

FRICTION MANAGEMENT



YOUR TOTAL TRACK MANAGEMENT COMPANY™

LBFoster®



FRICION MANAGEMENT

For more than a century L.B. Foster has provided the materials necessary to build and maintain the world's infrastructure. Today, we have begun a new generation of innovation as we expand to become a leading product innovator in mainline, transit, mining, port and industrial rail markets worldwide.

Our rail and track accessories provide the field-proven quality necessary to build a reliable railway infrastructure. L.B. Foster's new generation of comprehensive friction management and performance monitoring technology further strengthens the rail system by improving track safety and operational efficiency.

We have developed a wide range of proprietary systems to control friction between the wheel and rail for transit and freight rail applications. Our friction management products and delivery systems provide substantial cost benefits by maximizing equipment performance and minimizing wear at the wheel/rail interface.

L.B. Foster manufacturing facilities are located in the United States, Canada and the United Kingdom. Our sales and product professionals are available worldwide.

TOTAL FRICTION MANAGEMENT™

Total Friction Management (TFM™) is the systematic assessment and implementation of friction control, combined with the technology to monitor, maintain and manage friction to achieve short- and long-term performance benefits. TFM maintenance, filling services and performance verification provides assurance that our friction management system is always working properly. L.B. Foster works closely with customers to deliver reports on short-term performance indicators, such as consumption, forces and coefficient of friction. Long-term, we monitor the benefits of our system on fuel consumption, wheel/rail wear, rolling contact fatigue and track structure.

SUPPORT AND SERVICE

L.B. Foster's wayside systems are backed by market-leading experience with wheel/rail interface issues. Our team of professionals can provide the service and technical expertise necessary to install, maintain and verify the optimum performance of your system throughout its life cycle.

PROTECTOR® IV TRACK LUBRICATION SYSTEM

When protecting the largest asset - rail - and reducing fuel are among the top priorities, friction management offers a high return. From increasing operational efficiency through fuel savings and reduced track maintenance, to saving money in rails and ties – friction management plays a major role.

To achieve these benefits, a proven robust application system is required. L.B. Foster's PROTECTOR Series trackside systems are the industry standard. The PROTECTOR is designed to apply either gauge face grease or revolutionary Friction Modifiers, including KELTRACK and TOR Oils. This innovative system is easy to install and consistently delivers precise, controllable, and reliable application. Backed by the most knowledgeable service team in the industry, we have a solution that can be customized to fit your unique needs.

The heart of the system is the patented double gear pump, which ensures balanced outputs and reduces clogging. This robust gear pump has been reliably applying a wide range of friction control materials for over 5000 systems installed in the field today.

The brain of the system is the digital control box, now available with Remote Performance Monitoring (RPM) technology, which has the capacity to fine-tune the distribution of friction modifiers and lubricants through pump run time and activation intervals. RPM is a powerful tool that provides customers the capability to monitor and report uptime, maintenance concerns, and refilling requirements in order to proactively manage the equipment installed on track more efficiently.

Finally, the new generation of applicator bars incorporate L.B. Foster's patent-pending foam technology. Both our grease guide and TOR Foam applicator bars deliver the friction materials exactly where they are required far more efficiently than any other applicator bar in the industry. All bars provide outstanding, even flow because they share our field-proven, balanced port design, along with patented streamlined channels with Teflon®* coating, and a wear-resistant distribution blade with V-grooves.

BENEFITS

- Increases fuel economy
- Increases rail and wheel life
- Reduces lateral forces
- Reduces wheel squeal and flanging noise
- Reduces rail corrugation
- Reduces derailment potential

TECHNICAL SPECIFICATIONS	
Application	Gauge Face / Top-of-Rail
Power	DC Solar / AC Power
Tank Capacity	200-800 lbs. (Grease) / 25-100 gal. (Friction Modifier)
Mounting Options	Wall Mount / Embedded / Between Tracks / Surface Mount
Systems	Transit / Freight
Control Box Features	Self-Test, Fuse and Surge Protection, Watertight Enclosure
Smart Wheel Sensor	Standard Bi-Directional / One-Way
Consumption Rate	0.75 lbs /1000 Axles (Grease) / 0.5 L/1000 Axles (Friction Modifier)

* Teflon® is a registered trademark of E.I.duPont deNemours and Company



761 HYDRAULUBE WAYSIDE LUBRICATOR

Hydraulic systems offer more simplicity when compared to Mechanical system yet are more affordable than the higher precision electric systems. Hydraulic systems minimize the number of moving parts, however with limited degree of application control, and are better suited to shock loading and higher speeds than mechanical systems.

The 761 Hydraulube applies lubricants to the gauge face of the rail and features a gear type pump similar to the PROTECTOR IV. However the gear pump used on the 761 Hydralube is powered by a hydraulic motor that is part of a closed loop hydraulic system. The lubricant is available in 400 lb (200kg) and 800 lb (400 kg) capacities. The 761 Hydralube is most effective in territory where speeds are between 25 and 50 mph (40 to 80 km/h).

BENEFITS

- Reduces rail wear

TECHNICAL SPECIFICATIONS

Tank Capacity

Economy: 300 or 650 lb / Heavy Duty: 400 or 800 lb

Pressure

600 psi



AUTOPILOT™

AUTOPILOT is a mobile top-of-rail application system. This advanced technology can be installed onboard a freight car or locomotive and applies KELTRACK Friction Modifiers to the wheel/rail interface. The AUTOPILOT system uses GPS control to automatically adjust product application rates to optimize the friction levels at the wheel/rail interface. This flexible control technology can incorporate geo fencing as well as normal operating inputs to create a customized application strategy if required. These mobile systems are customized specifically fit any car or locomotive and aim to maximize tank volume capacity to meet the service needs of the customer.

The AUTOPILOT system is also supported by Remote Performance Monitoring technology. RPM is a powerful tool that enables customers to manage critical control settings to ensure optimal performance. It proactively manages the lubrication equipment by monitoring and reporting uptime, maintenance concerns and refilling requirements. The technology also facilitates advanced maintenance and filling programs by predicting when the equipment is arriving at the maintenance site so refilling can be completed within typical yard dwell times keeping your railroad operations on schedule.

BENEFITS

- Increases Fuel Economy
- Increases Rail Life
- Increases Track Structure Life
- Reduces Lateral Forces
- Reduces Derailment Potential
- Reduces Green House Gas (GHG) Emissions

TECHNICAL SPECIFICATIONS

Applications	Any commodity car (Iron Ore/Coal etc)
Tank Capacity	50 USG to 200 USG (current models)
Power	74 VDC – inverted from Locomotive
Control Features	GPS enabled control, RPM data collection & monitoring
Typical Application Rates	35 to 60 ml/mile/rail



KELTRACK® FRICTION MODIFIERS

Reducing friction on the running surface of the rail has been proven to reduce lateral forces, rail wear, fuel consumption, and Rolling Contact Fatigue (RCF). The key is to reduce the friction levels to an intermediate level so that there is no effect on the traction and braking of the train. KELTRACK Friction Modifiers are specifically designed to manage friction levels on the top-of-rail (TOR) at an intermediate and controlled level of 0.35. Containing no oils or greases, KELTRACK is similar to a latex paint and is designed to dry rapidly in the rail/wheel interface. A primary advantage of dry friction modifiers is that they do not accelerate RCF the way an incompressible fluid such as TOR Oil or water will.

Our KELTRACK friction modifier product lines share common friction control technology while possessing special chemistry developed specifically for the application environment.

KELTRACK TRACKSIDE FREIGHT

KELTRACK Trackside Freight Friction Modifiers have been specifically designed for extended carrydown in freight rail operations. Maximizing carrydown optimizes value by requiring less application equipment to cover an operating territory. Consequently, the product is able to effectively achieve significant benefits of increasing rail life, while reducing fuel consumption, lateral forces, rail corrugations, and derailment potential. KELTRACK Trackside Freight is applied through the PROTECTOR IV to cover areas of track with high economic returns. By co-developing the product and the delivery equipment we can provide a comprehensive solution that functions as one coordinated unit.

BENEFITS

- Increased Rail Life
- Reduced Fuel Consumption
- Reduced Lateral Forces
- Reduced Rail Corrugations
- Reduced Derailment Potential

TECHNICAL SPECIFICATIONS

Formulation Options	Freight / Transit
Available Sizes	19 L (5 US gallons) Pail or 1000 L Tote
Fire Safety	Non-Flammable
Odor	Slight Odor
Freezing Point (°C)	-6 (-16) Freight (LT) / -6 (Transit)
Viscosity, cP at 25°C	22,700-24,700 (17,000-19,000) Freight (LT)
Friction Levels	0.30 to 0.40 μ
Carry Distances	1 to 2 miles depending on Grade
Application Rate	0.5 litre/1000 axles



KELTRACK TRACKSIDE FREIGHT ER

KELTRACK Trackside Freight ER Friction Modifiers have special chemistry to boost the carrydown distance over the standard KELTRACK Trackside Freight product, while maintaining the intermediate coefficient of friction. Customers can choose to apply less material over the same distance, or apply the same amount of material and cover twice the distance. The additional chemistry required to achieve this extended carrydown results in a higher unit volume price, but an overall savings to the customer on their total Friction Modifier spend.

BENEFITS

- Increased Rail Life
- Reduced Fuel Consumption
- Reduced Lateral Forces
- Reduced Rail Corrugations
- Reduced Derailment Potential

TECHNICAL SPECIFICATIONS	
Available Sizes	19 L (5 US gallons) Pail or 1000 L(264 US Gallon)Tote
Fire Safety	Non-Flammable
Odor	None
Freezing Point (°C)	-6 (-16) Summer (Winter)
Specific Gravity at 25 °C	1.05 – 1.08
Friction Levels	0.30 to 0.40 μ
Carry Distances	2 to 4 miles depending on Grade
Application Rate	0.25 litre/1000 axles



KELTRACK TRACKSIDE TRANSIT

KELTRACK Trackside Transit Friction Modifiers are specifically formulated to provide effective noise and corrugation control on transit systems. KELTRACK Friction Modifiers have positive friction properties – where friction levels increase asymptotically as creep increases. This fundamental property of a true friction modifier is responsible for mitigating stick slip oscillations at the wheel/rail interface which cause wheel squeal. The inherent intermediate friction levels also reduces the flanging forces thereby reducing flange noise. Extensive testing has verified that KELTRACK Trackside Transit is also very effective for mitigating the onset of short pitch corrugations.

BENEFITS

- Reduce Wheel Squeal & Flange Noise
- Reduced Rail Corrugations
- Reduced Lateral Forces
- Reduced Derailment Potential

TECHNICAL SPECIFICATIONS	
Formulation Options	Freight/Transit
Available Sizes	19 L (5 US gallons) Pail or 1000 L Tote
Fire Safety	Non-Flammable
Odor	None
Freezing Point (°C)	-6 (-21)
Specific Gravity at 25 °C	1.07 – 1.09
Friction Levels	0.30 to 0.40 μ
Carry Distances	200 to 500 meters typical (curve specific solution)
Application Rate	0.5 litre/1000 axles



KELTRACK HIRAIL FRICTION MODIFIER

KELTRACK HiRail is a specific friction modifier formulation applied from a delivery system mounted on a HiRail vehicle. This form of KELTRACK dries quickly on the rail to form a thin film of friction modifier on the top-of-rail. KELTRACK HiRail is optimized for maximum retention for the number of wheel passes that the material remains effective. The product is an effective solution best for significantly reducing noise, rail wear, fuel consumption, gauge widening, and lateral forces in specific, problematic areas on lower tonnage freight railways. HiRail also reduces the risk of derailments without affecting braking or signaling of the freight locomotives.

The application system is the only one of its kind to offer a patented nozzle design that tracks the rail without complicated attachments. The system ensures consistent application of lubricant, regardless of possible variations in vehicle weight or speed during operation. It is supported by variable speed 12-volt DC electric motors that offer adjustable flow control and drive meshed gear pumps to satisfy output demands.

BENEFITS

- Increases Rail Life
- Reduces Fuel Consumption
- Reduces Noise in Targeted Curves
- Reduces Lateral Forces
- Reduces Gauge Widening
- Reduces Derailment Potential

TECHNICAL SPECIFICATIONS

Available Sizes	19 L (5 US gallons) Pail or 1000 L Tote
Fire Safety	Non-Flammable
Odor	None
Freezing Point (°C)	-6 °C (21 °F)
Specific Gravity at 25°C	1.08 – 1.10
Friction Levels	0.30 to 0.40 μ
Multiple Train Effect	2 to 3 trains
Application Rate	0.035 to 0.06 litres/mile/rail



KELTRACK MANUAL TOR

KELTRACK Manual Top-of-Rail is a water-based version of our proven on-board HPF solid stick. It is formulated specifically for instances where on-board application of a solid stick is not viable. KELTRACK Manual Top-of-Rail is ideal for mixed traffic situations involving dedicated vehicles that do not operate on the track.

KELTRACK Manual TOR is applied to the top-of-rail using our manual and easy-to-use Soloroller applicator. The material dries quickly, leaving an environmentally-safe friction modifier on the wheel/rail interface. KELTRACK Manual Top-of-Rail has been field-proven to reduce noise, on average, by half of the perceived noise recognized by the human ear and up to a maximum of 30 decibels. This improves comfort for riders and nearby residents and reduces dangerous lateral forces, lessening the potential for derailment without affecting signal transfer, traction or braking.

BENEFITS

- Reduces Noise Levels
- Reduces Lateral Forces
- Increases Railhead and Wheel Tread Life
- Increases Railhead and Wheel Grinding/Profiling Intervals
- No Effect on Signal Transfer or Braking

TECHNICAL SPECIFICATIONS

Available Sizes	19 L (5 US gallons) Pail
Fire Safety	Non-Flammable
Odor	None
Freezing Point (°C)	-6
Viscosity, cP at 25°C	825-1,100



KELTRACK AUTO PILOT FRICTION MODIFIER

KELTRACK AUTOPILOT is used exclusively in L.B. Foster's AUTOPILOT car mounted or locomotive mounted spray systems. KELTRACK AUTOPILOT has been formulated to be sprayed from a nozzle and dry quickly in the wheel/rail interface. Because KELTRACK AUTOPILOT has intermediate coefficient of friction, it is desirable to leave material behind the direct applying train to provide fuel savings on following train. This effect has been demonstrated in field testing and results in a higher capital utilization of the application equipment.

TECHNICAL SPECIFICATIONS	
Available Sizes	19 L (5 US gallons) Pail or 1000 L Tote
Fire Safety	Non-Flammable
Odor	None
Freezing Point (°C)	-6 °C (21 °F)
Specific Gravity at 25°C	1.08 – 1.10
Friction Levels	0.30 to 0.40 μ
Multiple Train Effect	2 to 3 trains
Application Rate	0.035 to 0.06 litres/mile/rail



LCF SOLID STICK ON-BOARD LUBRICANT

L.B. Foster's LCF (Low Coefficient of Friction) solid stick is a 100% dry, on-board lubricant specifically designed to reduce flange wear. LCF provides consistent lubrication to the wheel/ rail interface throughout the entire railway system and is safer, cleaner and more reliable than oil system alternatives.

Engineered to be different from traditional lubricants, LCF is applied directly to a portion of the wheel flanges of a rail vehicle using a spring-loaded bracket/applicator assembly custom designed to meet each customer's specific requirements. The LCF material transfers to the wheel flange and gauge face of the rail, leaving a thin film that provides excellent, system-wide wear protection.

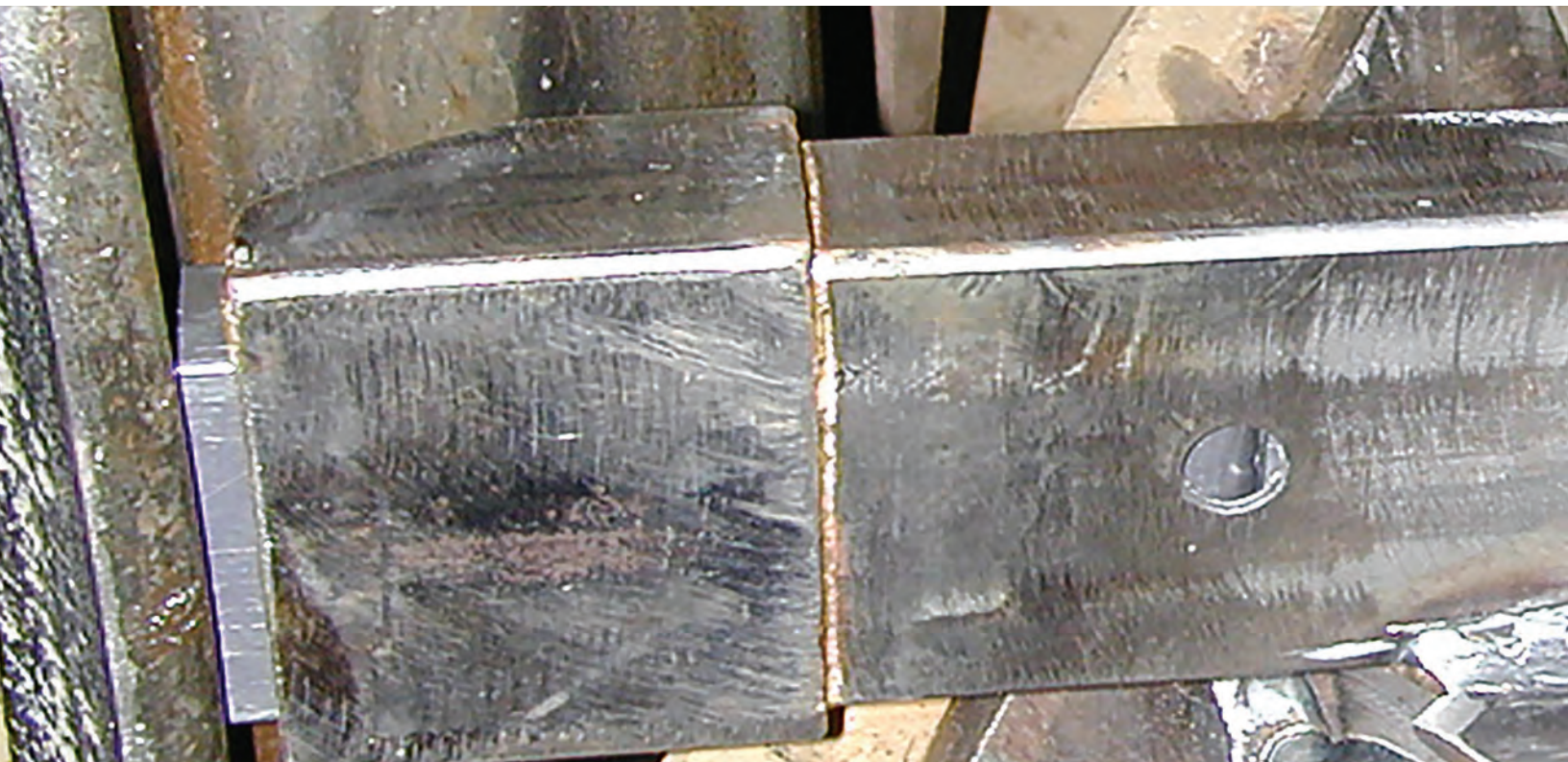
LCF solid sticks have several distinctive characteristics that make them the preferred choice of rail system operators. Each stick includes a patented interlocking feature to ensure continuous product application and minimal waste. The product's intrinsic thermosetting properties ensure no migration to the railhead and prevent the stick from melting under high temperatures. LCF is non-toxic, non-flammable and flame-resistant to meet strict environmental standards and is safe for use on subterranean railways.

BENEFITS

- Extends wheel flange and rail gauge life
- Reduces energy consumption
- Reduces risk of low-speed derailments
- No effect on traction or braking

TECHNICAL SPECIFICATIONS

Appearance	Black, opaque solid
Available Options	Interlocking and Non-Interlocking
Coefficient of Friction Range	< 0.15 on Metal Surfaces
Thermal Regulation	Does not change dimensions or melt under temperature. Decomposition begins above 250°C.
Fire Safety	Non-Flammable (ASTM D 4982-95) Unable to Sustain Combustion (ASTM D635-97)
Toxicity	Non-Toxic



HPF SOLID STICK ON-BOARD FRICTION MODIFIER

Our HPF (High Positive Friction) solid stick is an on-board friction modifier designed to reduce corrugation and tread wear. It is applied directly to the wheel treads of the rail vehicle using a spring-loaded bracket/applicator assembly specifically designed and built for each customer. The HPF material creates a micron-thin film layer between the wheel tread and the top-of-rail, providing a controlled friction level of 0.35 on the wheel/rail interface.

HPF helps to control wheel squeal noise and reduce the onset of short pitch corrugations after grinding. The stick consumption is self-regulating, ensuring reliability, cleanliness and easy maintenance. Our patented interlocking feature ensures continuous application and waste mitigation. Each stick contains thermoset characteristics that do not migrate to the railhead. The thermoset also prevents the stick from melting under high temperatures.

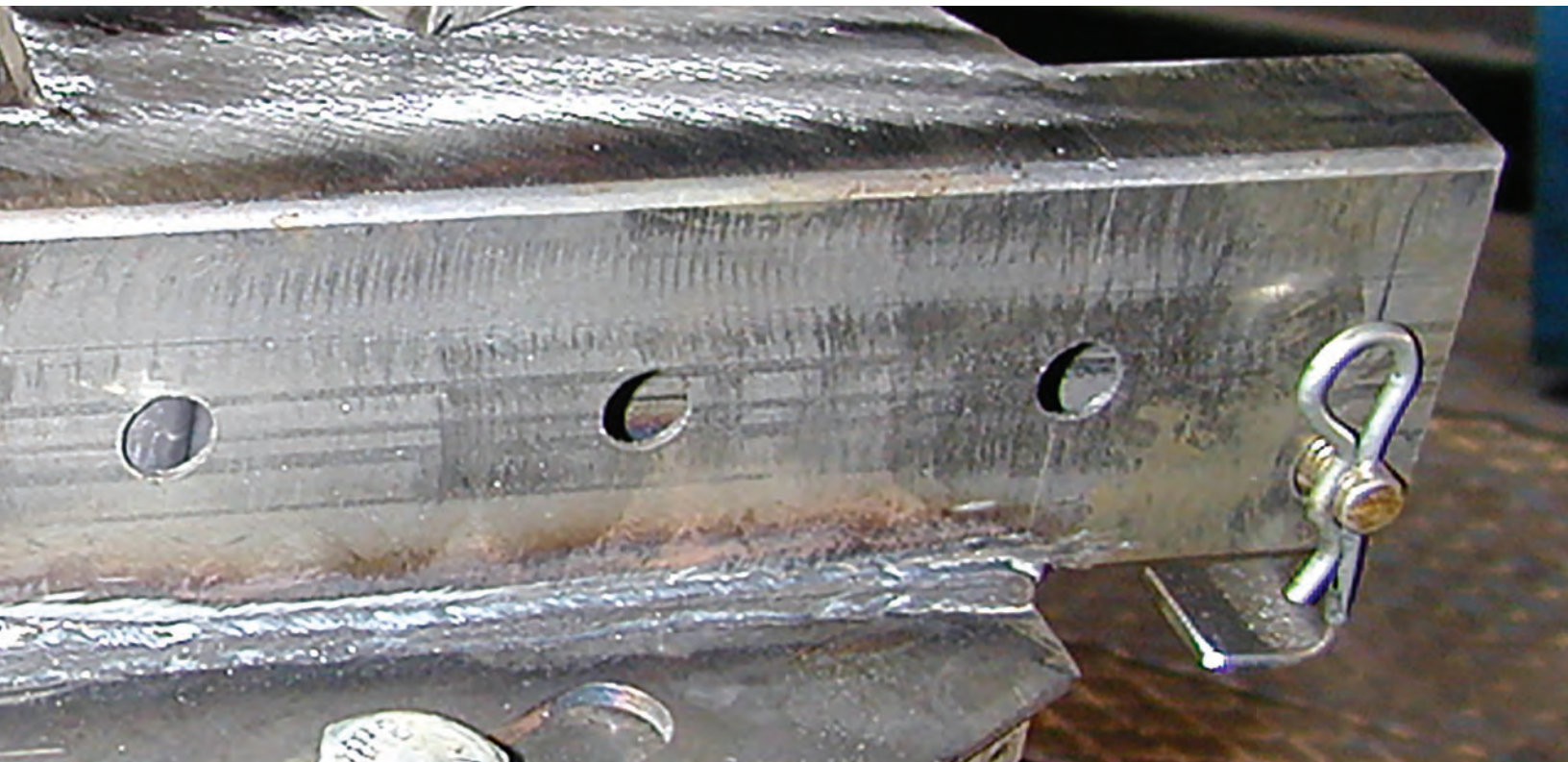
Unlike traditional lubricants, such as oil and grease, HPF has no impact on braking or traction. Additionally, it is non-flammable, non-toxic and environment-friendly.

BENEFITS

- Reduces short pitch corrugations
- Reduces rail replacement costs
- Reduces lateral forces by 30-50%
- Reduces energy consumption

TECHNICAL SPECIFICATIONS

Appearance	Black, opaque solid
Available Options	Interlocking and Non-Interlocking
Coefficient of Friction Range	0.30-0.40
Thermal Regulation	Does not change dimensions or melt under temperature. Decomposition begins above 250°C.
Fire Safety	Non-Flammable (ASTM D 4982-95) Unable to Sustain Combustion (ASTM D635-97)
Toxicity	Non-Toxic



GREASE

Through our numerous partnerships with grease manufacturers, L.B. Foster offers a wide range of products to suit your needs. Our unmatched level of industry experience can help us to determine the optimal grease for any system or problem.

L.B. FOSTER RAIL CURVE GREASE

L.B. Foster's rail curve grease is a high-performance grease designed with innovative oils to provide efficient lubrication and protection under a comprehensive set of performance requirements. Field testing has shown this grease to provide the lowest friction level on the gauge face of the rail at the furthest distance. Using this premium grade grease allows customers to space applicators further apart resulting in lower capital and maintenance costs.

BENEFITS

- Increases overall system efficiency
- Reduces rail/wheel wear
- Reduces maintenance costs

TECHNICAL SPECIFICATIONS		
Operating Temperature Range (°C)	-40 to 120	-35 to 120
NLGI Grade	0	1
Drop Point (°C)	165	176
Base Oil Viscosity, cSt (°C)	68	168

ELM[®] TEMPFLEX[™] *

TempFlex is a premium quality biodegradable, Biotechbased[™] Rail Curve Lubricant formulated from USA-grown vegetable oils and a lithium based thickener. When performance and biodegradability are critical ELM's TempFlex product is the only choice for effective rail lubrication..

BENEFITS

- Increases overall system efficiency
- Reduces rail/wheel wear

TECHNICAL SPECIFICATIONS	
Operating Temperature Range (°C)	-35 to 80
NLGI Grade	1
Dropping Point °C (°F)	199 (390)
Base Oil Viscosity, cSt °C (°F)	40 (86)
Base Oil Flash Point °C (°F)	326 (619)

* ELM[®] and Tempflex[™] are trademarks of Environmental Lubricants Manufacturing, INC.

ALLEVIATE[®] TRACTION GEL

ALLEVIATE is an innovative traction gel that enhances the coefficient of friction at the wheel/rail interface. It improves train braking capability, wheel traction and conductivity in track circuits.

BENEFITS

- Significantly enhanced COF with reduced traction and braking risks due to leaf fall contamination and iron oxide formation
- Optimized sand particle size via R&D, focusing on field-proven wheel/rail interface theory
- Cold weather application
- Innovative corrosion control properties to effect early morning dew/moisture suppressing the formation of iron oxides within the 3rd body layer
- Designed for trackside and vehicle-based delivery
- Optimized storage/shelf life

CATCH-ALL TRACK MAT

The CATCH-ALL track mat addresses the problems of soil and ballast contamination. Utilizing the latest geocomposite technology, CATCH-ALL Track Mat provides a simple and cost-effective solution for maintaining a clean, safe site that also delivers maximum lubrication or friction management.

CATCH-ALL Track Mat functions as a “high-tech carpet” by covering the lubrication/friction management site ground surface. Placed over the ties, CATCH-ALL is easily and quickly cut to match any gauge face or top-of-rail applicator configuration for a custom-fit installation. This mat has excellent durability and is highly resistant to ultraviolet deterioration, solvents, puncture, excessive temperatures, moisture and high volume traffic.

CATCH-ALL Track Mat requires little or no maintenance. Excess lubricant that would have otherwise penetrated the soil or ballast is easily removed from the CATCH-ALL surface (when in place) or can be disposed of by removing and replacing the CATCH-ALL unit entirely.

BENEFITS

- A cost-effective solution
- Easy to install and maintain
- Found in service around the world
- Currently used by Class I Railroads, regional and shortline railroads as well as transit authorities concerned with the environmental needs of track lubrication and friction management
- Compatible with all lubrication and friction management system applicators
- Compatible with all manufacturers' wiping bars and lubricators
- Permits water to pass through while retaining grease and other contaminants
- Immediate delivery
- Made in the USA from PET (post consumer beverage bottles)



TOTAL FRICTION MANAGEMENT

Our Total Friction Management program has the inherent flexibility required to meet the specific needs and practical constraints of railroads to obtain the economic benefits associated with optimal friction management of the wheel/rail interface.

FRICION CONTROL SOLUTIONS

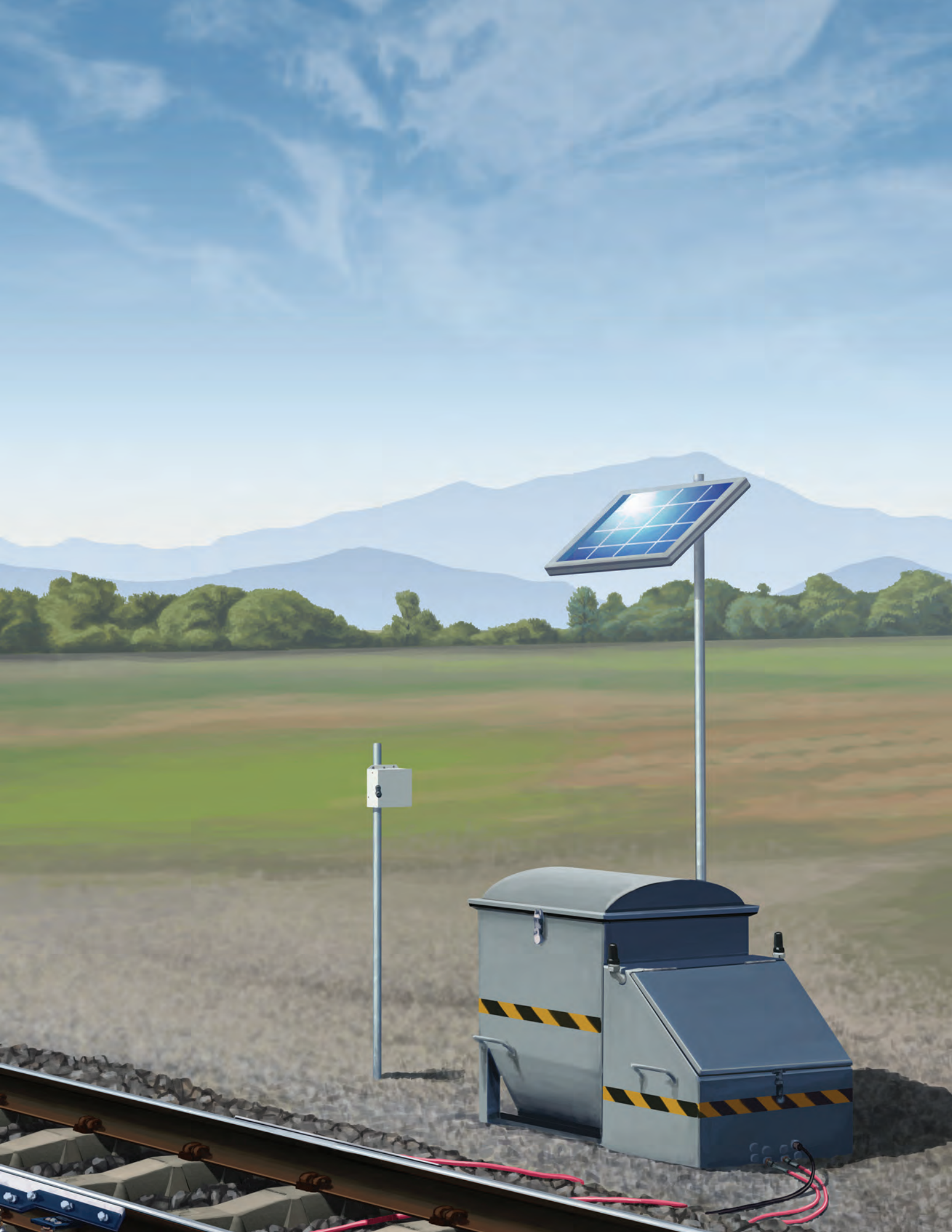
L.B. Foster is the innovative developer of ThinFilm friction control solutions. A major component of Total Friction Management (TFM), these products control friction at the wheel/rail interface reducing costs and improving performance. Used by rail freight and passenger operators around the world, our patented friction control products extend rail and wheel life, improve fuel efficiency, reduce green house gas emissions, noise, lateral forces, rolling contact fatigue and short pitch corrugations.

FRICION CONTROL HARDWARE

We are the leader in mobile and trackside friction management application systems. An important component of TFM these delivery systems, known as our H.O.W. (Hi-Rail, On-Board, Wayside) approach, provide a complete offering of options for application of lubricants and friction control products. From application systems to Remote Performance Monitoring technology to bulk distribution systems we offer the "total" package to get the job done.

FIELD SERVICE & TECHNICAL SUPPORT ASSESSMENT, IMPLEMENTATION, MANAGEMENT

L.B. Foster offers the expertise required for solving a variety of wheel/rail interface issues utilizing analysis techniques. We provide sophisticated and detailed monitoring of friction control performance and measurement/tracking of lateral/vertical forces, friction levels, rail wear, fuel consumption and rolling contact fatigue development.



U.S CUSTOMER SUPPORT

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