IGRALUB

TOTAL SERVICES PROVIDER

Curve Noise

TOR Control: the solution for
the application of mobile railhead lubrication.

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An increasing number of metro, tram and railway companies are interested in eliminating the noise of the rail squeak on bends by changing the friction between the wheel and the rail, thereby avoiding the necessity of structural noise protection measures. Local authorities and specialist bodies are hesitant in approving the use of lubricants on the railhead, however. The reason for this is the lack of safety certificates for this application. Thanks to the use of an industrial computer as the functional control, railhead lubrication by mobile spray systems has become possible. TOR Control is able to register all possible operational scenarios and to convert them into the corresponding commands. Insights into this new technology and its application are summarized and practical cases are presented.

Igralub AG, from Switzerland, has been involved in the subject of rail squeak on bends for more than 15 years, and, together with Railtec Systems GmbH, also from Switzerland, has brought a new development onto the market with the name of TOR Control (TOR). Unlike the earlier, simple systems for the detection of curves (curve sensors, transponders, GPS), TOR Control is a computer that receives signals from GPS and other sources, and controls and triggers the spray commands on the basis of predefined criteria. This

TOR control computer

new system guarantees a predetermined and precise use. Operationally relevant inputs are also registered, and can be redefined in a manner specific to the project. These inputs are registered during the operation of the TOR computer, and are converted into the corresponding commands. The use of lubricants on the railhead can thereby be controlled.

The following components are thereby used:

Lubrication system

The application of the lubricant takes place by means of a spray system built into the vehicle, which, while travelling, sprays a specific amount of the lubricant onto the railhead during a predefined spray period by means of compressed air (at 6-8 bar). This spray command is carried out by one or more solenoid valves in the system. The spray quantity and the spray duration are determined in advance. In the case of longer curves, the spray intervals are repeated until the end of the curve. If there is no compressed air available in the vehicle, a corresponding compressor unit will also have to be installed. In certain vehicle models, the installation of the compressor unit takes place in the bogie or in the interior area of the vehicle.

All the signals available from the spraying system and the compressor unit are registered by the TOR Control, and can be used for monitoring and control.

Lubricant

Where lubricants are used on the railhead as a friction modifier, it is a requirement that they only modify the friction coefficients to such an extent that the approved braking distance is not exceeded. Meteorological conditions, such as rain, mist, heat and cold must also be taken into account here.

At the same time, the lubrication film should also have a long service life, which means that the lubricant should have a high resistance to pressure and strong adhesion. The selection of available lubricants of this kind remains small, and is therefore an important decision for both the fulfilment of the requirements and the operating costs. The lubricant should also be biologically degradable and water-repellent. The amount sprayed in each case amounts to an average of 0.25 cm^3, corresponding to a theoretical film thickness of 0.083 µm. In order to ensure that rail squeak on bends disappears for several hours with this minimal quantity, Igralub recommends that the lubricant Headlub, which has been successfully used on the railhead for many years, should also be employed in addition to the existing wheel flange lubrication.

Spray system with compressor unit in the bogie

Controller

The controllers that have been used up to now for mobile railhead lubrication simply detected the curve, or the desired spray location and the length of the spray film. As curve sensors react to speed, it can happen that the same quantity is not always sprayed at the same location. It must also be noted that curve sensors react late to a curve, with the result that the spray command is only given a few metres after the curve has started.

Controllers of railhead lubrication systems that only provide a spray command as a result of location detection no longer satisfy the complex requirements of today's operations. The "brain" is missing. In order to be able to register all the requirements, a computer is needed that can independently produce commands according to the specific situation on the basis of the pre-determined input and output signals of the system.

Together with the Railtec Systems GmbH company in Hergiswil/Switzerland, Igralub has developed a controller that is sold under the name "TOR Control". This is a computer whose software is linked to incoming operational signals and that provides the corresponding commands from them. Many of these operational signals are already available in most vehicles and can be very easily accessed by the system. Various interfaces are available for this: LAN, CAN, digital I/O, analog inputs, frequency inputs and serial ports.

Precise spraying

The TOR Control detects the precise application locations by means of GPS, the vehicle speed and any other available signals. This takes place in both the open air and in tunnels. In the case of a loss of signals, the distance to the defined spray location is calculated from the vehicle speed. The definitions of the precise spraying locations and their length are achieved from a mapping that is directly created during a teach-in run using a laptop in the vehicle. The setting of the spray command takes place using a simple software

that is a component part of the supplied operational software. The exact positions can be entered into the route plan created from the mapping by simply setting the start and end points. Modifications or the addition of new spray locations are possible at any time and can be carried out by the operator himself. This intervention into the operational software is simple, and requires no programming know-how.

Spray nozzle for top of rail application

## Components and inputs of TOR Control

In order to ensure that the spray activation takes place correctly, the TOR Control accepts control signals from its eight digital inputs, as well as from the LAN or CAN. Eight outputs are then available for the spray process and other functions. The direction of travel, the line number of the vehicle, speed, door opening, emergency braking, as well as the onset of rain, are thereby registered by the TOR Control, and are converted into commands. There are also the control signals for the entire system. TOR detects faults, and reports them. These include, for example, a low lubricant level in the tank, or no pressure build-up in the system. Despite the wide range of functions, TOR Control has been designed for a simple application. It is clear that over-lubrication of the same location by several vehicles following each other must be excluded by the TOR Control. The possibility of issuing an operational protocol provides information about lubricant applications that have already taken place.

TOR Control is therefore ideally suited for the use of mobile rail head lubrication systems.

Teach-in run to create the mapping
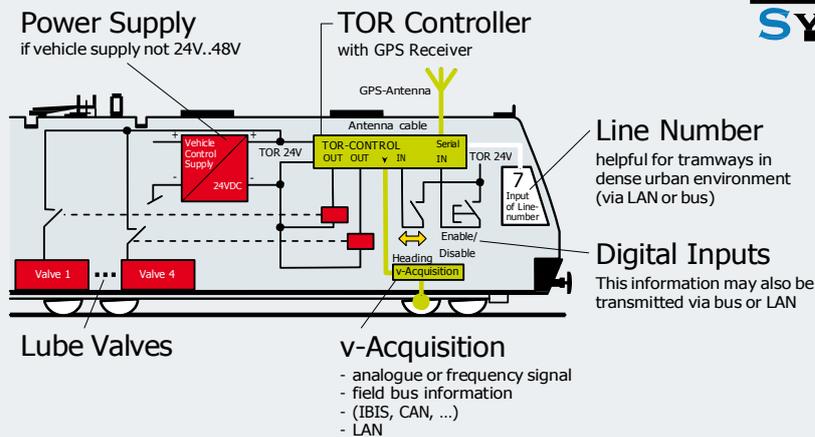
Define end of stretch to be lubricated by mouse click
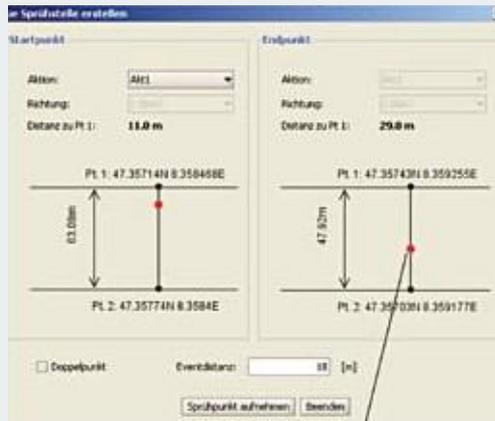
Defined by moving the red point with the mouse

Recorded Position

Recorded line with coordinations

Defined end

Components and Interfaces

RAILTEC SYSTEMS

Power Supply
if vehicle supply not 24V..48V

TOR Controller
with GPS Receiver

GPS-Antenna

Antenna cable

Line Number
helpful for tramways in dense urban environment (via LAN or bus)

Digital Inputs
This information may also be transmitted via bus or LAN

Lube Valves

v-Acquisition
- analogue or frequency signal
- field bus information
- (IBIS, CAN, ...)
- LAN

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Total Services Provider as a successful customer solution

Igralub now offers all components for wheel flange and top of rail lubrication systems as a Total Service Provider. Customer specific project development, commissioning and maintenance control are therefore all available from a single source.
This service makes it possible for larger metro and tram operators, as well as railway operators, to introduce a comprehensive railhead and wheel flange lubrication.

Collaborations with well-known lubrication system manufacturers (including Rebs, Delimon, SKF Vogel, BEKA) make the retrofitting of railhead lubrication possible.
With its many years of know-how, Igralub is able to advise rail and tram operators about all details and wishes.

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