

UIC Strategy on the Future of Vegetation Control



The railways are actively developing a holistic approach to integrated vegetation management on railway track.

The objective is to progress from a single method-based concept - spraying of conventional chemical herbicides - to an integrated, flexible, multi-method-based approach.

This new approach allows treatment to be fine-tuned to a large variety of conditions.

The aim is to progress from:

a static approach to a dynamic, condition-based approach

a single method to a flexible mix of methods; from conventional chemical treatments to alternative, herbicide-free methods

purely operational weed control to an integrated approach comprising preventive and operational measures, including impact assessment, as well as continuous monitoring of the track

specialised single-method application vehicles and equipment to versatile and flexible multi-method technologies for application

standalone IT systems for monitoring, reporting and impact assessment to automated IT solutions integrating all of the functionalities required for integrated vegetation control

vegetation control to plant-specific measurements, taking individual plant physiology, ecology and dispersion strategies into account



Optimisation of herbicide use

The use of conventional chemical herbicides is currently by far the most cost-efficient and effective method of vegetation control on the track area and offers the best operational performance (see [HERBIE Report](#)). The most promising alternative methods are not yet mature enough for application at industrial scale in the area surrounding the railway track and therefore need to be adapted for railway use. Thus, further commercialisation - as well as optimisation of use and reduction of the quantity of conventional chemical herbicides required - is of paramount importance in the short and medium term.

These objectives can be achieved by

- using state-of-the-art technology for spraying trains with automatic plant detection, avoiding duplication of treatment in the space between double tracks by automatically closing relevant nozzles and reducing spraying angles
- developing and implementing plant species recognition and automatic adaptation of herbicide mixtures and dosage in accordance with the actual population of targeted plants
- development and approval of scientifically substantiated, sustainable herbicides for railway track
- rapid implementation of automatic plant detection for the application of herbicides with road-rail vehicles and small motorised equipment. Since the proportion of herbicides applied with technologies other than spraying trains is high - accounting for 50% of total herbicide use in some companies - this measure will significantly reduce the quantities of herbicide used on the track area



Alternative methods

The most promising alternative methods for vegetation control - hot water, superheated steam, electro-weeding and organic acids, evaluated in the Herbie Report - are not yet mature enough for large-scale industrial application on the railway track area. They are currently used outside the railways either manually or with small motorised equipment, with relatively low levels of automation and offering significantly lower operational performance in comparison to spraying trains with conventional chemical herbicides.

Consequently, the railways need to focus efforts on further testing, developing, optimising and adapting these alternative technologies. The main research and development focus should be on

- adaptation to the specific requirements of the railway track area (special geometry of the track, electrical installation or devices)
- automation and improvement of operational speed
- improvement of the duration of the effects of treatment (reducing the need for multiple treatments)
- reducing specific costs per track km or m²



Standards

The current paradigm of zero weed on tracks (especially the ballast) needs to be assessed and, if necessary, replaced with a more targeted, standardised approach. Standardisation shall be defined as an acceptable degree to which the presence of vegetation can be tolerated which, in turn, is defined in accordance with

- the track category and priority
- the requirements for track quality
- actual operational patterns - frequency, speed, schedules, etc.

This new, standardised approach provides a new basis for further potential reduction of herbicide use in the railways, supporting more rapid implementation and the use of alternative methods.



New contracts

Railway infrastructure managers may use new calls for tender and new types of contracts for vegetation control to promote alternative methods, already used by some UIC members, by creating demand and facilitating better market penetration. By specifically requesting vegetation control without conventional chemical herbicides in specified areas, and by defining the required track quality but not the technologies to be used, contractors are encouraged to develop high quality, cost-efficient alternative solutions. The tendering process may be supported by incentive schemes.



Application technologies

The various application technologies for methods of vegetation control range from rail-based technologies (spraying trains and road-rail vehicles) to small motorised machinery. Manual applicators should be further developed to enable a multi-method approach, together with flexible and efficient coverage of the whole network. They can be further enhanced to offer higher levels of automation, flexibility and cost efficiency. There should be a strong focus on concepts that are technology-agnostic, i.e. basic vehicles and tools that can be equipped with applicators for various methods of vegetation control. In addition to the application technologies currently in use, robotic platforms may offer high levels of automation and flexible application technology in the long term.



IT tools

The integrated system of vegetation control has to be supported by powerful IT systems and tools (e.g. geographic information systems, databases). These tools offer important functions such as status monitoring, recording of treatment, documentation and reporting, impact assessment and risk assessment (in relation to the environment, human health and cost of implementation) as a basis for further planning.

Railway operators and other stakeholders will be able to optimise vegetation management by integrating the various functions and IT tools and automating the relevant processes.

