Engineering Practices Manual

Civil Engineering

Guidelines for Trackside Lubrication

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1. Scope

These guidelines are intended for use in establishing or improving the performance of trackside lubrication.

The guidelines should be applied for the establishment of lubrication, the review and improvement of existing lubrication and for diagnosis of problems.

The best application of the guidelines will be achieved by seeking expert advice from the lubrication specialists in ARTC Standards & Systems department.

> ***Note:*** *Gauge face lubrication is not normally effective in reducing wheelsqueal. Other friction modification techniques are required to control squeal.*

2. Reason and Nature of Change

Document reissued as ARTC Engineering Practice Manual.

3. General

There are two identified strategies for improving the performance of trackside lubrication:

- Improvements in grease transfer by placing trackside lubricators on moderate curves in advance of the sharp curves which are the main target
- Improvements in the lubricant used by choosing a high performance product (albeit a more expensive one)

Both strategies will result in an increase in lubricant travel and a reduced friction coefficient on the gauge face of the rail. The outcome is:

- a reduction in the number of lubricators needed

- a reduction in the amount of lubricant required
- a reduction in rail wear and a reduction in wheel wear

There is also less lubricant contamination of the rail surface and less lubricant wasted. This means better locomotive adhesion and braking, and less rail damage from wheelburns and lubricant induced crack propagation.

The application of the first strategy involves, simply, a review of the existing lubricator location and the repositioning of lubricators to suit. A 'before and after' inspection needs to be carried out which includes the taking of friction measurements.

The decision to adopt the use of high performance lubricant will depend on the cost benefit trade-off where the cost of using a better lubricant is weighed against the benefits. In the metropolitan area the biggest savings arise from reductions in wheel wear of passenger trains which significantly outweigh the additional cost of the product. Only high performance lubricant is now used in the metropolitan area.

In the country areas the savings from using a high performance lubricant are less universal. Savings in rail wear can take a long time to realise and freight vehicles are better at curving and have harder wheels than metropolitan passenger trains. The application of higher performing lubricant should be considered on a case by case basis.

4. Where is lubrication required?

Lubrication is required wherever there is potential for significant wear. The wear can arise from wheels or rails, evidenced by the condition of the gauge face of the rail or from the presence of metal flakes on the foot of the rail.

The primary determinant for the need for lubrication will be the curvature. Rails in curves above about 600-800m radius generally will not require lubrication. Within this curvature range the main factor is the type of traffic. Freight vehicles will be superior to passenger vehicles and freight with steering bogies will be superior again. In addition freight vehicles have harder wheels so they are less sensitive to wear than passenger trains.

5. Lubricator Types

Single pump, single blade lubricators are the preferred type of lubricator. Any new lubricators must be of a design approved by the ARTC Manager Standards & Systems.

Current approved lubricators and lubricants are listed in Appendix 1.

6. Lubricants

Only approved lubricants (see Appendix 1) should be used. All lubricants in the metropolitan area should be of a high performance type (currently the recommended product is Rocol Rail Curve Grease but this may change as lubricant technologies improve). The exception is for special environmental areas, where a biodegradable lubricant may be required.

Country areas can use standard lubricant (currently Caltex 904) or can select a high performance lubricant where economically justified. However, under severe grade braking locations (more than about 1:50), the standard lubricant will not be adequate. The high performance lubricant will be satisfactory.

> ***Note*** *For individual cases this can be verified by measuring wheel temperatures (via non-contact thermometer) to ensure the maximum wheel temperatures are well within the temperature range of the lubricant.*

7. Locating Lubricators

Lubricator positioning has been found to be the most important factor in the performance of a gauge face lubricant. If at all possible, lubricators need to be located in moderate radius feeder curves ahead of the sharper curves which are the main target. Positional alternatives are:

- Within the transition at the beginning of the curve in the direction of travel of medium radius curves with radii in the range 400m-600m. On single lines, place lubricators at the beginning of curves in the direction of the heaviest traffic. The ideal position within the transition is where wheel flanging is just beginning to occur. This will usually be closer to the TRS than the tangent point.

- Within the body of relatively shallow curves, with radii greater than 600m and up to about 1000m, as long as there are some indications of very minor wheel flanging and no indication of heavy wheel flanging. This is an ideal location for lubricators on single lines where the lubricator is servicing both directions.

- Lubricators should not be positioned in tangent track or the low rails of curves or on very wide radius curves (greater than 1000m radius) since no flanging will occur.

- Where possible, lubricators should not be positioned at curves with radii less than about 300m. If this is the only alternative the best position is within the transition area where flanging is just beginning to occur.

- Where located in the transition, lubricators should be positioned at the beginning of the curve for the direction of travel. For single line tracks they can be positioned either at the start or the end of the curve.

Where the desirable wide radius curves are not available the widest radius available should be selected. Carry distances and lubrication effectiveness will, however, be reduced.

8. Spacing of Lubricators

In track containing relatively sharp curves, the above positioning of lubricators will generally lead to efficient lubrication distances from the lubricator of:

- Up to 8-10km in timber sleepered track and moderate grade and curvature

- Up to 5-7km on timber sleepered track under severe grade braking conditions (more than about 1:50), or a high proportion of sharp curves (<300m).

- Up to 5-6km on concrete sleepered track and moderate grade and curvature.

- Up to 3-4km on concrete sleepered track under sever grade braking conditions (more than about 1:50), or a high proportion of sharp curves (<300m).

For single lines, travel distances either side of the lubricator should be reduced by about 20-30%.

Under very severe grade conditions (more than about 1:50 in either braking or climbing direction), lubricators on the Up and Down rails should not be positioned any closer than 0.5km of each other.

Distances are based on about 40-50% of the track being serviced by the lubricator. Where, for example, long sections of tangent track are interposed between curves, then travel distances will be proportionally increased.

These distances are based on the use of high performance lubricant in areas of metropolitan passenger traffic and standard lubricant in country areas. Actual distances will depend on the particular track situation involved and the type and mix of traffic and should always be verified by testing prior to and after implementation.

9. Installation & Adjustment Requirements

Generally, the required plunger heights above the running surface of the rails are: 3.2mm (1/8 inch) in summer when the lubricant is less viscous, and 4.4mm (3/16 inch) in winter when the lubricant is more viscous. However, it is essential to check visually whether lubricant is migrating to the running surface of the rails. If this occurs, the height of the plungers must be reduced.

10. Performance Review – friction, smoothness, filings, noise, rail wear

Testing should be carried out to verify the lubrication strategy proposed for a particular area. This can be done using portable lubricators. The performance requirements are:-

- The friction on the gauge face of the high rails should be less than 0.30 and preferably no more than 0.25 if metropolitan passenger trains are involved.

- The friction on the running surfaces of both high and low rails should be greater 0.35 (greater than 0.40 preferred) and greater than 0.40 on grades steeper than 1 in 50. A lower friction level is acceptable on the rail surface in the immediate area of the lubricator (within 50m).

- It is also desirable that the difference in the running surface friction between the high and low rails should be no more than 0.15.

The friction testing should be carried out with a tribometer, and cover at least 100m in each track section to be assessed. There must also be a visual examination of the gauge face and the top of rail and for any signs of wear debris. Note the gauge face of the rail should be smooth in texture and display good coverage of the lubricant.

11. Follow up and Servicing

The performance of the lubrication regime should be regularly monitored in conjunction with routine track inspections. Any indications of severe wear, in the form of wear debris or rough surface on the gauge face, should be reported so that the lubrication functioning can be checked. If lubricators are found to be functioning correctly the strategy should be reviewed and may need to be modified.

***Note** that Lubricators will require basic servicing at intervals of 2-4 MGT.*

Appendix 1 – Approved Lubricator Types

1. P&M (Fessl) – the most common older type lubricator which exists as a bolt-on or more recently as a clamp-on type.

2. Tamper – no longer used except in some areas of the Metropolitan system.

3. RTE 25 – an improved version of the P&M lubricator.

For new lubricator applications use the following types

1. RTE 25 – an improved version of the P&M lubricator.

Approved Lubricants

	Lubricant	**Conditions of use**	**Use with Lubricants**
1	ROCOL Rail CurveGrease	High Performance	All Lubricators
2	CALTEX 904		All Lubricators
3	FUCHS 234GOWX	High Performance Environmentally friendly	All Lubricators