

A Clean Solution – New Methods of Railway Infrastructure Cleaning

The phrase “clean railway technology” is usually associated with alternative drives, exhaust emissions and diesel particulate filters. Cleanliness is also essential where millions of people are on the move every day: on platforms and railway tracks. The track condition is directly related to track availability, and there is also an increasing health risk, in particular in the underground infrastructure. The removal of dirt at regular intervals is, therefore, a major challenge for the operators of busy urban rail networks:

- o Dirt from lubricants or abrasion on components leads to damage to vehicles and installations.
- o Dust and rubbish on tracks and in tunnels impair railway operation and increase the risk of fire and accidents.
- o Fine particulate dust from abrasion from vehicles in tunnel systems and underground stations endanger the health of passengers, railway staff and trackworkers (see box).

To ensure operational safety, reduce maintenance costs and increase customer satisfaction, an increasing number of transport companies implement regular preventive cleaning:

Cost factor:

- o Fewer line closures and cancelled trains
- o Increased ballast quality and reduced maintenance costs
- o Reduced growth of plants on the track

Health factor:

- o Significant reduction of fine particulate exposure levels
- o Healthy working conditions for staff

Feel-good factor:

- o Improved image and acceptability due to clean stations

How can track cleaning be made systematic?

A large number of individual solutions are used for the cleaning of track and installations depending on operator and network. This costs time and money and makes the regular, targeted removal of dirt as part of preventive maintenance more difficult.

The modular cleaning machine system (RO-CLEAN) brings new quality, process safety and

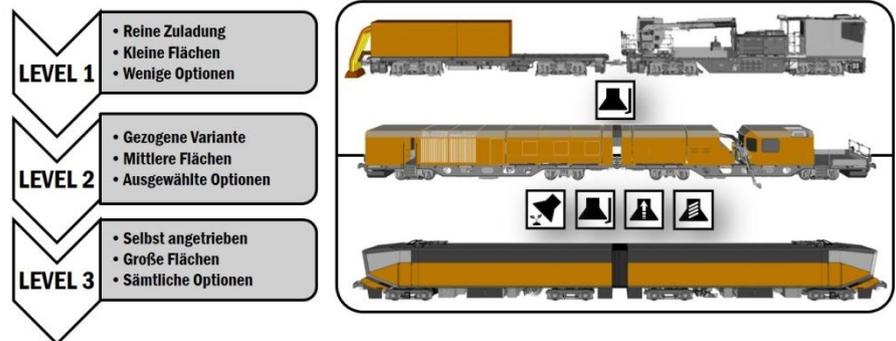


Fig. 1. The three performances classes of the cleaning system are equipped with different units depending on area of use and application.

accordance with the traction requirements and application (Fig. 1).

The modular system provides modules for additional functions such as deep vacuuming, dry ice cleaning, vacuuming of metallic objects and vegetation control.

The starter version consists of a container cleaning unit which is mounted on a standard flat wagon. Vacuuming module, filter and power supply are matched to one application, e.g. track cleaning. A two-part system pulled by locomotives is used for the cleaning of larger areas at higher speeds (max. 5 km/h). This is equipped with an additional suction tube for cleaning difficult to reach areas and a hydraulic tilting function for the automatic emptying of the dirt container and the filter unit. Even more flexibility is provided by integrating the vacuuming and cleaning unit option into the vehicle, enabling the removal of deep-seated dirt which is difficult to remove otherwise.

The highest configuration level and thus the all-rounder amongst the cleaning machine systems can be set up as a multiple-unit vehicle with its own drive. Just like when buying a new car, the customer selects the drive and additional options, such as staff room and storage areas, as well as all cleaning units depending on use and underlying conditions. Optimised logistics result in massive time savings and a clear increase in work safety when cleaning large areas and installations.

Rail Maintenance Shape

Fast cleaning without water and chemicals: dry ice cleaning

Robel's newly developed ROCLEAN Ice cleaning method uses dry ice in the form of pellets the size of rice grains as an effective abrasive for the removal of dirt in a railway environment.

- o Removal of oily and greasy deposits on components such as rails
- o Cleaning of switches
- o Removal of graffiti from surfaces and vehicles
- o Control cabinet cleaning
- o Removal of autumn leaves
- o Cleaning of platforms

As with sandblasting, the pellets strike the surface to be cleaned at a high speed from a nozzle matched to the application (Fig. 2).

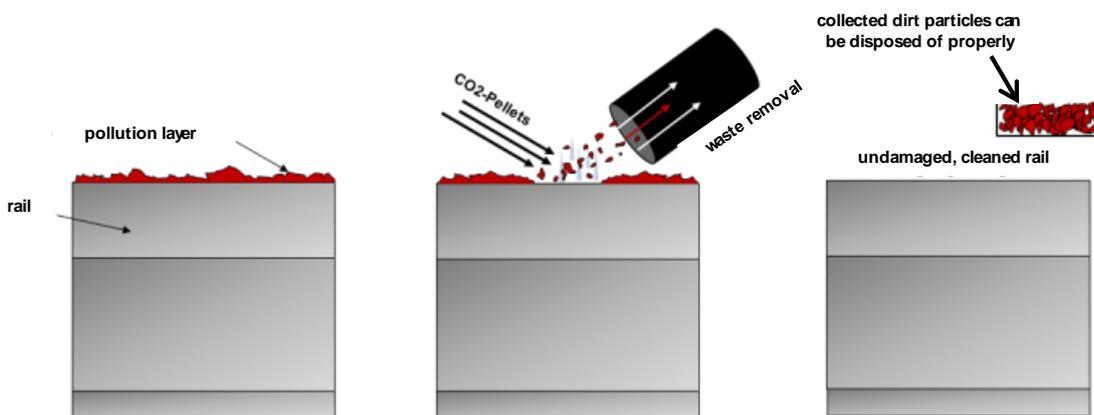


Fig. 2. In contrast to sandblasting, cleaning a surface with dry ice is free from residue and does not change or damage the surface.

Due to the thermal stress generated, the dirt layer detaches from the base material – without water and without additional chemical cleaning agents (Fig. 3).



Fig. 3. The most environmentally friendly way of removing graffiti: the dry ice pellets sublime completely after use.

Main Topic: Getting the Infrastructure into

The following pellets completely remove the contamination without changing or damaging the surface as would be the case with sandblasting.

The advantages of this method:

- o The dry ice pellets completely sublime into a gas immediately after impact and return to the atmosphere from which they were originally extracted.
- o Dry ice does not leave any liquid behind and can therefore be used for electrical installations, too.
- o Only the dirt, which has been removed, is left behind and this can be vacuumed up completely, filtered and expertly disposed of.

The cleaning system has two parts: The self-contained supply container is mounted on the vehicle by means of a twist-lock (Fig. 4). Depending on use, the cleaning unit connected to the container is mounted on the track vehicle (Fig. 5) or is part of a hand-operated unit (Fig. 6) which cleans and vacuums simultaneously.



Fig. 4. The two-part ROCLEAN Ice cleaning system is easy to operate and removes dirt without water and chemical additives.

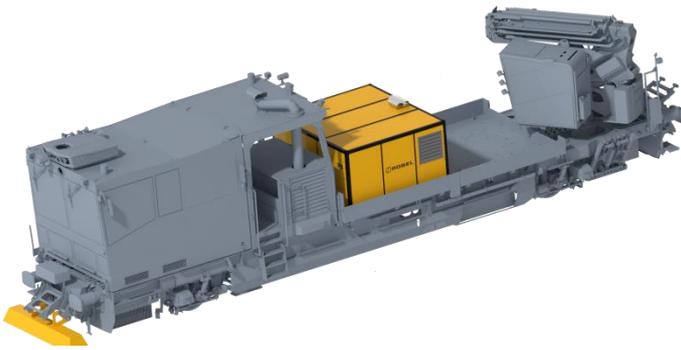


Fig. 5. Dry ice cleaning unit on a standard track vehicle.



Fig. 6. Intuitive and ergonomic cleaning: the hand-operated unit has three cleaning levels and height-adjustable handles (Images: ROBEL Bahnbaumaschinen GmbH).

| Specification of ROCLEAN Ice Level 2 | |
|--------------------------------------|---|
| Weight complete system | approx. 3,300 kg |
| Dimensions complete system | 2,500 x 2,800 x 1,500 mm |
| Operation | 3 pre-set cleaning levels |
| Consumption | approx. 80 kg dry ice/h |
| Compressor output | up to 6 m ³ at 8 bar pressure |
| Suction unit output | up to 15 m ³ /min |
| Cleaning capacity | approx. 7.5 m ² /h |
| Cleaning cost/m ² | approx. 10 €/m ² plus operating costs |
| Total cost/m ² graffiti | approx. 40 €/m ² inc. staff and purchase costs |

A clean track as a win-win solution

Availability of track and maintenance costs are often a question of track condition. The structured preventive cleaning of track and installations creates the conditions for smooth operation and reduces the costs significantly. At the same time, a clean infrastructure provides for a healthy and attractive travel and work environment. Robel offers collaborative partnerships for environmentally friendly track cleaning and is currently negotiating with several urban transport operators in Germany.

Controversial topic: fine particulates

The EU limit for fine particulates of 50 µg/m³ is frequently exceeded on the road networks in conurbations and industrial areas. As a result, demands for banning vehicles and strengthening public transport are on the increase. It is less well known that the fine particulate levels at the track, and in particular in underground stations and tunnels, are frequently higher than on the road due to dust and abraded particles being stirred up.

<https://www.br.de/nachrichten/bayern/feinstaub-in-der-u-bahn-hoehere-belastung-als-auf-der-strasse,RHDH8Fy>

As early as 2015, a study by the French Agency for Health and Safety, ANSES, concluded that “people in underground train systems are exposed to chronically alarming levels of pollution”. Following measurements in May 2017, the Berlin Transport Authority merely states that the limits for workplaces in tunnels of 1,250 µg/m³ are being met: this means that train drivers, ticket inspectors and track workers breathe in 25 times more fine particulates than permitted on the road.

(Source: <https://www.zeit.de/mobilitaet/2019-04/u-bahnen-feinstaub-luft-lokfuehrer-frankreich-grenzwerte>).

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