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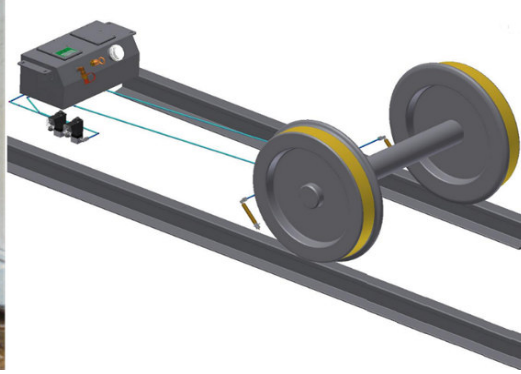
TOTAL SERVICES PROVIDER

RAILHEAD CONDITIONING
Reduces Noise and Wear

- Approval railhead conditioning as a complete solution against noise and wear for trams and trains
- First braking test procedure for two wheeled vehicles
- Test results for tram operation and two wheeled vehicles
- Many years of practical experience
- The future of railhead conditioning by railway companies

Measuring the quantities sprayed onto the railhead.



Spray system to condition the railhead

Approval railhead conditioning as a complete solution against noise and wear for trams and trains.

Unpleasant noises often occur when trams and trains negotiate tight curves in their tracks. It is possible to prevent that by conditioning the railheads; but this must not be allowed to make either the tram operation or the road traffic less safe.

In recent years, a growing number of tram and railway operators has been testing and implementing a separating agent on the railhead to prevent the nuisance that is curve squeal. To overcome curve squeal, the vibration excitation between wheel and track caused by the stick-slip effect must be reduced or prevented. This is achieved by reducing the difference between static and dynamic friction. And the product used is the friction modifier. If possible, the latter should be capable of preventing the stick-slip effect between wheel and track over an extended period of time. In this context, the product is referred to as a 'conditioner.'

And results achieved to date show measurable success.

For example, Leipziger Verkehrsbetriebe (LVB) GmbH procured a series of tram vehicles from Bombardier with mobile spraying systems for conditioning the railhead, by REBS Zentralschmiertechnik; the objective being to eliminate curve squeal from its entire route network.

The quantities of lubricant sprayed are distributed across a geographically predetermined railhead surface area, and guarantee the uniform desired coefficient of friction.

The quantity sprayed in so doing can be calculated as follows:

Width of surface treated:		ca. 30 mm
Normal running speed in the curve:		30 km/h
Spraying duration:		8 sec
Quantity per nozzle:		0,5 cm^3
Length of lubricant film:	approx.	67 m (8s with 30 km/h)
Total area treated:		$2m^2$
Film thickness: (theoretical)		0,25µm

The process begins before the start of the curve and distributes the amount determined by the spraying system onto the interior railhead of the curve for six to eight seconds.

The spraying process is repeated for longer curves. Featuring a control system that issues spray release based on location recognition, among other things, mobile spraying systems are efficient and reliable. It is also possible to pre-set the temporal application and thus suspend application in rainy weather, during sanding, or at times when the tram is running below the minimum speed.

Operation of these lubrication systems in vehicles is subject to a regulatory approval procedure. The operator commissioned DEKRA-Industrial in Halle, Germany, to perform the necessary testing activities.

Friction measurements

Rollover conditioned curve section

Directly treated tires

First braking test procedure for two wheeled vehicles

Because of the driving physics of two-wheeled vehicles, it is very difficult to furnish proof of safety for private transport as regards the use of a railhead conditioning system. The narrow contact surface of a motorcycle wheel (approximately 25mm) (and which needs to travel across various materials such as tracks and asphalt) leads to various discontinuities that are critical, and thus inappropriate for measurements. For this reason, DEKRA-Automobile, which was charged with performing this special test process, recommended friction coefficient tests pursuant to VDI 2700. It used a corresponding measurement technology, which still needed to be adapted for 'tyres/tracks' and 'tyres/asphalt' test configurations.

By measuring the coefficient of friction, it is possible to determine the change in road grip on the rail once the conditioner has been applied. This coefficient determines the possible deceleration. The brakes were not to be engaged on the rail. Instead, the wheels were to be wetted with the maximum possible amount of friction modifier. The braking test was then conducted on the adjacent asphalt. The results of the driving test are only reproducible within very narrow guidelines and are dependent on the driving behaviour of the test driver.

Both of the test variants conducted (coefficient of friction measurements and braking) come with advantages and disadvantages. For this reason, using both is reasonable and meaningful.

The friction modifier used was the biodegradable product **Head*Lub***®, by IGRALUB. It has already been successfully applied to real railheads worldwide.

Test results for tram operation and two wheeled vehicles

Even at 10 x single-rail spraying, the measured results fell within the acceptable range for both tram braking and friction measurements. The braking decelerations recorded with the motorcycle (with the same number of sprays) tended to be slightly better than before once the friction modifier had been rolled in by the tram wheels.

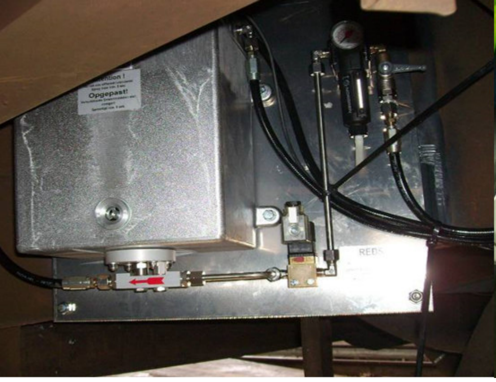
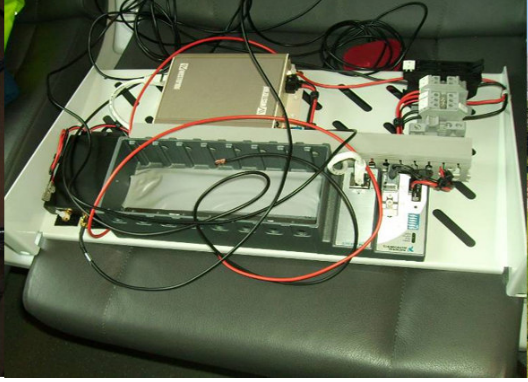
Even when the friction modifier was applied directly to the tyre tread, there was only a 13% reduction in braking deceleration compared to the initial reference measurement. This leads us to conclude that when a mobile spraying system is used by trams, no danger is posed to other road users by conditioning the railhead using HeadLub as the friction modifier.

At the end of 2012, the Swiss Federal Office of Transport (FOT) granted a permit for railhead conditioning based on measurements performed by Swiss transport operator BernMobil, using the same spraying system and friction modifier.

Many years of practical experience

Based on operator Essener Verkehrs-AG's (EVAG) many years of experience using mobile railhead conditioning systems in scheduled service, the effect of friction modifiers is ascertainable in terms of modifying the coefficient of friction after the first application, yet has no impact on the braking distance of the tram for up to five treatments.

IGRALUB possesses worldwide know-how in the implementation of railhead conditioning systems and acts as a total services provider both in project implementation and in conducting testing for the regulatory approval process.


The measurement case with which the required data are collected for the control and monitoring of conditioning and analysed in real time.

The future of railhead conditioning by railway companies

Since 2009, Dutch rail infrastructure manager ProRail has been working on a new concept for decreasing noise caused by wheel-rail contact. In addition to reduced noise pollution, reduced noise levels also mean reduced infrastructure wear and reduced wear on train wheel-sets of trains. The wheel-rail conditioning project dispenses with stationary systems and relocates application of HeadLub to the train. An electronic system measures the constant grip of the wheel on the rail, and evaluates results.

In order to ensure safety in all operating conditions, trains equipped with the railhead conditioning system also have measurement boxes installed. This box performs permanent monitoring of dispensing. The parameters can be configured by a control centre, and all important train information is available online. Among other features, dosing can be interrupted once the coefficient of friction drops too low. The latter is derived from the current flow of the traction motors and serves to alert the occurrence of slipping. A sudden change in current consumption is a reliable indicator of the interruption of wheel-rail contact. The adopted lower limit is a friction coefficient of 0.2 (friction when starting from standstill). No rail conditioning with the friction modifier is performed below this value. This means that safety is ensured at all times. Conditioning takes place at friction coefficients of between 0.2 and 0.4.

Experiences gained in field testing are thus generalised so that applicability as well as the cost benefit ratio of the railhead conditioning system can be predicted. Moreover, based on feedback by ProRail, a working group at the UIC (International Union of Railways) began investigating the railhead conditioning system at the end of 2011. As the chair of the pilot studies, ProRail will monitor the process closely and continue professionalising it, together with experts and tribologists in Europe and China.

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