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Plasma leaf zapping – a space age solution to an age-old problem

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Leaves on the line. Always elicits a groan from passengers, and possibly the oldest joke out there when it comes to moaning about delayed trains.

You wouldn't think dealing with such a problem would require an overly cutting edge solution – surely it's a case of sweeping them away? Not so, according to Network Rail, who throughout October have been trialling a space-age solution to this very autumnal issue.

A fleet of multi-purpose vehicles (MPVs) fitted with lasers and plasma jets are undergoing testing on the East Lancashire Railway heritage line, to see if the cutting-edge solutions could be the answer.

If it all sounds a bit 'Dalek-y,' well, that's because it is, however the lasers and jets may provide a sustainable way to vaporise autumn leaves from lines, helping minimise passenger delays. Currently, high pressure water systems are used to clear the leaf mulch, but engineers have been trialling the two alternatives, provided by:

- Laser Precision Solutions – The 'LaserTrain' uses three high powered beams per railhead to treat the rails. When the intensity of the lasers hits the railhead the contamination instantly vaporises (ablates), without heating up the rail.
- PlasmaTrack – Uses direct current (DC) plasma technology which uses heat and active electrons to split things apart. The high energy electrical plasma beam tears apart the leaf layer as well as heating and burning it off.

Suhayb Manzoor, Network Rail project engineer, said: "Leaves on the line are often seen as a joke on the railway but they can cause serious problems and we're always looking at new ways to tackle this age-old problem.

"It's also not unique to Britain, with railways all over the world having issues when trees shed their leaves. For that reason, it's exciting to be putting some of the newest technology out there to the test with the hope that one day it could help Network Rail keep passengers and freight moving safely at this operationally challenging time of year."

The current water treatment fleet covers one million miles between October and December, the same as treating the entire network 50 times over (or going to the moon and back twice). To do this, it has to use around 200 million litres of water isn't very sustainable.

In addition, the fuel needed to transport it around the country is significant, both from a cost and environmental point of view.

If the tests find lasers or plasma can clean the rails effectively, further development work will be needed to see if it would work on the complexities of the live railway network.

Ben Medendorp, Laser Precision Solutions head of finance and commerce, said: "Normally you really have to move mountains to get access to a railway network, so having a testing site like this which is secluded where you can take measurements every day is essential to gather data.

"I really do think that Network Rail is taking a leadership role in the industry by solving this global issue of low railhead adhesion. We are proving technologies and learning valuable lessons that could help railways around the world."

Julian Swan, PlasmaTrack chief executive officer, said: "Having three weeks of uninterrupted testing available on an operational railway isn't usually possible so being able to carry out these trials with Network Rail and East Lancashire Railway have been invaluable.

Side view of the plasma jet in action

“We’ve learnt a lot on how the autumn treatment trains (MPVs) currently operate, and how the PlasmaTrack system could benefit train wheel traction and protecting wheel-slide caused by leaves on the line.”

Mike Kelly, East Lancashire Railway chairman, said: “When people think of heritage railways, they probably think they just look at preserving the past, but here at the East Lancashire Railway we want to be a moderniser too.

“We’re very proud to be able to play our part and provide our tracks and infrastructure to allow Network Rail to do their important research and development, and excited to be at the forefront of technology which could make millions of future journeys better for passengers across the country.”

Image credit: Network Rail