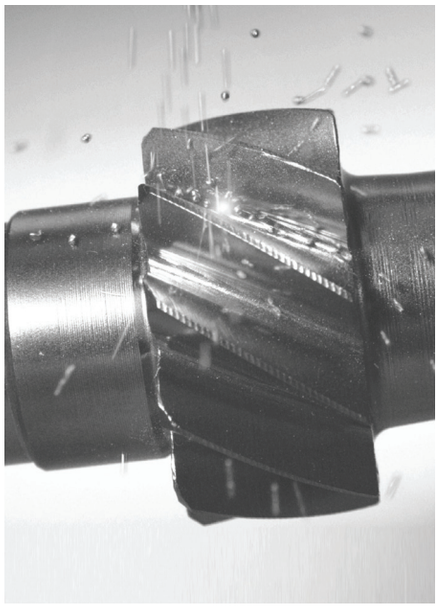
Wheelabrator Group has the capability to realise complete solutions with different blasting processes from one source, with the ability to combine air and wheel blast technology. Wheelabrator Group offers a range of innovative solutions to fulfil customers' needs.



Automated Air Blast Peening machine - Automotive

Automated Air Blast Peening machine - Aerospace

Subcontract shot peening in the Motorsport/Automotive Industry



Wheelabrator Impact apply fatigue enhancing, controlled, automated shot peening processes to most metallic/alloyed components incorporated in a motorsport racing vehicle. These processes are also increasingly being applied to everyday automotive motor vehicle production.

The applications for shot peening in auto sport and automotive engineering are highly varied and are applicable to most high cyclic stress loading environment conditions, including performance sports cars and also very large plant vehicles.

Applications

In gear peening applications the process offers distinct benefits. Firstly, the introduction of compressive residual stresses helps to prevent crack initiation, thus lengthening the life of the gear. Secondly, the resulting extremely shallow dimpled finished produced on the hard surface of the gear teeth provides improvements in lubricant retention between the contact faces of the gears.

This process can also benefit a wide variety of other components such as drive shafts, pinions, clutch components, con rods, pistons, crank shafts and casings, amongst others. Even structural elements such as frames, chassis, wishbones and brake components can derive a considerable benefit from this process.

Wheelabrator Impact also offer the REM super finishing green isotropic process specifically designed to polish the surface of gears. This process reduces friction increasing the transmitted power and decreasing noise.

Wheelabrator Key facts

- Over 30 globally situated sales and service centres
- Serving customers in over 100 countries
- Over 22,000 product lines in stock
- Over 400 technical experts globally

Shot peening subcontract services are offered globally but delivered in limited locations.
You can contact us at our subcontract shot peening headquarters:

Wheelabrator Impact Finishers
107-109 Whitby Road
Slough
SL1 3DR
T: +44 1753 215676
F: +44 1753 215670
E: impact@wheelabratorgroup.com
W: www.wheelabratorimpact.com

wheelabrator
impact shaping industry