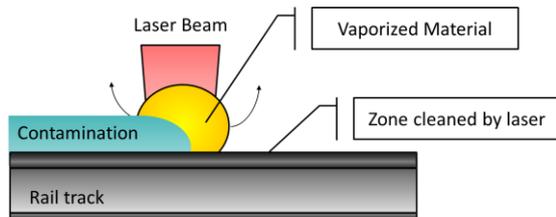




The LaserTrain: Fully Eradicating Slippery Railways

Railway companies have always been plagued by slippery rails because of falling leaves, grease, oil, diesel, rust and water during the autumn. This often leads to delays or in the worst case scenario safety hazards. The LaserTrain can solve this problem by using laser technology. Although laser cleaning is a proven technology applied increasingly in various industries, it is new to the rail industry.

Our LaserTrain briefly heats the organic material on the rails. As the organic material expands more rapidly (ablation), it separates from the rails. By removing the contaminated layer, the level of friction can be kept in the optimal state year-round.



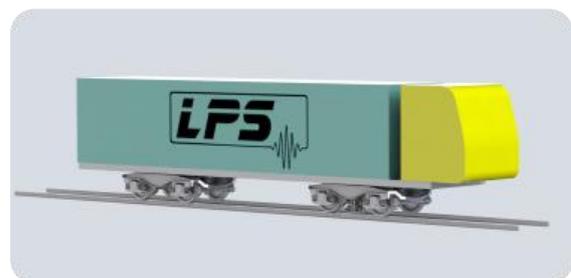
Advantages

- Increased **traction**, less slip, faster acceleration, better braking and less energy loss.
- Increased **safety** due to better train detection.

This leads to:

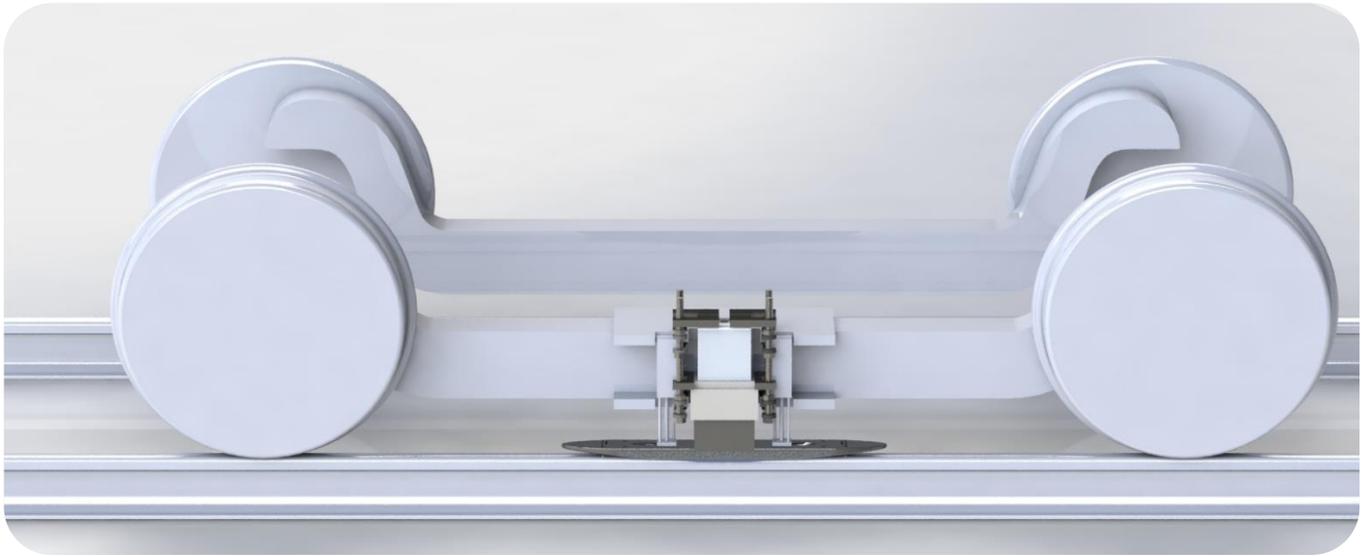
- Increased railway safety.
- Increased track availability.
- Increased total track capacity.
- Decreased vehicle maintenance.

The system of the LaserTrain is delivered as a 40 foot container standardized version which can be mounted on a Multi-Purpose-Vehicle, with the cleaning system mounted on the bogie. The LaserTrain cleans the contact area of the railhead on each side of the track at speeds up to 65km/h.



The construction can be adapted for use on most rail-based vehicles and can be adjusted for various track gauges. The system incorporates a suspension system to protect the optics, precise positioning of the laser beam and added laser security. Tests have shown that rails and other infrastructural objects are not damaged by the ablation process in any way.





How it works

A high intensity laser pulse is focused on a surface, rapidly heating and ionizing the material by radiative heating. The material will either vaporize or sublime. The ablation process is governed by characteristics of the ablation laser such as its wavelength, energy density, pulse duration and both the optical and thermodynamic properties of the substrate material and contamination layer.

The most important laser parameter governing the effectiveness of the ablation process is the energy density. If the energy density is below a certain threshold called 'the ablation threshold', the material will not heat up sufficiently in an instant and thus will not vaporize. Above the ablation threshold, vaporization will occur. In case of the autumn leaf problem, the ablation threshold of the contamination layer is much lower than the ablation threshold of the railway track. This makes it possible to remove the slippery contamination layer from the railway track without causing any damage to the railway track itself.

The design

The alignment of the laser requires in-depth knowledge of railway operations, bogie dynamics and laser techniques. The position of the railhead relative to the optical lens must stay within the critical operating range. In order to do this LPS developed an optics box that ensures the optimal position. With our optics and laser, the energy density is above the ablation threshold and the ablation process is effective. The optics box has been designed to withstand all vibrations of trains and the design of all elements has been simplified over and over again to create a system with the least moving parts. This ensures the highest reliability of our cleaning method over a long period of time, with low maintenance.

The product

Three LaserTrain versions are currently designed:

- **15km/h:** For large switching yards.
- **25km/h:** For cleaning dedicated lines.
- **65km/h:** For cleaning nationwide networks. Available early 2019.

Further information?

Please visit www.laserprecisionsolutions.com

