

PLASMA \\ TRACK

Leading the way in
rail track cleaning
technology.
Viewpoint 2022



Sustainability

PlasmaTrack \ \ A more sustainable solution to the problem of leaves on the line

Following the COP26 summit at the end of 2021 and the growing impetus to cut carbon emissions to arrest the acceleration in global warming, the importance of sustainability is once more moving to the front and centre when it comes to long-term transport planning. The rail industry, along with other mass transit solutions, obviously has an important role to play, and it is good to see the industry ensuring that, in becoming part of the solution, it is not becoming part of the problem.

Documents such as Network Rail's Environmental Sustainability Strategy 2020 – 2050 not only cement the UK network's ambitions to be a low-emissions railway with a target of net zero by 2050 (2045 for Scotland), but also pay close attention to the adaptations necessary to make the network resilient to climate change, improve biodiversity, and adopt the minimal waste ethos of the circular economy.

It is critical the all the railway process can fit within this framework. As well as recognizing there is now an urgency to reach Net Zero and the need for change to get there, as well as embracing new solutions to solving the problems of low rail adhesion in the autumn season.

The environmental cost of water jetting

The environmental impact of current water jetting technology is substantial. A fleet of dedicated trains racks up 1.04 million cleaning miles and a large carbon footprint every year carrying heavy tanks of water. This is sprayed onto the rails at a rate of 1,000 litres per minute at a pressure of 1500 bar. Not only are the emissions of running this fleet high, but approximately 180 million litres of water carrying toxic by-products from the rail environment are discharged into the surrounding ecology every year as both runoff and spray. The pollution that results has a profound impact on trackside biodiversity and the local environment.

What is required if line cleaning is going to meet the goals of the Environmental Sustainability Strategy is a way of disposing of the leaf layer that both reduces environmental impacts in the trackside environment and reduces the carbon footprint of the overall operation.

\ \ The PlasmaTrack solution does just that.

PlasmaTrack is a commercially viable and sustainable rail cleaning solution that has been designed for the 21st Century. It works by applying a high voltage direct current to a compressed gas, which turns it into a plasma jet comprised of high energy electrons and ions. This is then applied to the rail head at speed at approximately 700°C where it thermally ablates the compressed leaf layer.

It restores the track to a clean, dry, and uncontaminated state, creating summer braking conditions with a single pass. It enables trains to run to normal timetables all year round, leading to increased network capacity and the end of seasonal timetabling.



Environmental cost
1.04 million
cleaning miles each year



Environmental Impact
180 million litres
of contaminated water



PlasmaTrack cuts
water consumption,
harmful by-products
and carbon emissions



PlasmaTrack plasma
jets thermally ablate
compressed leaf layer



PlasmaTrack solution
restores track and
enables trains to run
more efficiently all year

Environmental benefits

As well as enabling summer running conditions all year round, the PlasmaTrack solution provides significant benefits to any rail network trying to achieve sustainability targets. **In summary these are:**

There are also future developments in the PlasmaTrack roadmap that realise further environmental benefits. A low-energy projected passenger/freight train-mounted system uses multiple lower energy heads along the full length of the train designed to produce a cumulative benefit for the host train and following services. As well as obviating the need for dedicated trains to be scheduled to deal with the leaf layer problem, its operation during braking and initial acceleration could be powered via either surplus energy from the drive system or potentially use regenerative energy from the braking process itself, further minimising its energy costs and footprint.

This is also part of a wider ecosystem being developed that couples modular cleaning solutions with automated track sensing and data capture via the PlasmaTrack Intelligent Sensor. Based on RAMAN spectroscopy, this is being designed to identify black spots and apply remedial action before any operational issues develop. This allows the rail network to be proactive rather than reactive, minimising necessary operations and carbon footprint at the same time.

Reduced fuel consumption per treatment mile



PlasmaTrack harvests the raw material it requires to create the plasma jet, nitrogen, from the surrounding atmosphere. This makes the deployed solution lightweight and reduces fuel costs and emissions per treatment mile.

No consumables



Using nitrogen harvesting reduces the impact of using consumables at all indirect points in the process (Scope 3 standard).

No negative environmental impact



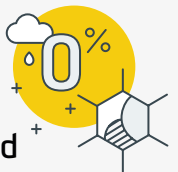
The thermal ablation procedure vaporises the leaf layer, which dissipates harmlessly in the localised environment. It is non-toxic, with zero impact on the water table and trackside ecology.

No impact on track circuits or signals



By avoiding the use of water, there is less damage caused to the rail environment. This reduces the footprint produced by increased maintenance, replacement etc.

No negative effect on railhead metallurgy



Rigorous metallurgical testing has revealed that the plasma jet has no harmful impacts on the rail itself, prolonging the lifetime of the existing infrastructure.

Time for change

Low adhesion is a continuing problem for rail networks and a significant ongoing cost which has profound impacts on the way a network is run. Not only is current technology failing to address the issue, but it is doing so at an appreciable environmental cost. Running special, heavy trains laden with water produces a significant carbon footprint in terms of fuel alone, and the environmental impact of millions of litres of tainted runoff entering the surrounding ecosystem and water table is substantial.

Sustainability is a key driver in strategic business decisions, the importance of which will only grow over the coming years as the impacts of climate change become increasingly widespread. PlasmaTrack offers a solution to mitigating low adhesion that is not only effective in dealing with the leaf layer, but does so with a minimal environmental impact from the first day of deployment.

With further environmentally friendly technologies on the developmental roadmap, such as using regenerative energy, the PlasmaTrack system will help ensure that organisations like Network Rail can meet the targets set out in the Sustainability Strategy 2020 – 2050 to serve the nation with the cleanest greenest mass transport. It will also enable rail networks worldwide to play their role as part of the overall solution to lowering emissions effectively and sustainably into the future.

Read further viewpoints:

- › Commercial viability
- › Technology

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