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Railway applications - Wheel/Rail friction management - Part 1-1: Equipment and Application - Flange Lubricants

Bahnanwendungen - Reibungsmanagement zwischen Rad und Schiene - Teil 1-1: Vorrichtungen und Anwendung - Spurkranzschmierung

Applications ferroviaires - Gestion des frottements roue/rail - Partie 1-1 : Équipement et application - Lubrification des boudins de roues

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45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 15427-1-1:2020) has been prepared by Technical Committee CEN/TC 256 “Railway Applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document is part of the series EN 15427, Railway applications - Wheel/Rail friction management, which consists of the following parts:

— Part 1-1: Equipment and Application – Flange Lubrication

— Part 1-2: Equipment and Application – Top of Rail materials

— Part 1-3: Equipment and Application – Adhesion materials

— Part 2-1: Properties and Characteristics – Flange lubricants

— Part 2-2: Properties and Characteristics – Top of Rail materials

— Part 2-3: Properties and Characteristics – Adhesion materials

— Part 3: Rationale for requirements and further background information

Introduction

Friction management using solid or fluid (oil, grease, etc) substances at the wheel-rail interface is a complex subject and includes:

— lubrication of the wheel flange / rail gauge corner interface, commonly referred to as “flange or rail lubrication”;

— lubrication of the back of flange/ check rail interface, commonly referred to as “check rail lubrication”;

— altering the level of friction at the interface between the top of rail and the wheel tread, commonly referred to as “top of rail friction management”;

— applying materials to the wheel rail contact to increase (improve/ enhance/ recover) adhesion.

This document sets out requirements for the lubrication of the wheel flange / rail gauge corner and back of flange/ check rail interface. It describes systems fitted on board trains and on the track, as both systems may need to be employed to achieve effective lubrication of the wheel-rail interface.

Managing the wheel-rail interface effectively will reduce wear of both wheel and rail. When friction is managed effectively, noise levels, wear levels and the risk of flange climbing are reduced. Conversely, where not managed effectively, assets may require replacement prematurely before reaching their full economic potential.

There needs to be control in the application of lubrication such that there is:

— no loss of traction or braking performance;

— no adverse effect on signalling systems or track circuits;

— understanding of the increased risk of fire;

— no harmful environmental effect;

— no incompatibility between the different lubricants/ materials in use, particularly, between solid and fluid systems.

1 Scope

This document is limited to specifying the requirements when applying lubricant to the interface between the wheel flange and the rail (active interface), either directly or indirectly to the wheel flange or to the rail and includes both trainborne and trackside solutions.

This document only covers the equipment and application of lubricant to the active interface.

This document defines:

— the characteristics that systems of lubrication of the wheel-rail interface shall achieve, together with applicable inspection and test methods to be carried out for verification;

— all relevant terminology which is specific to the lubrication of the wheel-rail interface.

This document only applies to the mainline railway.

NOTE This document can also be used for other railways, e.g urban rail.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 15427-2-1:2020, *Railway applications — Wheel/Rail friction management — Part 2-1: Properties and Characteristics — Flange lubricants*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
active interface
contact area between wheel flange and the gauge face of the rail and contact area between the check rail face and the back of the wheel

3.2
applicator
part of trackside/trainborne equipment that delivers the lubricant to the active interface

EXAMPLE Nozzles or sticks

3.3
trainborne equipment
system carried on the train that consists of one or more applicators, a storage unit and a means of control

3.4
trackside equipment
system installed on or adjacent to the track that consists of one or more applicators, storage containers and a means of control

3.5
train operator
authority responsible for operating the train or their authorised representative

3.6
infrastructure manager
authority responsible for the infrastructure or their authorised representative

3.7
supplier
organisation responsible for supplying the equipment/ lubricant

3.8
lubricant
substance designed to alter friction at the wheel/rail active interface

3.9
technical specification
document outlining agreement between the client and the supplier

3.10
top of rail material
substance that changes the rheology of the third layer body to lower friction

4 General

4.1 Purpose of equipment

The aim of the equipment is to apply the lubricant to the active interface to reduce the risk of flange climb derailment and achieve wheel/rail friction conditions that optimises asset life, as part of a wider wheel/rail management strategy without compromising the safe operation of the railway.

Wheel flange/ rail friction management may be used to:

— reduce noise and vibration;

— reduce the rate of wear;

— reduce number of wheel and rail defects.

The specific purpose for the use of lubrication equipment and lubricants shall be understood before deployment in order to achieve the desired outcome (e.g reduction in wear).

4.2 Application of lubricant

The trainborne/trackside lubrication equipment shall apply lubricant to take effect in the active interface as set out in chapters 5 and 6 of this document.

The trainborne/trackside lubrication equipment shall be designed to limit contamination of any other part of the train or infrastructure.

The trainborne/ trackside lubrication system shall not compromise the performance of the train (i.e braking and traction), see Annex B.

The application of the trainborne/trackside equipment shall be considered where both can be in use at the same location.

Compatibility between different lubricants (such as flange lubricant and top of rail material/ adhesion material) in use shall be taken into account. Lubricant properties and characteristics shall comply with the requirements set out in prEN 15427-2-1:2020.

The applicator shall be adjustable such that it can be returned to its correct working position (refer to 5.4) following wheel or rail reprofiling or other maintenance changes.

A method to determine when refilling is required shall be provided.

A method by which the equipment can be checked to ensure its functional status shall be provided.

NOTE 1 Ensure the lubricant being applied to the active interface has been approved for use by the relevant authorizing bodies (see Annex B).

NOTE 2 It is good practice for all affected parties (infrastructure manger/ train operator/ suppliers) to discuss the final use as early as possible to ensure a smooth approval process.

Where there is any change to the approved design of the equipment, the customer shall be informed. Such changes may lead to equipment requiring reapproval,

5 Requirements for trainborne equipment

5.1 General

When applying to the active interface, the following shall be considered:

— method of braking (e.g. tread, disk or other);

— position and number of applicator(s) on the vehicle;

— direction of travel;

— proximity of applicator to the wheel and the rail;

— speed of train;

— frequency and amount of application.

The position and alignment of each applicator shall take into account:

— suspension movements to ensure application of the lubricant to the active interface in all conditions;

— the need to gain access for maintenance.

The trainborne equipment shall comply with the vehicle gauge.

5.2 Design of trainborne equipment

General consideration when designing and installing trainborne equipment shall include:

— ambient temperature range and climatic conditions (see EN 50125-1);

— equipment positioning – The design and location of the equipment shall factor in the consideration for quick and easy refilling capability;

— space constraints (e.g. static and dynamic);

— availability of necessary supplies (e.g. electrical, air, hydraulic, etc...);

— options for system control and lubricant regulation;

— interface with other on-board systems (e.g. braking);

— the type of lubricant to be applied and its intended function;

— total life cycle cost and maintainability;

— length/ type of train;

— interface with infrastructure systems;

— intended design life and sustainability;

— safety and reliability requirements;

— compliance with vibration and shock loads requirements of EN 61373 and EN 13749 relevant to the position on the vehicle;

— protection of the equipment from flying objects eg track ballast;

— EMC standard (EN 50121-1);

— aerodynamic effects (e.g. Wind turbulence can affect the performance of a spray system which may be optimized by use of a windbreak);

— Electronic equipment used on rolling stock (EN 62621);

— EN 50238-1:2003 Compatibility between rolling stock and train detection systems – General;

— noise emissions.

5.3 Installation of trainborne equipment

The supplier of the trainborne equipment shall produce instructions for the installation and use of the equipment.

Trainborne equipment shall be installed in accordance with the manufacturer's instructions.

The installation shall be checked after a short period of service to ensure that the lubricant is being applied correctly to the active interface, see Annex B.

5.4 Operations, Inspection and maintenance

Maintenance instructions for the trainborne equipment shall be provided. These shall include a method for fault diagnosis to check that the trainborne equipment is not partially or fully blocked or misaligned and that all components are securely attached to their mountings (see Annex D for some examples).

A train maintenance plan shall include a check of the trainborne equipment to be carried out at pre-defined intervals taking into account the equipment supplier's instructions. This maintenance plan shall include monitoring of lubricant usage and application alignment as a method of checking effective delivery.

Before any lubricant is used, it shall be verified if it is compatible with the equipment, as specified in prEN 15427-2-1:2020, Annex F.

5.5 Application

The equipment shall be designed so that the rate of application of the lubricant is consistent during the agreed service conditions.

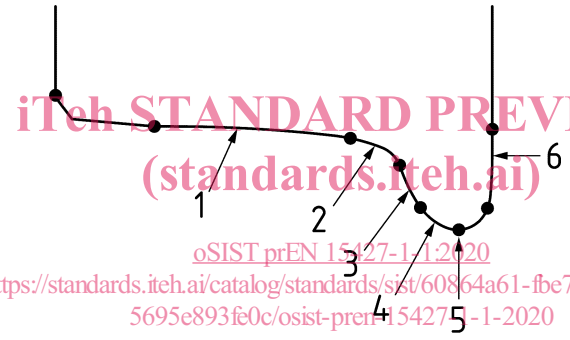
Where lubricants are manually applied by the driver, consideration shall be given to record this action.

Any trainborne equipment using a spray applicator shall have a low speed cut out.

High speed cut out should be considered for trainborne equipment design.

The lubricant shall be applied to area "2, 3" or "6" as shown in Figure 1.

Migration of lubricant to other zones is not desirable.



Key

1 tread
2 flange root
3 flange face
4 flange toe
5 flange tip
6 back of wheel

Figure 1 — Areas of a wheel tread

5.6 Verification

Verification of the trainborne equipment shall be undertaken to establish effective application of the lubricant. The method chosen shall depend on the type of equipment and shall be relevant to the application.

The method of verification shall be determined between the client and supplier, see Annex B.