Justification:
Instruction

(Design & Maintenance)

Private Owner Circular Letter 546 Issue 4

Title
Axle Bearing Greases, Seals and Overhaul Standards

AUTHORISATION

Authorised by:

P.P. .....
J. Allenden, Professional Head of Plant and T&RS

1. INTRODUCTION

POCL 546 Issue 4 has been produced to advise Private Owners that the re-manufacture of axle bearings by Timken Rail Services has been approved by the PWRA Management Group as a process that may be used on Private Owner wagons.

2. FREQUENCY OF OVERHAUL AND AXLE BEARING LIFE

The frequencies at which axlebox and cartridge bearings must be re-greased and overhauled are given in **Table 1**. The life of axle bearings shall be 24 years unless previous agreement has been obtained from the Senior PWRA Engineer, PWRA Management Group.

	Non-Cartridge Bearings	**Cartridge Bearing Units**
Re-grease	Following rotational and end float check. At wheel re-profiling but not to exceed 8 years. Wheelsets re-profiled on ground wheel lathes shall receive a rotational and an end float check. Re-greasing may either be carried out in the workshop undertaking the re-profiling or at an alternative approved location.	Cartridge bearings shall only be re-greased at overhaul.
Overhaul	Not to exceed 8 years. At wheel renewal.	Not to exceed 8 years. At half wheel tread thickness or at re-profiling if this results in the wheel tread thickness being reduced to half or less. At wheel renewal.

Table 1 Greasing and overhaul frequencies for axle bearings

Note: The competence of personnel and supervisors responsible for overhaul of axle bearings or the maintenance of axle bearings or any activities which may disturb the axlebox / axle bearing assembly or work activities which may influence the condition of axle bearings shall

be in accordance with GM/GN2646, Issue 1 'Guidance on Axle Bearing Maintenance'.

3. GREASING OF AXLE BEARINGS

Axle bearings (other than cartridge units) shall be greased or re-greased using any of the methods given in **Tables 2** to **5**.

Note: Cartridge bearings shall not be greased using these procedures.

Facilities

Re-greasing of axle bearings shall be undertaken in a dry, dust free and clean area, in a covered workshop. Only if agreed in advance with the Senior PWRA Engineer shall re-greasing of axle bearings be undertaken at a site without covered workshop accommodation. At all sites authorisation will be dependent upon the provision of suitable screening and protection to prevent the ingress of dust, water or debris into the bearings.

Equipment

Grease pump (manual, electric or pneumatic), suitable fittings, dummy front covers or greasing fittings for the specific axle bearings concerned.

4. AXLE BEARING GREASES AND SEALS

The particular axle bearing grease used shall be specified within the vehicle's maintenance plan. It is important to ensure that only the correct grease is used in conjunction with the particular sealing arrangement and hence the axle bearing manufacturer's recommendation shall be followed.

Note: It has been generally accepted since 1992 that the life of axle bearing grease in service is 8 years maximum for Private Owner wagons.

New designs and modifications

All engineering change and modifications to axle bearings (including seals and grease) shall require approval by a VAB.

Note: The process specification for acceptance of new axle bearing greases is now detailed within BR673 Issue 2.

Any new design of vehicle shall take account of the latest technology available to protect axle bearings from corrosion due to the ingress of water, or other liquids (e.g. seal design, improved greases, etc). Wherever possible such new technology shall also be incorporated into replacement bearings sourced for existing vehicles subject to VAB approval.

Axle bearing grease approved to BR 673 Issue 1

The only axle bearing grease now approved for use against BR 673 Issue 1 (and still being produced) is Fuchs Renolit MP3. Note that this grease was previously manufactured under the trade name of Century Lupus A3.

Other axle bearing greases in use

Certain other axle bearing greases are also in use on freight vehicles, having been accepted thorough the VAB process for new procurement. These greases are listed as follows:

Shell Arapen RB320
Shell Alvania 2760B
Esso Beacon 3
Esso Waelzlagerfett 085.30

Note: These greases shall only be used where VAB approval has been specifically granted for new axle bearings concerned.

5. STANDARDS APPLICABLE TO AXLE BEARING OVERHAUL

The process standards applicable to the overhaul of various the axle bearing types are detailed below:

IB/COS UA 001	Overhaul of SKF Axlebox Roller Bearing Unit & Adaptor
IB/CEPS 1002	Overhaul of SKF Spherical Axlebox Roller Bearings
IB/COS UA 002	Overhaul of SKF TBU Cartridge Bearing Units
IB/CEPS 1003	Repair/Overhaul of Timken Taper Roller Axlebox bearings
IB/CEPS 1017	Overhaul of Timken SP Cartridge Bearing Units
IB/CEPS 1039	Overhaul of Timken AP Cartridge Bearing Units (Incorporating HDL & rubbing seals)

Axle end caps shall only be fastened and locked using the approved method for that axle bearing.

6. WATER INGRESS TO AXLE BEARINGS

There is a need to ensure that (as far as is practical) water or other liquids do not impinge directly upon the rear seals of axle bearings. The axle bearing seals are designed to protect the bearings from water ingress under normal circumstances.

However, the seals may not be totally effective under conditions of sustained dousing and ingress of water will result in corrosion and eventual bearing failure. Certain wagon types may be more susceptible to this problem, e.g. container and other flat wagons of a 'skeletal' design. These wagon types, by virtue of their open construction, do not afford the same degree of

protection as solid floored wagons. In addition, some payloads, (containers in particular) may channel run-off water onto the axle bearing rear seals.

Wagons that are at risk from this problem shall be investigated and if necessary suitable splash plates fitted. Any such modification will require VAB approval.

It is also important that front covers (where fitted) are securely fastened. Used gaskets shall always be discarded and replaced with new items whenever front covers are removed and replaced.

7. RE-MANUFACTURE OF TIMKEN RAIL SERVICES AXLE BEARINGS

Timken freight axle bearings fitted to PWRA registered wagons may be re-manufactured in accordance with Timken Rail Services Specification RBS1197, Issue G, dated 9th May 2008, subject to the following two conditions:

i). The re-manufacture of Timken axle bearings shall only be carried out by Timken Rail Services.

ii). Private Owners employing re-manufactured Timken Rail Services axle bearings shall ensure that their Maintenance Plans/Policies are amended to reflect the change in process and that the relevant signed-off amendment sheet (noting that the change does not affect the mandatory requirements of Railway Group Standards) is inserted into the documentation.

8. SCOPE

This POCL is applicable to all PWRA vehicles that operate on Network Rail controlled infrastructure.

9. IMPLEMENTATION

This document shall be implemented immediately.

In the event of any query arising, or clarification required, please contact:

Senior PWRA Engineer
PWRA Management Group
Room 203 Derwent House
rtc Business Park
London Road
Derby
DE24 8UP

Priority	Method	Applicable Axle bearings	When Applicable	Notes
Preferred	A dummy front cover which is fitted to front of axlebox to allow grease to be pumped through a nipple in cover.	Most Timken and SKF axle bearings and others of similar design. Also used for Hoffmann boxes.	After assembly or when re-greasing is necessary.	Ensures complete purging of the bearing and that front cover is clear of grease when fitted.
Approved Alternative Method	A greasing collar is fitted between bearing races and grease is pumped in, either through the side of the collar or through a nipple in collar.	All SKF double spherical bearing axle bearing assemblies of BR or UIC design.	As **preferred** method but can only be used for re-greasing at specifically approved sites.	Axle bearing has to be removed hence there is a danger of debris entering. The only method suitable for "Bullet" UIC boxes.
Least Preferred	Axlebox grease plug, where grease is pumped into the axle bearing by means of a nipple screwed directly into the axlebox.	Most Timken axle bearings and SKF designs for BR but not UIC types.	As **preferred** method but only when dispensation is granted to not use the **preferred** method.	Complete purging of front bearing not guaranteed. Front cover must be removed to remove excess grease.

Table 2 Methods of greasing axle bearings

Stage	Action	Notes
1	Clean the outside of the axlebox at the front to prevent dirt and debris entering the bearing when the front cover is removed.	White Spirit may be used, applied by a cloth, but high-pressure water jets, abrasive powder or solvent cleaners are prohibited.
2	Remove front cover, gasket and when necessary the axle end cap.	Axle end caps shall only be removed if it is required by the design of dummy front cover.
3	Examine the condition of the grease and visible parts of bearing. Any contamination shall be reported to the supervisor for further investigation, otherwise proceed with re-greasing.	Look for any metallic slivers at the bearing inner ring/end cap/journal interfaces that might indicate that the bearing has moved.
4	Fit dummy front cover.	Each type and size of axlebox has a specific cover.
5	Pump grease through nipple in dummy front cover. Examine condition of old grease as it exudes from rear seal.	During pumping of the grease, to ensure proper distribution within the bearing, the box should be oscillated gently approximately 45° either side of its initial position. Pump until fresh clean grease exudes from the rear seal.
6	Remove dummy front cover.	
7	Refit axle end cap as necessary. Refit front cover and gasket.	A new gasket shall be used, axle end cap bolts shall be correctly torque tightened and a new locking plate or wire where applicable, shall be used on each occasion.
8	Wipe excess grease from rear of axlebox.	**Do not** use any liquid cleaners or pressure water jets.

Table 3 Preferred method of greasing axle bearings

Stage	Action	Notes
1	With axlebox removed, clean bearings thoroughly. If this is impractical remove surplus old grease with clean lint free cloths.	Use white spirit and dry bearings thoroughly with clean, dry compressed air. The workshop must be clean and dust free.
2	Attach greasing collar around journal between the two bearings and ensure it is sealed against the outer rings of both bearings.	
3	Attach grease pump feed line to nipple in collar.	
4	Pump in new grease until it exudes from all round both front and rear bearings.	During pumping of the grease, to ensure proper distribution within the bearing, the assembly should be oscillated gently approx. 45° either side of the initial position.
5	Remove greasing collar.	
6	By hand apply new grease to the front of the front bearing to form a wedge around the journal. Also by hand apply grease to the rear Labyrinth seal to ensure the grooves are filled around their full circumference.	Ensure grease is kept free of contamination until axlebox is fitted – if necessary fit temporary sleeve or cover.
7	Having ensured that the bore of the axlebox is clean. Fit the axlebox over the bearings.	
8	Re-fit the rear cover/seal and, where applicable, the front cover.	Fit a new gasket, "O" ring seals as appropriate and ensure they are positioned correctly.

Table 4 Alternative authorised method for greasing SKF axlebearings (Double spherical bearing assemblies)

Stage	Action	Notes
1	Clean outside of axlebox at front and around grease plug to prevent dirt and debris entering the box when the front cover and grease plug are removed.	White Spirit may be used, applied by a cloth, but high-pressure water jets, abrasive powder or solvent cleaners are prohibited.
2	Remove grease plug and attach feed from grease pump. Pump in grease until fresh clean grease exudes from all round the rear seal. Examine condition of old grease as it exudes from rear seal. Any contamination shall be reported to the supervisor for further investigation before proceeding.	During pumping of the grease to ensure proper distribution within the bearing, the axle box should be oscillated gently approx. 45° either side of its initial position.
3	Loosen front cover (care must be exercised) to release pressure inside box. Remove front cover completely.	Trapped air inside the front cover will be pressurised by the grease pumping operation. As the front cover bolts are loosened this pressure will be released and grease may spurt out.
4	Pump, as before, a little more grease to ensure that fresh clean grease exudes from all round front bearing.	This ensures as near complete purging as possible of the old grease form the bearings.
5	Detach grease line and re-fit plug in axlebox body.	
6	Remove all grease form inside front cover, examine condition of old grease. If contaminated in anyway report this to supervisor for further investigation before proceeding.	There should be no more than a wedge of grease around the circumference of the end cap (or journal when end caps are not required) at the front of the bearing and front cover should be clean to ensure the necessary air space exists within the axlebox.
7	Check security of end cap (if applicable) or ensure it has been correctly refitted if removed for any reason.	Axle end cap bolts shall be correctly torque tightened and a new locking plate, or wire where applicable, used on each occasion.
8	Refit front cover.	A new gasket shall be used.
9	Wipe excess grease from rear of axlebox.	**Do not** use any liquid cleaners or pressure water jets.

Table 5 Least preferred method for greasing axle bearings