

Wheel end service for greased wheel ends

Tech tip

Scope

This document recommends procedures for servicing greased wheel ends. Included are SKF recommendations for manually adjusted, hard greased (NLGI 1, 2, and 3) and semi-fluid greased (NLGI 000 and 00) wheel ends. We'll provide important information regarding symptoms of a failing wheel, wheel end inspection and service, and give helpful clues on how to safely and properly assure quality workmanship.

Warning: Never work under a vehicle that is supported by only a jack. Always support the vehicle with proper stands. Block the wheels and make sure the vehicle will not roll before releasing brakes. Always wear eye protection and all necessary protective apparel. Follow all safety policies and regulations. Never put yourself or any co-worker at risk of injury.

Symptoms that wheel end is in need of service

- Hot to the touch hubcap (**Careful – hubcap could be extremely hot**)
- Site glass (oil) on hubcap is discolored or burnt
- Low lubrication level
- Wetness around hubcap gasket area
- Vibration or wobble (**serious condition – service as soon as possible**)
- Grinding noise
- Abnormal side pull when braking
- Burning smell
- Smoke after returning from the road
- Whenever a wheel end has been submerged in flooded waters (**Wear safety equipment. The water could be toxic.**)
- Putting vehicle back into service after long storage (seals may have taken set and/or become contaminated)
- Wetness around wheel seal

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 2

Inspect

Inspection Level 1: Pre-trip (In Service) – usually performed by driver

Frequency: Prior to every trip and whenever driver returns to vehicle while in service

Inspect as soon as vehicle is stopped:

- Feel hubs/hubcap for excessive heat **taking care not to burn yourself**. Note variance in temperature between wheel ends.

Inspect prior to going on the road:

- Visually inspect each wheel end for loose, damaged or missing fasteners. These conditions will shorten bearing life.

Warning: Missing nuts or lugs can cause wheel loss.

- Inspect each hubcap for missing or loose bolts.
- Check for wetness at the hubcap



Weeping at gasket/ok



Significant wetness/inspect wheel end

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 3

Inspection Level 2: Detailed inspection – if no brake job has been done in 7 years; otherwise, these procedures are to be included in a proper brake job.

- Conduct all of the inspection criteria listed under level 1
- Lift and support each axle. Rotate wheel checking for vibration. If rotation is not smooth or a vibration is detected, carefully inspect bearings.
- Check bearing end play with a dial indicator. If end play is out of the TMC recommended range (RP618) .001” to .005”; inspect bearings for wear and damage.
- Pull outer bearing and inspect lubricant level. Both over and under fill conditions shorten wheel end life.
 - Semi-fluid grease should be 3:00/9:00 fill level
 - Hard grease should be present between all rollers and filled in the hub cavity to the bearing races.
- Inspect condition of grease
 - If milky white or foamy, it has been contaminated with moisture. Clean all lubricant out of hub, clean and inspect bearings for damage.
 - If grit or hard particles are present, grease has been contaminated with external dirt, rust, grit or metal debris from failed wheel end component (i.e.: bearings). Use magnet to determine if metallic and if so, carefully inspect bearings and other internal metal components.



Lube contaminated with water



*Use magnet to determine if debris
In lube is metallic*

Removal and component inspection

Caution: Always keep all components of each wheel assembly together and separate from other wheels.

Remove lug nuts and bolts.

- Carefully inspect nuts and bolts. Replace any that are damaged or cracked following proper protocol for wheel type.
- Using a wheel dolly, pull the wheel from axle.

Clean the bearings in solvent, handling with extreme care.

- A dropped bearing should not be reused.
- Suspend or hold bearings while cleaning.



Proper bearing cleaning

- Do not lie or allow to rest in bottom of the container. Sediment will sink to bottom of container.
- Use an approved solvent.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 5

- Dry bearings thoroughly. If compressed air is used, DO NOT allow bearings to spin and **always wear safety glasses.**



*Do not spin bearings
with compressed air*

- Be sure to put bearing cone back into the same hub from which it was removed.

Remove bearing cup if it or the bearing cone require replacement.

- Ferrous hubs: Use hydraulic press to remove cups
- Aluminum hubs: DO NOT USE hydraulic press. Instead, weld bead around the face of the bearing cup. **Allow to cool 15 minutes.** Remove by hand.



Weld bead

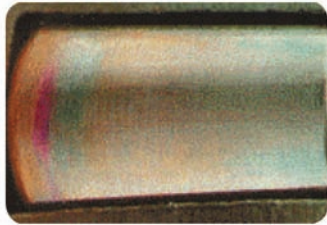
Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 6

Inspect both inner and outer races and cones. Look for discoloration, wear, spalling, pitting, etching or rust. All of these conditions warrant bearing replacement. Replace both cone and race. Examples below:



Discoloration



Roller end wear



Contaminated lube



Contaminated lube or improper installation or wear



Moisture contamination

See SKF TFO Manual 457975 for more examples.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

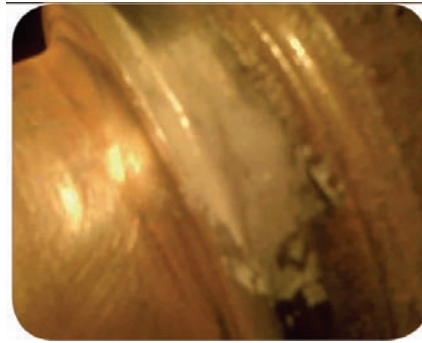
Page 7

Inspect spindle all around for flat spots, burrs, deep scratches, gouges, cracks – be sure to inspect carefully under side of spindle.

- Fill grooves with a hardening gasket material. Smooth with emery cloth.



Visually check underside as well



Fill deep grooves with epoxy

Inspect spindle end threads.

- The threads on spindle and nut need to be intact without grooves or damage.
- Chase spindle axle threads to remove burrs or deformed materials. Replace if needed.
- A fine emery cloth may be used on the spindle surface as needed.

Inspect spindle nut.

- Replace if threads damaged, wear marks present, damaged keyway, keeper ring or tab (or missing).

Inspect hubcap for evidence of leakage.

- Look for cracks in hubcap.
- Check to see if flange is flat. A bent flange may not provide a good seal.
- Check to see if vent is clear.
- Use new gasket whenever hubcap is removed or replaced.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 8

Remove seal with SKF SRT-1 or other tool designed not to damage hub or bearing and inspect the seal. **The SRT-1 uses leverage and avoids back strain.**



SRT-1 seal removal tool

- Always replace seal once wheel is pulled from vehicle.
- The seal can provide useful evidence for failure analysis. Wetness may not be present but seal lip wear path can indicate the running condition.



Cocked in hub



Seal running path also shows angled wear

- See SKF TFO manual 457975 for further examples. Learning how the seal performed will help to continuously improve installation technique.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 9

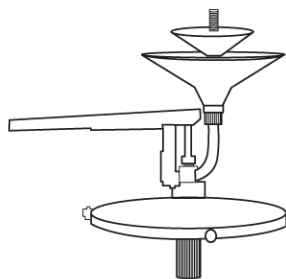
Wear protective gloves and thoroughly wipe out old grease from hub and inspect spoke wheel or hub for cracks, nicks or damage including seal bore.

- Replace or repair as needed.

Installation and Re-assembly

Place a light coating of grease on all metal components for corrosion protection using same grease as in hub. DO NOT mix lubricants.

Pressure pack the clean, dry wheel bearings with hub grease filling the space between roller and cage. Smear excess along outside of rollers.



Grease packer

If new bearing cups are required, the installation procedure will vary based on ferrous or aluminum hub material.

- Ferrous hubs: Use proper driver to install cup being sure the hub is free of burrs, nicks or otherwise damaged.
- Aluminum hubs: Prior to pressing cup into hub, heat the inspected and damage free hub in an oven to 250° to 300°F (using a temperature probe) and chill cups in freezer.
- Use a .002" feel gage to ensure cup is properly seated.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 10

Place hub assembly at 45° to facilitate seal installation. Place clean, dried and grease packed inner bearing cone into hub. Complete installation instructions can be found in SKF TFO Manual 457975. Follow specific seal installation instructions.

- Scotseal PlusXL does not require special tool.
 - Be sure to lube OD and ID with hub lubricant.



Lube ID/OD



Hand install seal

- Wait 5 minutes before mounting hub back onto vehicle.
- Scotseal Classic – be sure to select the correct installation tool.
 - Rotate seal in the bore to find best fit.
 - Drive the seal until it bottoms out. Once tone changes, DO NOT STRIKE AGAIN.



Use proper installation tool

- Whenever a seal is installed cocked, redo installation with a new seal while vehicle is still in shop. This will be far less expensive than experiencing an unplanned road service later.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 11

Pack the hub cavity with grease:

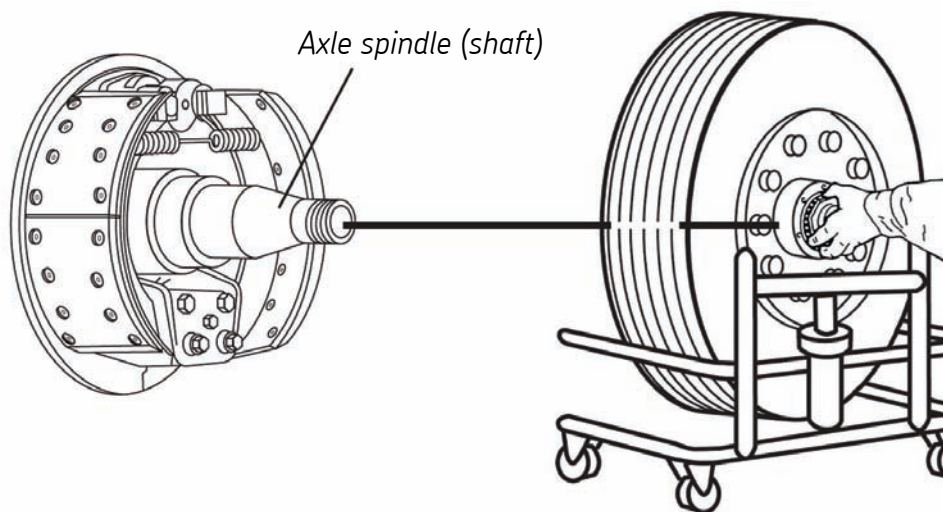
- Hard grease: Before installing hub onto spindle, place grease into hub between the two bearing cups to the level of the cup's smallest diameter – fill the hub except for the spindle hole diameter.



Wheel cavity filled with grease

- Semi-fluid grease: After mounting hub and before outer bearing cone is installed (continue to support hub) fill the bottom of the hub cavity until it reaches 9:00 / 3:00 level.

Using wheel dolly, align the wheel assembly with the spindle and push into position with one fluid motion.



Carefully align hub to spindle

- Bumping the seal on the spindle will cock it and replacement is recommended.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 12

With tire and wheel still supported by wheel dolly, place clean and dried, grease packed outer bearing cone into hub.

Properly torque rim clamps **before** adjusting wheel bearings to ensure proper bearing adjustment.

Hand tighten adjusting nut (do not use pneumatic tool) and **then** remove wheel dolly.



Keep dolly until outer bearing is in place to prevent cocking seal

- Using a calibrated torque wrench, follow TMC RP618 for bearing adjustment.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 13

Wheel bearing adjustment procedure¹

Step 1: Lubricate the wheel bearing with clean axle lubricant of the same type used in the axle sump or hub assembly. Note: Never use an impact wrench when tightening or loosening lug nuts or bolts during the procedure.								
Initial adjusting nut torque	Initial back off	Final adjusting nut torque	Back off			Jam nut torque		Acceptable end play
			Axle type	Threads per inch	Final back off	Nut size	Torque specifications	
Step 2	Step 3	Step 4		Step 5	Step 6	Step 7		Step 8
200 lb•ft (271 N•m) While rotating wheels	One full turn	50 lb•ft (68 N•m) While rotating wheels	Steer (front) non-drive	12	1/6 Turn *	Install cotter pin to lock axle nut in position		.001"- .005" (.025mm- .127mm) As measured per procedure with dial indicator
				18	1/4 Turn *			
				14	1/2 Turn	Less than 2 5/8" (66.7mm)	200-300 lb•ft (271-407 N•m)	
				18				
			Drive	12	1/4 Turn	Dowel type washer	300-400 lb•ft (407-542 N•m)	
				16		Tang type washer**	200-275 lb•ft (271-373 N•m)	
			Trailer	12	1/4 Turn	2 5/8" (66.7mm) and over	300-400 lb•ft (407-542 N•m)	
				16				

- * If dowel pin and washer (or washer tang and nut flat) are not aligned, remove the washer, turn it over, and reinstall. If required, loosen the inner (adjusting) nut just enough for alignment.
- ** Bendable type washer lock only: Secure nuts by bending one wheel nut washer tang over the inner and outer nut. Bend the tangs over the closest flat perpendicular to the tang.

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¹For ConMet "PreSet" hubs:

With single nut: 250 lb•ft. Do not back off.

With two-piece nut: Inner nut 300 lb•ft, outer nut 200 lb•ft. Do not back off.

- Use a dial indicator to measure endplay which should be between .001" and .005".



Dial indicator

- Redo adjustment procedure until proper endplay is achieved.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 14

Install hubcap and gasket.

- Follow a star pattern and torque to the value specified for the hubcap type.

TF Zytel Hubcap: 12-16 lbs.ft. (use supplied assembled washer bolts)

Steel hubcap: 10-14 lbs.ft.

Lexan spin-on: 60-70 lbs.ft.

- Vented hubcaps are recommended to allow wheel end to release increased pressures which can occur during normal operating conditions of the wheel end.

Install the wheels and torque wheel bolt nuts in a star pattern to 200 to 250 lbs.-ft. Be sure all nuts are equally tightened to prevent tire wobble.

Use of genuine SKF products

There have been imitators of SKF Scotseals over the years. SKF has tested these seals under the same conditions that genuine SKF seals go thru in the qualification stage. None tested have even approached the life of genuine SKF.

Seals and bearings are safety critical components and are relatively inexpensive in the overall operation of the vehicle. This is no place to cut corners. Wheel separations have disastrous possibilities. Using inferior products when public safety and company liability is involved is extremely risky with little reward.

Besides the risk, cost of ownership is not reduced despite the lower acquisition cost. Shorter wheel end life puts the vehicle into service more often and actually costs more in the life of the vehicle.

Wheel end service for greased wheel ends – cont.

TT 10-002

March 2010

Page 15

When using SKF products, be sure the product is either marked SKF or Chicago Rawhide.

SKF purchased Chicago Rawhide in 1990 and the old company name may still be present on seals in the marketplace. SKF Scotseal Classics are only manufactured with green Bore-Tite®, a baked-on sealant that does not scratch off easily. If the color coating flakes off, it is not SKF. SKF does not manufacture Scotseal Classics in any other color.

SKF tools should be used for SKF products as they are designed specifically for SKF Scotseals. Damage may occur if SKF tools are used to install non-genuine seals.

You may find related service material and technical bulletins at www.vsm.skf.com.

