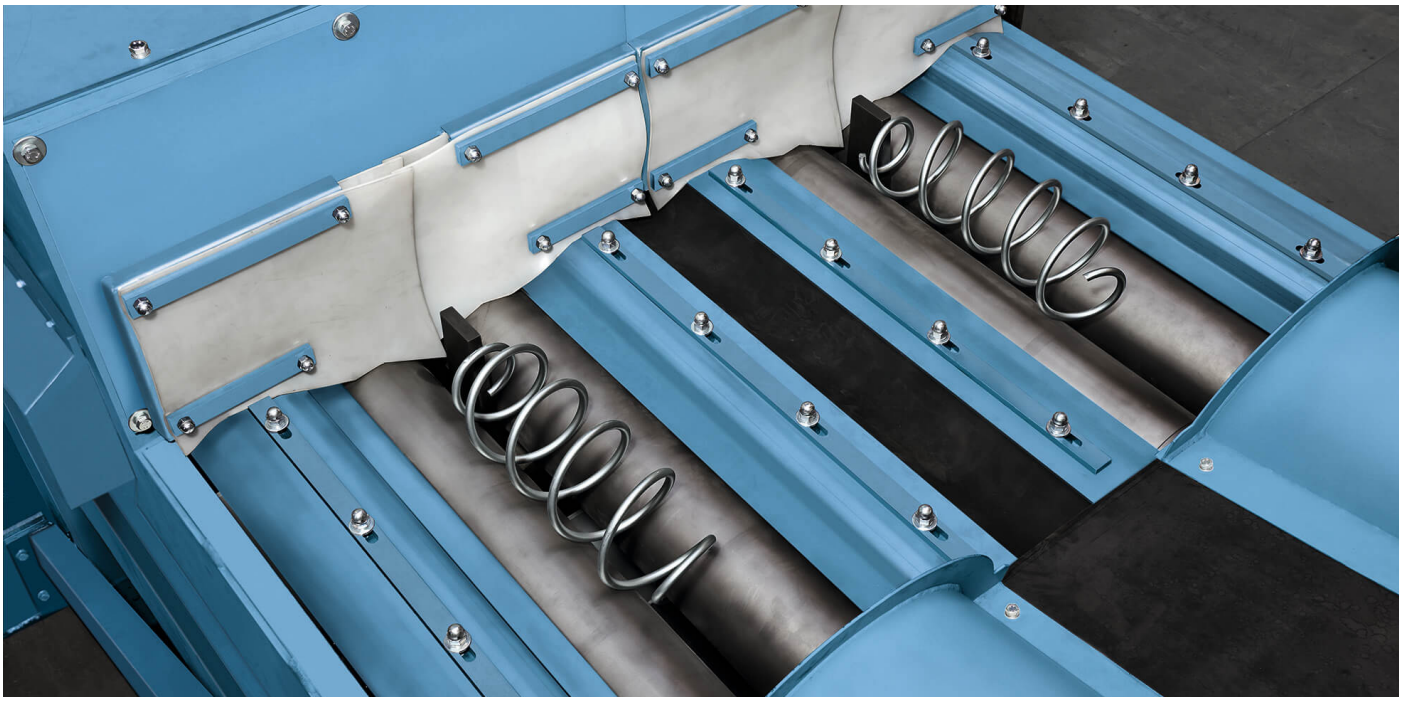
Wheelabrator

Safety & Performance: Shot Peening for Rail



Rail operators know metal fatigue is dangerous.

The disaster at Eschede, Germany, in 1998, caused by a single broken train wheel, killed over 100 passengers. And that was just one incident in a string of serious accidents due to fatigue failure since the dawn of railway travel.

To improve the fatigue performance and other characteristics of metal components, the rail industry has relied on peening for over a century. The industry has two major peening applications: first, as an anti-fatigue measure for critical parts like wheels and, second, to make springs "spring", increase their operating life and improve their fatigue strength too.

But first: what is peening?

Peening for Performance and Safety

Peening is the process of working a metal's surface to improve its material properties. Simply hitting metal with a hammer (cold working) causes plastic

Wheelabrator's fully-automated Railway Wheel Peener offers fine process control, using two blast wheels that target each wheel simultaneously from both sides

deformation and induces a residual compressive stress in the peened surface.

That compressive stress makes crack formation less likely and delays some types of corrosion. Peening also hardens a metal's surface layer, further reducing the likelihood of crack formation and increasing abrasion resistance too.

However, manual peening is a slow, laborious affair. Shot peening is far faster, with each spherical shot acting as a miniature ball-peen hammer. Shot is accelerated towards the workpiece surface using airblast (driven by compressed air) or wheel blast (shot is introduced into the centre of a spinning wheel and flung out by centrifugal force) technology.

Airblast, Wheel Blast, Process Control

Airblast machines are more suitable for peening smaller quantities of components; manual airblast control is common but automation is possible too. Wheel blasting is ideal for a fully automated process where blasting intensity must be set and maintained to match the desired Almen value and component coverage.

There are challenges to overcome. Peening is a precise surface treatment that requires fine control to achieve the specified result – absolute accuracy and repeatability are vital. It must also be carried out quickly and cost-effectively in order to economically process high volumes of parts.

Peening in Rail: Fatigue Strength

The first major rail application is fatigue treatment of critical parts like wheels and axles. Constantly turning in operation and subject to high forces, wheels and axles endure many millions of loading cycles. This causes movement within the metal (dislocation movement), leading to crack initiation and propagation. As the component approaches and exceeds a certain number of cycles (the fatigue limit), cracks become longer and more numerous, making serious damage and failure much more likely. Peening increases these components' fatigue strength, which allows a combination of higher loadings and longer times between mandatory crack inspections.

Peening in Rail: Wheels

For critical, high-volume rail applications like wheels, highly specialist, super-efficient equipment has evolved over time. Wheelabrator's Railway Wheel Peener (RWP), for example, is a fully-automated, high-capacity, in-line shot-peening machine that offers fine process control, able to monitor and control variables such as blast velocity, blast media size and media flow rate.

Trusted by rail specialists such as MG-Valdunes, the RWP shot-peens railway wheels using two blast wheels that target each wheel simultaneously from both sides. Wheels roll in and out of the blast

cabinet assisted by automated work handling while a roller arrangement spins each individual wheel in the blast stream.

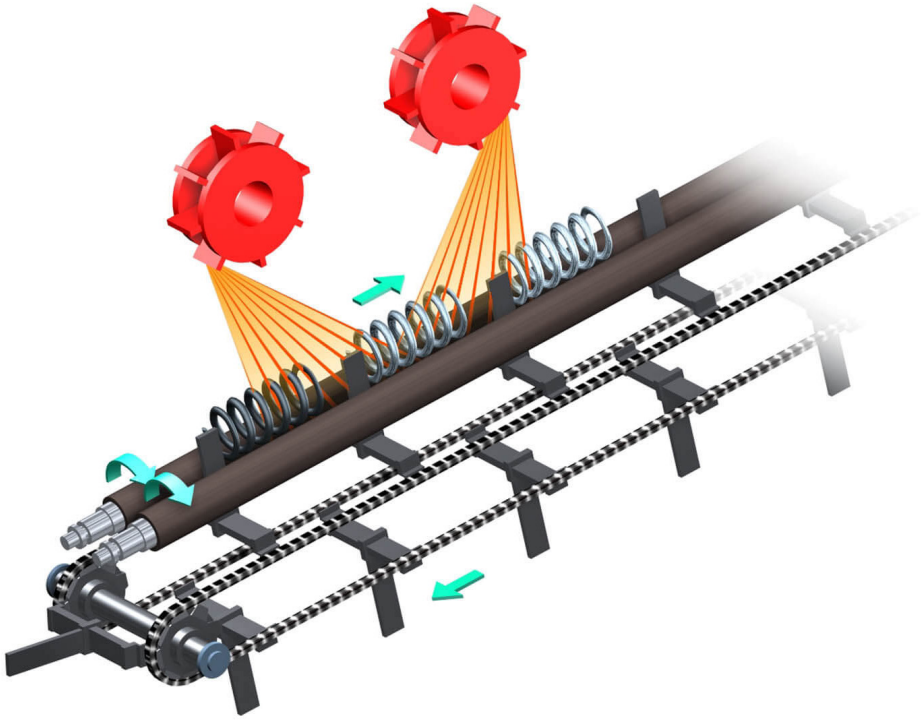
Wheelabrator blast wheels deliver high shot energy, excellent energy efficiency and reduced machine maintenance. An automatic reclaim system recycles the blast media, removing any scale or dust. The RWP's blast chamber is made from highly wear-resistant steel, with the blast zone protected by Wheelabrator's replaceable Long-Lyfe® liners.

Peening in Rail: Surface Treatment for Springs

Torsion, tension and both leaf and coil compression springs are vital parts of both trains themselves and other rail infrastructure such as buffers and signalling. Shot peening increases spring fatigue strength and lifespan, raises their maximum working load and prevents sagging.

Here, too, special machine concepts have been developed that make the treatment of springs fast, economical and reliable. Wheelabrator's RDS machine is purpose-built for spring peening and is perfect for treating the coil compression springs found in primary (bogie) and secondary (carriage) rail suspension systems and in air brake cylinders. Parameters like throughput speed, blasting time, discharge speed, shot size and distribution can be controlled with absolute precision, consistently delivering exactly the right peening intensity and coverage.

The RDS cuts peening costs with its automatic operation, high output and uniform quality. In-line coil spring shot peening machines like the RDS convey coil springs on parallel rotating rollers with pusher fingers that transport them through the blast zone. Multiple blast wheels target the springs, providing different blast angles that peen the coil springs as they spin through the blast cabinet.



Wheelabrator's RDS machine is purpose-built for spring peening and is perfect for automatically treating the coil compression springs widely used in rail

The RDS's continuous throughfeed operation is simple, safe and ideally suited for fully automatic production, with a range of flexible loading and unloading options. With its compact design, the RDS requires minimal space and can be easily integrated into existing production lines.

Delivering Perfect Peening

Cost-effective and reliable, modern shot peening technology avoids complicated, expensive or manual processes and is often the only practical option available for increasing the fatigue strength of rail components.

Wheelabrator's purpose-built shot peening machines let this vital surface treatment technique be applied accurately, consistently, quickly and economically, regardless of the shape and size of the workpieces.

For railway operators, maintenance specialists and manufacturers alike, Wheelabrator's peening equipment helps ensure the safest rail operations with maximum operating time and minimum service downtime.

www.wheelabratorgroup.com/airblast

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Save time and money with highly efficient shot blast processes

We offer a full range of shot blast solutions for the rail industry – from cleaning track to peening springs, from processing wheelsets to blasting whole carriages.

Increase your capacity, improve your productivity, stabilise your process.

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