



## **BIODEGRADABLE TOP-OF-RAIL FRICTION MODIFIER**

Whitmore® TOR Armor® is a top-of-rail friction modifier (TOR FM) that is specifically designed to provide a friction coefficient between 0.3 and 0.4 at the wheel-rail interface. TOR Armor® substantially reduces noise, wear and lateral forces. High lateral forces lead to loosened tie plates and fasteners, and can result in low rail rollover.

During normal rolling, TOR Armor acts as a lubricant but when wheel creep occurs the sliding friction immediately converts to “positive friction”, controlling the creep condition and returning the wheels to a healthy rolling motion. The result is a substantial reduction of vibrations, corrugations and high-frequency squealing.

The positive friction generated by TOR Armor reduces lateral creep, thus reducing lateral forces. This has been measured on instrumented track at TTCI and Class 1 and 2 railways.

TOR Armor offers a year-round solution by using regular TOR Armor in hot to moderate climates and adding TOR Armor Artic in areas where temperatures dip below 10°F (-12°C) for extended periods of time. *Both grades of TOR Armor are fully compatible and can be mixed in trackside applicators without changes to the performance characteristics other than the low temperature usage.*

***US Patent No. 9,617,498, No. 10,214,225, No. 10,814,890 and patents pending.***



TOR Armor contains no solvents, latex or toxic materials. It dries quickly between the wheel and the rail due to frictional heat but will not harden in the holding tank or at the ports of the applicator. It will not corrode holding tanks, pumps or other steel components. The carry-down distance will depend on conditions such as curvature, braking and gradient, but 3 miles (5 km) is achievable in the vast majority of cases. In some cases, reductions in lateral forces have been measured at 6 miles from the applicator. The long carry distance often results in a reduction in the number of applicators needed.

TOR Armor does not affect braking or tractive effort.

### APPLICATIONS:

- Wheel/Rail interface with applicators.

### BENEFITS:

- **WEAR** - Reduces or eliminates creep, hunting (also known as yaw), and corrugations.
- **NOISE** - Stops or substantially reduces high-pitched squeal.
- **REDUCES FUEL CONSUMPTION IN CURVES** - Studies have shown that using TOR friction modifiers reduce fuel consumption 3- 15% depending on the radius of the curve.
- **LATERAL FORCES** - Greatly reduces rail damage by reducing lateral forces and angle of attack.
- **QUIET** - Smoother, quieter ride for transit customers.
- **LONG CARRY DOWN** - Will carry 3-5 miles (5-8 km).
- **WIDE TEMPERATURE RANGE** - TOR Armor can be used from -10°F (-12°C) to 140°F (60°C) while TOR Armor Arctic can be used from -31°F (-35°C) to 90°F (32°C) which allows year-round use with one grade in some areas.
- **ADHESION** - Improves adhesion on stretches of track that are prone to low friction. This can result in allowing more cars to be added.
- **LOW CONSUMPTION** - 300 - 425 ml per 1000 axles for freight, 175 ml per 1000 axles for transit rail.
- **SAFE** - contains no heavy metals, petroleum solvent or hazardous ingredients. Easily passes the OECD 301B test for "Ready Biodegradability".

### TYPICAL CHARACTERISTICS

	TOR Armor	TOR Armor Arctic
<b>Brookfield Visc.</b> (Spindle 6 @ 60 rpm, 23°C)	15,000	8,000
<b>Specific Gravity</b> , g/cc @ 60°F (15.5°C)	1.270	1.260
<b>Flash Point</b> (closed cup).	None	None
<b>% Effective solids</b> g/cc @ 60°F (15.5°C)	10 - 15	10 - 15
<b>Application Rate</b> (Per 1000 Axles) Transit Freight Mixed	175 ml 300 ml 220 ml	175 ml 300 - 425 ml 220 - 300 ml
<b>Appearance</b>	Smooth Dark Gray Paste	Smooth Dark Gray Paste
<b>Usable Temperature Range</b> , °F (°C)	-10° (-12°) to 140° (60°)	-31° (-35°) to 90° (32°)

### Packaging:

Nonreturnable Totes, Drums, Kegs and Pails



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Made in the USA in an ISO 9001:2015 and ISO 14001:2015 Facility.