PRODUCT BROCHURE

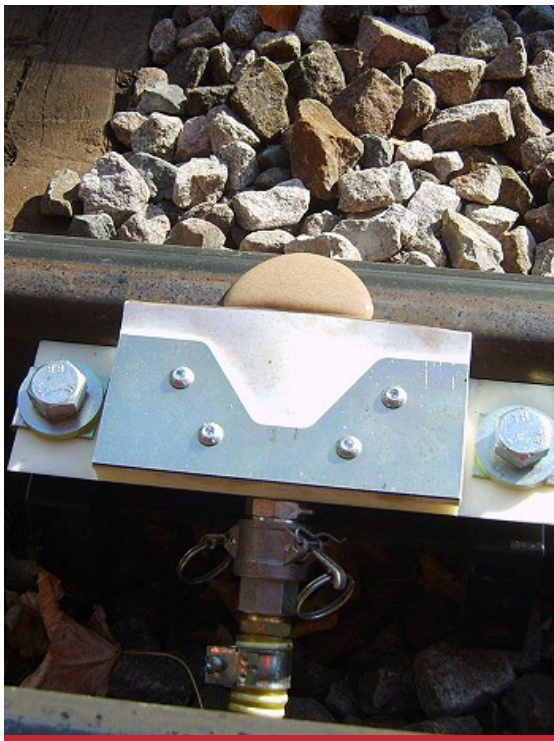
FRICTIONMANAGEMENT

TGA3 and ALLEVIATE®

Traction Enhancement in Rail Operations

TGA3 and ALLEVIATE® Wheel/Rail Interface Traction Enhancement

L.B. Foster's TGA3 Traction Gel Applicator system and ALLEVIATE traction enhancing consumable are proven to improve adhesion conditions at the wheel/rail interface.



Loss of adhesion can result in braking and traction problems, which in turn can lead to serious safety concerns and operational inefficiencies.

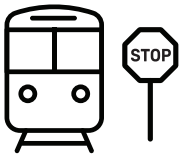
L.B. Foster's TGA3 Traction Gel Applicator system and ALLEVIATE traction enhancers work together to deliver reliable adhesion enhancement in all operating environments – from year-round low adhesion trouble spots to autumn's treacherous leaf fall.

The TGA3 is an intelligent, trackside application system which dispenses ALLEVIATE traction enhancer precisely to the wheel / rail interface. ALLEVIATE traction enhancers are advanced, water-based gels engineered to increase adhesion, cut through leaf residue, combat wet rail, and do so without affecting signalling.

Together, this solution increases friction levels between the wheel and rail, ensuring safer braking, smoother acceleration, and preventing costly delays, stop overruns, and operational inefficiencies.

With decades of global field experience, remote performance monitoring options, and a design refined for quick installation and easy maintenance, L.B. Foster delivers a complete solution that keeps railroad operations running safely and efficiently.

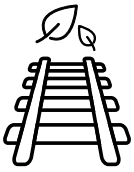
Key Areas for TGA3 and ALLEVIATE Implementation



Critical Starts and Stops

Implement TGA3 and ALLEVIATE systems in areas where stop points and starting acceleration is operationally and safety critical.
Examples include:

- Passenger rail stations
- Freight or mine loading and unloading zones
- Signals



Consistent Problem Areas

TGA3 and ALLEVIATE systems excel when low adhesion is a known issue or specific concern over a specific area of track.
Examples include:

- Areas affected by leaf fall
- Wet rail phenomenon
- Grades

Key Benefits

- Reduce operational issues and safety concerns related to low adhesion
- Enhanced braking and traction
- Reduce station overruns
- Reduced risk of Signals Passed at Danger
- Fewer train delays and improved reliability
- Less risk to vehicle head ways
- Reduced risk of track circuit failures due to leaf fall
- Fewer wheel flats

Traction Enhancement in Mining Operations

How TGA3 and ALLEVIATE® implementations can drastically improve mining rail operations struggling with low adhesion

Improving operational efficiency in rail operations.

L.B. Foster was approached by representatives of one of the largest underground mining complexes in the world. The mine relies on an automatically controlled locomotive fleet responsible for the loading and delivery of the mined ore on a network of 23 km (14 miles) of track.

The customer was experiencing issues with low adhesion on the tracks located within the underground tunnels. They needed a solution to prevent wheel slide on the locomotives as this was leading to operational issues. Any wheel slip/slide incidents required a pause in operations to reset the automatic locomotives in order to allow them to restart movements. This was costing the mine a significant amount of unproductive time in carrying out reset procedures. As a temporary measure, train car loadings were significantly decreased to reduce the chance of slides.

L.B. Foster supported an initial trial applying the ALLEVIATE to the head of the rail by hand using rollers and brushes. This trial successfully restored friction levels on the rail surface, reduced the frequency of wheel slip incidents, and increased the uptime of the locomotives.

On the basis of this successful trial, the customer installed several TGA units applying ALLEVIATE Traction gel. Continual monitoring of the operations showed car loading restored to the original design specification, an increase of up to 46%.

Key Benefits

- Reduce operational issues and safety concerns related to low adhesion
- Enhanced braking and traction
- Reduce station and stop zone overruns
- Ensure maximum car loadings achieved
- Reduced risk of Signals Passed at Danger
- Fewer train delays and improved reliability
- Less risk to vehicle head ways
- Fewer wheel flats

Key Features

- ALLEVIATE is a viscous, water-based gel.
- The gel's viscosity ensures it remains effective on the top-of-rail surface.
- ALLEVIATE does not interfere with signalling
- TGA3 75 Litre (19.8 USG) tank provides sufficient capacity to optimize maintenance and refilling program.
- Lightweight and portable allowing ease of installation. Dry system weight is approximately 45 kg (100 lb).
- Easily retrofittable into existing mining operations.
- Cabinet dimensions are W 798 mm (31.4 in) x H 1082 mm (42.6 in) x D 464 (18.3 in)

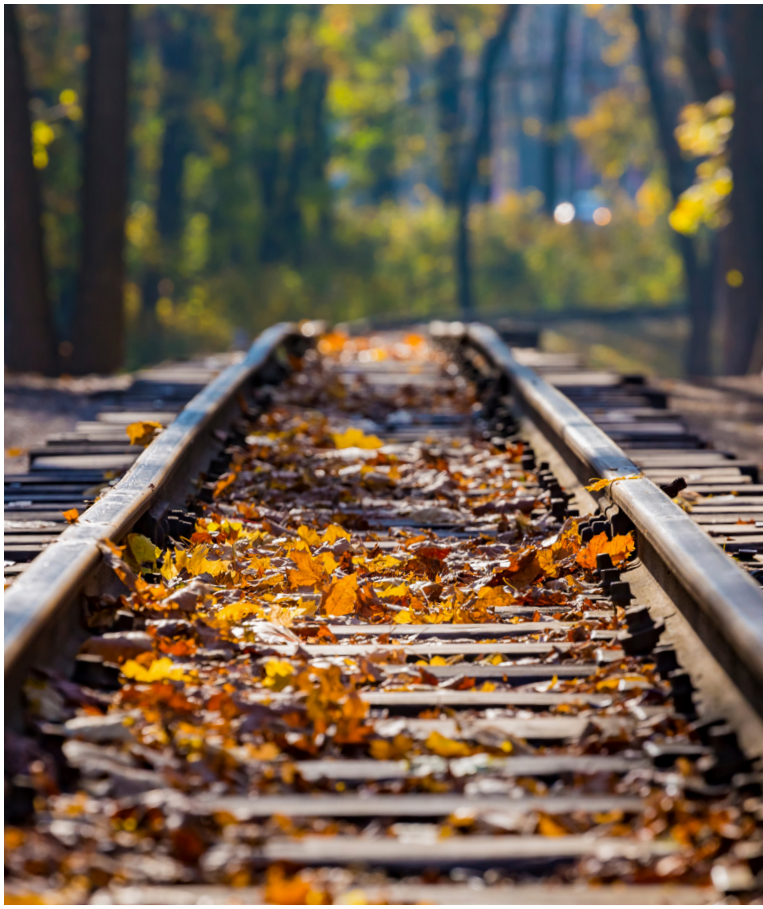
What they said

> *"Simply by introducing L.B. Foster TGA3 systems and ALLEVIATE at key locations, our mine was able to increase car loadings by up to 46%."*
>
> **Mine operator after recent TGA3 and ALLEVIATE implementation**

Leaves on the Line Addressing low adhesion issues in autumn

TGA and ALLEVIATE® can be used as a seasonal traction enhancer and is particularly useful for dealing with the problems of leaf fall or other problematic surface conditions such as wet rail phenomenon.

Wet leaves are sucked onto railway lines by the turbulence created from passing trains. This is a particular problem for the rail sector in autumn, when trees shed their leaves. Leaf fall is compressed by the weight of train wheels, depositing a thin, black layer of leaf residue on the rail. When this comes into contact with rain it becomes incredibly slippery, giving rise to the much derided issue of 'leaves on the line'.



The resulting impact of leaves on the line on rail services is lengthy delays and costly cancellations, as trains have to accelerate more slowly and decelerate over greater distances.

So what can be done to alleviate this issue? Dr. Jon Paragreen, UK Sector Manager at L.B. Foster, explains: "Adhesion between vehicle wheels and rail is dictated by top of rail surface conditions and contamination."

Our Traction Gel Applicator (TGA3) distributes traction enhancing material directly to the position on the rail where it is required. "Where you have an issue of low adhesion, such as leaves on the line, it results in braking and traction problems. Leaf layers can also lead to potential signal failures caused by loss of track circuit detection, as well as station overruns and insufficient traction on inclines."

"We have had unprecedented orders for our TGA3 from Network Rail for installation at locations across the UK. These are in readiness for all that the adverse autumn weather has to throw at the network."

"Furthermore, ALLEVIATE is L.B. Foster's innovative traction enhancing material that combats both seasonal and all year round adhesion issues. In the autumn, loss of traction from seasonal leaf fall creates a slippery surface on running rails. ALLEVIATE is designed to cut through this layer and restore friction levels on the rail."

The Problem

- Low adhesion caused by layer of leaf residue on the rail.
- Operational delays caused by acceleration and braking distances being extended to accommodate.

The Results

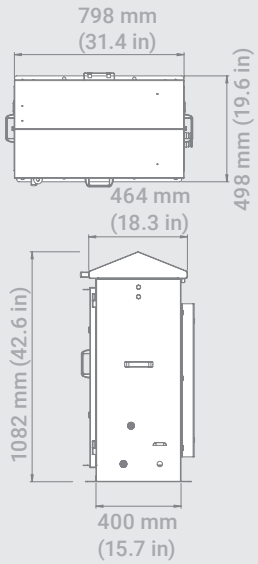
- ALLEVIATE acts to weaken and abrade leaf layer thereby restoring adhesion levels.
- Reliable and consistent train acceleration and braking restores train head ways and operational efficiencies.

TGA3 Traction Gel Applicator System

Built on decades of experience, L.B. Foster's TGA3 system precisely distributes approved traction enhancing materials directly to the position on the rail where they are required. It is specifically designed to distribute L.B. Foster Traction Enhancer ALLEVIATE®.

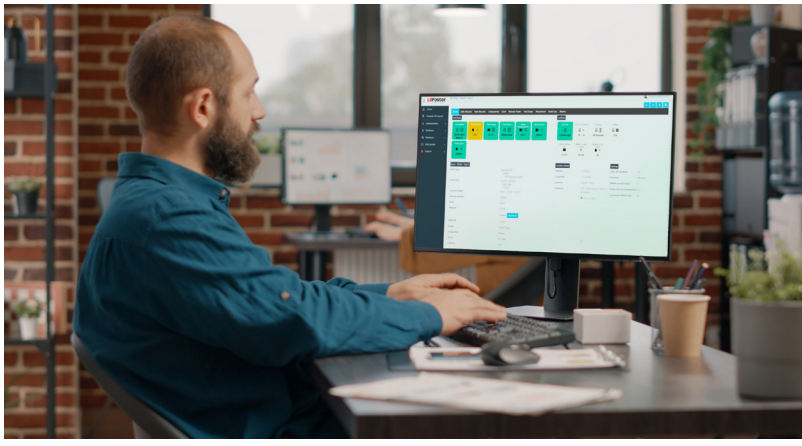
Key Features

- 75 Litre (19.8 USG) ALLEVIATE tank provides sufficient capacity to optimize maintenance and refilling program.
- Dual peristaltic pump assemblies ensure even product distribution to each rail.
- Designed for ease of access and maintenance.
- Lightweight and portable allowing ease of installation. Dry system weight is approximately 45 kg (100 lb).
- Optional quick-release fasteners simplify the fitting of the rail mounted components (applicator bars and wheel sensors).
- Applicator bars specifically designed to distribute traction enhancing materials.
- PROTECTOR® series control system provides proven reliability.
- Power options include solar, solar and wind combined, or mains power (AC 115V/230V or DC 12V).
- Low power consumption.
- Integrates with L.B. Foster's Anatomy Asset Intelligence™ system (formerly Remote Performance Monitoring - RPM) to optimize asset management.
- Optimized distribution system for deploying the L.B. Foster ALLEVIATE traction enhancers.



ANATOMY
ASSET INTELLIGENCE

All L.B. Foster TGA3 systems can be equipped with our **Anatomy Asset Intelligence (formerly RPM)** system, allowing railroad owners and system maintainers to remotely manage their assets and gain insight into their operation. This technology helps to maximize uptime and minimize the operating costs and track time associated with maintaining an effective Friction Management program.

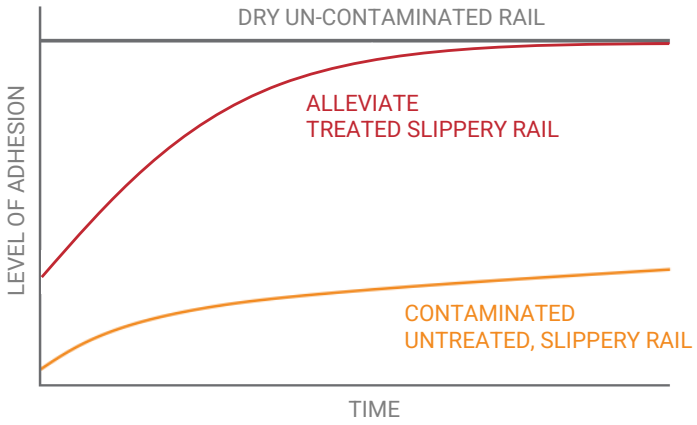


ALLEVIATE® Traction Enhancers

ALLEVIATE traction enhancers are advanced water-based gels that significantly improve rail traction by enhancing friction between the wheel and rail. These products are specifically formulated to address common rail adhesion issues, providing robust solutions for both seasonal and year-round traction challenges.

Key Features

- **Viscous Water-Based Gels: ALLEVIATE gels are applied directly to the rail head and do not interfere with track signalling. The gel's viscosity ensures it remains effective on the rail surface, enhancing traction.**
- **Abrasive Action: By combining abrasive action to break down hardened leaf layers and adhesion enhancing particles for grip, ALLEVIATE effectively increases friction levels, improving rail traction in adverse conditions.**
- **Cold Environment Suitable: ALLEVIATE LT (Low Temperature) is available with a freezing point of -16°C (3°F), suitable for colder climates.**



The graphic on the left depicts the very low levels of adhesion typically observed with wet, slippery rail. These low levels of adhesion can result in very poor traction.

When the same wet, slippery rail is treated with ALLEVIATE, much higher levels of adhesion are observed. The resulting traction then becomes very similar to dry rail.

Technical Specifications

	Method	Unit	ALLEVIATE	ALLEVIATE LT
Product Code			MED0013 (10 L, 2.6 USG Pail[3])	MED0045 (10 L, USG Pail[3])
Season			Year-Round	Autumn/Winter
Appearance			Beige, Thixotropic Gel	Beige, Thixotropic Gel
Base			Water	Water
Viscosity at 77 °F (25 °C)	Brookfield RV6 at 20 rpm	cP	13,500 - 14,500	10,500 - 11,500
Density at 77 °F (25 °C)	ASTM D1475	g/cm³	1.35 - 1.45	1.35 - 1.45
Freezing Point	ASTM D2386-97	°C (°F)	-6°C (21°F)	-16°C (3°F)
pH	ASTM E70		9 - 10	9 - 10
Product Stability[1]	Modified ASTM D2243-95		Pass	Pass
Aquatic Toxicity	OECD 203		Non-Toxic	Non-Toxic
Flammability			Non-Flammable	Non-Flammable
Environment			Product has low mobility and is not expected to bioaccumulate	Product has low mobility and is not expected to bioaccumulate

Notes

1. The product stability test accelerates the effect of freeze-thaw cycling on the product stability of water-based materials. The material is cycled from -18 °C (0 °F) to 70 °C (158 °F) continuously over a week of testing. A pass indicates that no signs of product separation or settling has occurred during the test.
2. Recommended storage is within a warehouse at a temperature between 5 °C (41 °F) and 35 °C (95 °F). Avoid exposure to heat sources such as direct sunlight. Keep containers sealed to prevent water loss. If recommended storage conditions are used, the shelf life of the product is 21 months.
3. Other sizes available, including 8.5 L (2.2 USG) pails and 1000 L (264 USG) totes depending on region. Please contact your L.B. Foster representative.
4. For additional technical information, please contact your L.B. Foster representative.

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