

(To that familiar tune...) **Rollin' Rollin' Rollin' ... Keep that Trailer Rolling...**

By Stephen Louie "Hosspuller"

One of the worst things to happen with a horse trailer is a mechanical break down on the road. If you have never been there, thank your lucky stars. There are a couple of reasons why it's a particular problem.

One; you're forced to deal with large animals. Unloading beside a busy road is dangerous to all concerned. It is especially dangerous to those foolish drivers that won't slow down as you frantically wave to them. They don't realize a thousand pounds of horse spooked into the roadway in front of them will crush their car like an empty beer can, with them in it. Then, even if you can safely unload the horses, the question of the moment is what do you do with the horses? It's not like you can hail a local cab or a bus to get them home. Or the local hotel has stalls ready to keep them comfortable, while your rig is being repaired. Perhaps a hundred years ago, but not today. Hotels today are more guest tuned with high speed Internet access than livery stable.

Two; and most important... it's mostly preventable. You can't control the impatient driver. You remember... the idiot that tailgated your rig and ran slap into the rear tack compartment. But, you can and should control the care and feeding of your trailer's wheel bearings. Regular inspections and simple maintenance will prevent break-downs on the road. While aerospace maintenance is too expensive and elaborate for a horse trailer, a person with a modicum of knowledge can prevent breakdowns. A person doesn't have to be a mechanical genius to notice a sign of impending trailer trouble. If a person can learn to communicate with a horse, the same skills can be used to prevent a breakdown. To establish a respectful relationship with a horse, a person needs keen powers of observation. Noticing the ear position is just as subtle as noticing unusual warmth in a wheel hub. Feeling a horse collect himself applies to unusual vibrations rolling down the road that transmit to one's seat, hands, or ears. The key, to prevention, is the understanding of warning signs. Someone that sees the pinned ears but doesn't understand will be surprised at the explosive kick. So too, someone feeling unusual wheel hub warmth and vibrations but not understanding, will be surprised when their trailer wheel falls off.

Do trailer wheels fall off? Certainly, actually after flat tires, wheel bearing failures are the most common cause of roadside trailer breakdown. This failure is so common that in almost every old cowboy movie that involves a high speed chase with a wagon or coach, a wheel falls off. Well, we've come a long way ... Those old wagons used to have simple metal to wood, or wood to wood, axles and wheel hubs. The only thing that kept it rolling was grease. And not very good lubricating grease at that. Maybe, it was whatever was left over from dinner that evening before!

Today, we use bearings and lubricants that are the culmination of a hundred years of developmental art in the fields of chemistry, metallurgy, manufacturing, measurements, and trade. These bearings and lubricants are an integral part of our modern machine

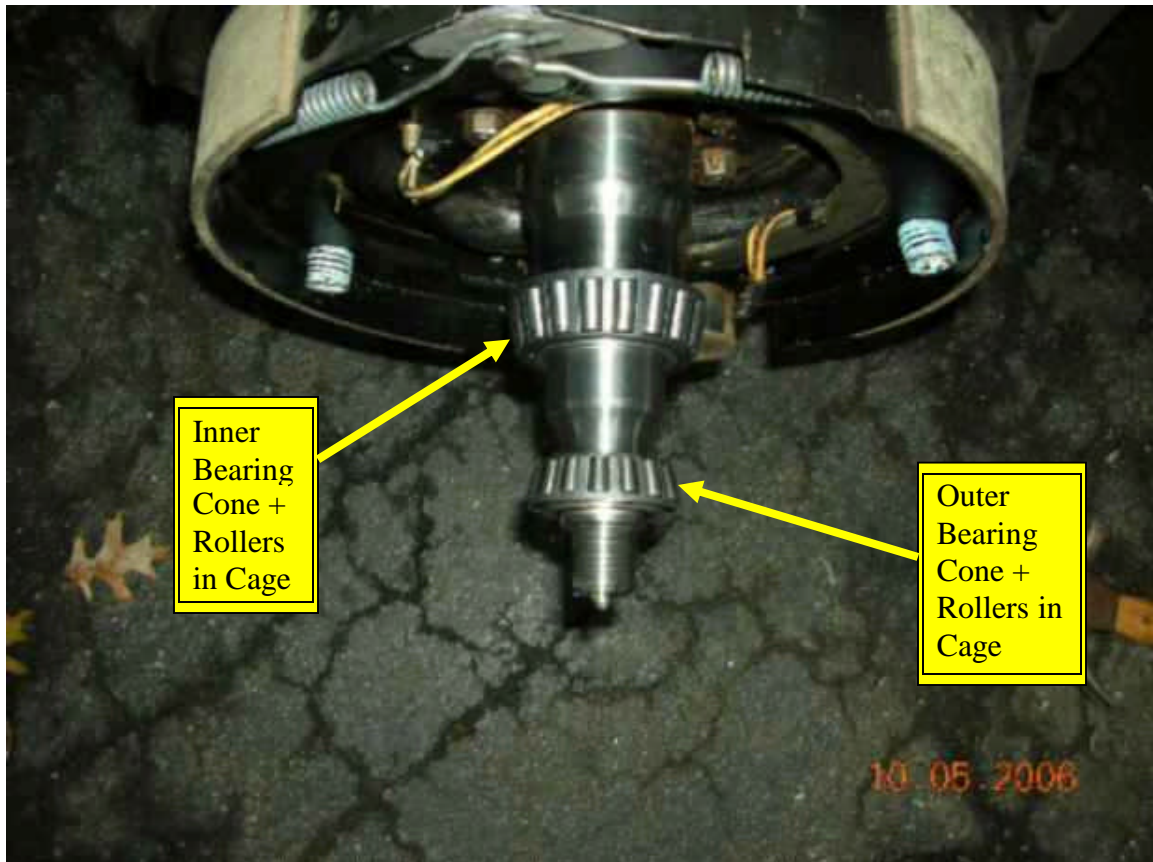
based lifestyle. So much so that, rolling element bearings were a strategic component during the Second World War. Allied bombers made many long & dangerous flights to destroy Axis bearing factories. The idea being, without roller bearings the Axis war machines would seize up and stop.

What is it about roller bearings that fail? Why shouldn't it keep rolling? There's nothing to rub together. Right? Wrong! Looking at a wheel bearing, it looks like it should roll forever. But at a microscopic level, there is metal deformation. As each rolling element, (balls or roller or needles) comes under load, it skids along and then the load squeezes the roller and the race together. The metal of the bearing cycles between tremendous pressure and little pressure. All this happens zillions of times as the wheel rolls on the road. Eventually, the metal starts to fatigue and break down. When the bearing is designed, the operating life is calculated in the millions of revolutions. In terms of mileage, it would seem like the wheel bearings should last the lifetime of both you and your progeny. Why doesn't it? The bearing killer in real life use is the sum of installation, lubrication and dirt. Improper handling, storage and or installation are just the start. Second, the grease that lubricates the bearing is only a sponge. Grease is merely a way of getting oil to the working spot. The oil film just keeps the parts from welding together. The grease is mostly made of oil and a thickener. Over time the grease thickener gives up the oil and is exhausted via separation and oxidation. In other words, the grease ages and wears out. Lastly, wheel bearings are in a dirty environment. They work in a shower of dirt and brake dust. Like a shower curtain, the wheel seals and caps do a fair job but aren't a complete barrier. Each of these factors reduces the bearing life.

In short, the wheel bearings used on trailers require regular service.

Up to now we've used ball, roller, or needle interchangeably. All of these are rolling elements. As neophytes of the bearing this was acceptable. Till now! You are about to have the mysteries of the wheel bearings revealed to you.

Most horse trailers use tapered roller bearings between their axles and wheels. The taper of the two bearings is installed facing each other. In this manner, the wheel hub is held between the two bearings, but allowed to turn freely



Tapered roller bearings consist of four interdependent components: the cone or inner ring; the tapered rollers or rolling elements; and the cage, or roller retainer; the cup or outer ring. The taper angles allow the bearing to handle a combination of radial and thrust loads. The steeper the cup angle, the greater the ability of the bearing to handle thrust loads at the compromise of reduced radial loads. Radial loads are generated from the weight of “Old Dobin” and the trailer itself. Radial loads are also dynamic. The momentary loads from the wheel hitting a bump are the result of dynamic forces. These momentary loads are many times the load from just the trailer at rest. Thrust loads are generated by the side forces. The side forces are from the sharp turn to enter your driveway or road pitch. Even the crosswind produces a side force. The bearing must handle the thrust loads too. Or else, the wheel is forced off the axle. All these loads add together. The axle design engineer has figured all the loads together and selected a set of bearings for the anticipated task. The wondrously designed tapered roller bearings handle it all.

Now in Part Two... The care and feeding of your trailer wheel bearings...

Part two

Whether your trailer is used daily, weekly, or once in a “Blue moon”, grease deteriorates. Bearings need cleaning and repacking every year at a minimum, and more often with severe use. Consider the money and/or time well spent as insurance against spending hours stuck on the side of the road... if you’re lucky. If you’re unlucky, think of the disaster a trailer wheel could cause when it parts company with you and the trailer.

While the cost of having a shop clean and repack the trailer bearings is usually quite reasonable... There is good reason for every trailer owner to know how it’s done. That reason is getting value for your time and money. If you know the proper procedure, you’ll appreciate the shop’s charge or question why the shop isn’t charging enough. What! Why would you complain when you’re getting a deal? Certainly... Merely pumping grease into the wheel fitting is not enough. In my experience, using a grease gun on a Dexter “E-Z lube” axle is actually a poor practice. The grease can escape the seals and contaminate the brake shoes. As you can image, this is bad for brakes. Or merely repacking only the “easy to get to” outside bearing neglects the inner bearing and seal. A poorly done wheel bearing job is worse than nothing. The poorly done wheel bearing service will lead a person to have misplaced confidence in the wheels. ...“I just had the trailer bearings serviced, that noise isn’t serious”...until the wheel leaves your party early.

A common mistake is to assume that if a little grease is good, then a lot is better... Actually, an under greased bearing is better than an over greased bearing. Bearings require only 30 percent of their free space to be filled with grease. Any excess grease will be expelled as the bearing rotates. If the bearing housing is already chock-a-block full of grease, there is nowhere for the excess to go. The grease is constantly churned, building up heat. The grease will break down and not lubricate. The bearing will then begin to fail. Pumping in additional grease only makes the problem worse.

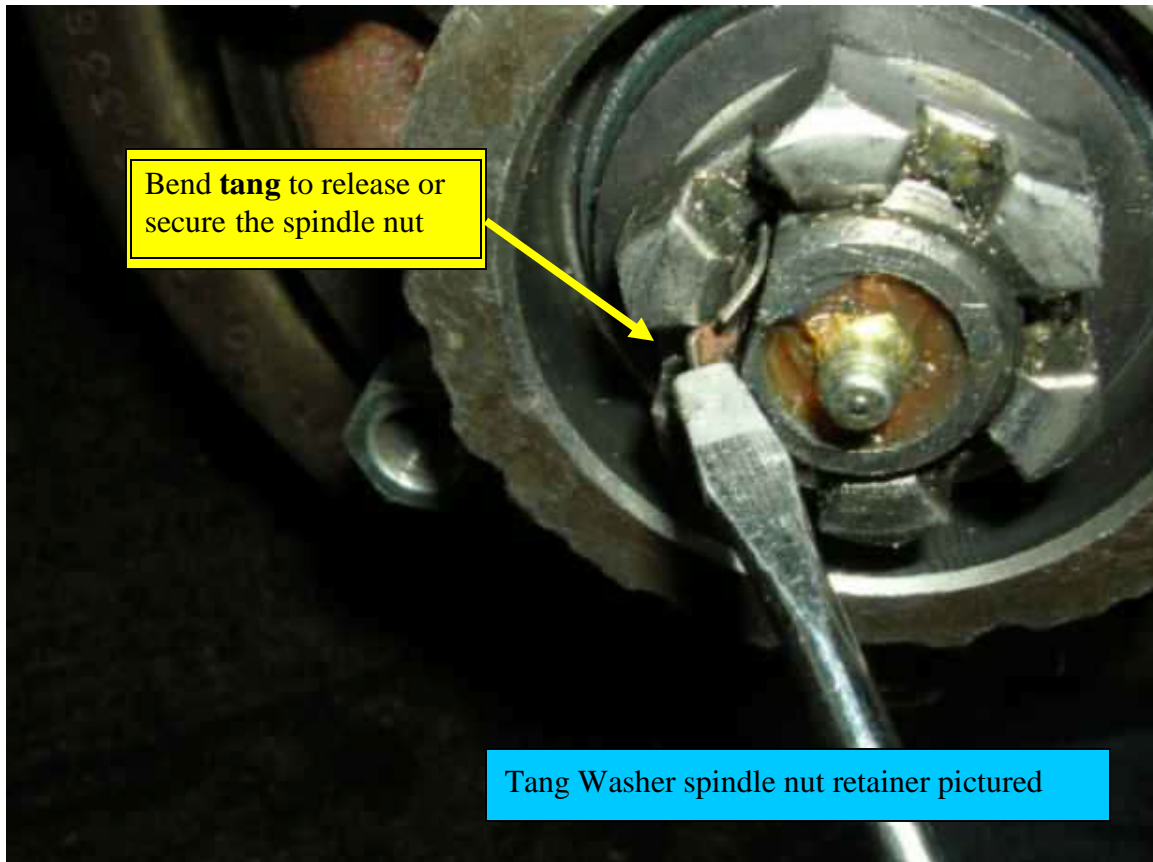
The first step is to loosen the all wheel lug nuts while the trailer is on the ground. Don’t remove the lug nuts, just loosen them. The extreme force required to break the nuts free might cause the trailer to move off the jack stand and fall. Having the trailer weight on the wheel keeps the wheel from turning while you’re working too.



Storing the removed nuts on the hub lugs will protect the fine threads from damage while the hub is handled. (Keeps them from getting lost, too!)

Lift the trailer and secure the trailer on jack stands or heavy blocks of wood. Do not use concrete or cinder blocks alone. Concrete blocks may collapse under a concentrated load like a trailer frame on the block. "Safety comes from proper precautions before doing..."

Remove the wheel and tire. Remove the bearing dust cover. Usually the cover is just pressed in. Use a small screw driver blade, and work it gently all around, between the cover & spindle. Once the cover is off, you'll see the spindle nut. That nut holds the wheel hub on the axle spindle. It is secured from turning by one of three methods. 1) A Cotter pin through a hole in the spindle. 2) A Tang washer that engages a matching flat on the spindle or 3) A Spring clip that grips the nut. If your trailer has either #1 or #2; don't reuse it. Purchase a new part. The pin or tang must be bent over to secure the nut. Removing it requires an opposite bend. Like a paper clip repeatedly bent, the metal could break and allow the spindle nut to rotate off. When this happens, a few seconds later the wheel & hub will leave you and the trailer. Bad things will begin to happen quickly.



After removing the spindle nut securing device, remove the nut. Note the order of the pieces as they are removed from the spindle. Be extra careful not to drop the outer bearing on to the hard concrete driveway. It will be damaged. (Murphy's Law)

The hub is next removed. It should simply pull off. If the hub seems loose but won't come off the spindle, the brake shoes might be holding against a ridge on the worn hub. The brake shoe may have to be adjusted in, to release the hub.

Wait a minute! Didn't we say there are two tapered roller bearings? We seem to be missing one. Not to worry... It's hidden in the hub, behind a grease seal. Use a pry bar or large screwdriver to remove the rubber and metal seal. Note the orientation of the rubber seal lip in relation to the hub. Don't be bashful about bending or tearing the seal. I've never been able to remove and reuse the seal. I will always install a new seal. The cost of a seal compared to the time and effort of redoing the job says...Use a new seal. Factor the parts cost in judging the value of your bearing service.

Now the fun part... Clean all the pieces. Remove all the old grease and the dirt with it. A convenient and safe solvent for this, and several other jobs, is plain old cheap paint thinner; often called naphtha or mineral spirits. Gasoline will work but its flammability

and vapors are dangerous. Don't use gasoline for cleaning. Wash the bearings in the solvent with a small brush like a paint brush or parts cleaning brush and by swishing them and rotating the caged rollers while submerged. When good and clean they can be dried with compressed air, a hair dryer, or by simply letting them air dry. Do not allow high pressure air to spin the rollers. The high speed and lack of oil will damage the bearing. It is important to dry the bearing properly. If any solvent is left, the new lubricant will breakdown faster. When dry, closely inspect all the rollers and matching races for any sign of pitting or foreign matter pressed into the surface. There should be no surface defects. As a further check, hold the inner ring horizontally with one hand and turn the outer ring. If the bearing is faulty, a gritty vibration will be felt in the hand. If there are defects! ... Congratulate yourself. You have detected a sure failure in the near future. Replace both cone and cup. If one piece has a defect, the defect will soon be mirrored in the other. The defect will transfer like a rubber stamp image to the new part.

In the event you find a bad bearing you will have to remove the cup from the hub. Lay the hub on a solid surface with the bad cone on the down side. You may have to block it up with wooden blocks to allow room for the cone to exit the hub. Look closely through the hub and you'll see the edge of the cup extending slightly out of the edge of the hole through the hub. Many times there will be two notches in that surface that expose nearly all of the edge of the cup and are there to accommodate driving the cup out.

Use a medium hammer about the weight of a common claw hammer or smaller and a punch to drive the cone out. Using moderate to light blows, alternate the punch from one side of the cup to the other until it is expelled. This is a relatively slow process coming and going, just be patient, the cup is moving with every blow and has to go straight out and straight in or it won't go at all. Reverse this procedure to install the new cup. Use a piece of hard wood to protect the new cup when driving it in place. When the new cup bottoms in its recess in the hub you'll note the sound of striking it changes from dull to clear. That's how you know it is seated properly, listen for it.

To pack the cleaned and/or new bearings requires nothing but the grease. You should use actual wheel bearing grease available in 1 pound containers. The brand name means little; the main thing is to get grease that is NLGI (National Lubricating Grease Institute) number 2 with a minimum viscosity index of 80. (as recommended by Dexter Axle) Black grease, containing "Moly" or Moly Disulfide, or semi-synthetic grease is a plus, but not a necessity. The Moly is an additive that gives the grease the "EP" designation. That is "Extreme Pressure". Don't mix different grease types in a wheel. Some grease types are not compatible with each other. A poor reaction will cause the grease and oil to separate or worse.

An often over looked necessity is cleanliness. A speck of dirt in the sticky grease will ruin all your work and time spent. That speck will imbed itself in the bearing. The extreme pressure repeated a zillion times will be like lighting a fuse to destruction. From the moment you declare the bearing parts are clean and dry, treat the wheel like a patient in a surgical procedure. Clean... Clean hands, clean grease, clean rags, clean parts, and clean tools. Did I mention clean the spindle, hub internals and the backing plate too???

You don't want any dirt and grit falling on to the sticky greased bearings or spindle while you wrestle the heavy hub on.

Wipe a thin grease coat on the spindle and a very thin grease coat on the seal surface of the spindle. Now the fun part... **Packing the bearings with grease.** There is no way to properly pack a bearing at home without greasing a palm. Using any tool other than a bearing packer is like spreading jam on toast with a shovel. If you are right handed put a small pile of grease in your left palm and take the larger inner cone into your right. Left Handers; do the reverse.

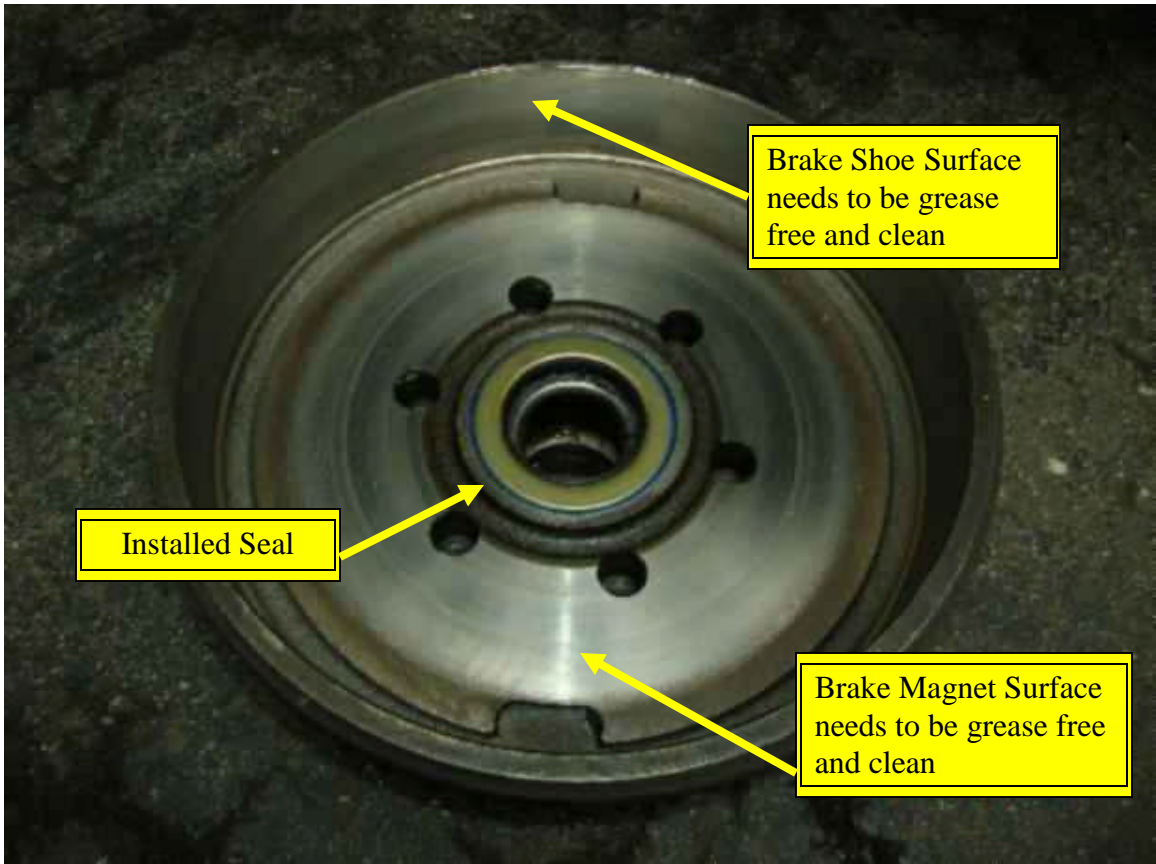
Begin by pressing the most open side of the roller cage through the edge of the grease and against your palm. Repeat this until you have grease coming out the other side of the roller cage. Turn the cone a bit and repeat. Keep turning and packing the bearing until the whole roller cage is full. Wipe a generous coat on the outside of the cone and place it into the cup in the hub.



Remembering the orientation of the seal lip, install the new seal. This can be done with light hammer taps to a small block of wood across the seal.

Drive the seal only to where its outer side is level with the edge of its recess in the hub. Then, wipe a light coat of grease on the sealing surface.



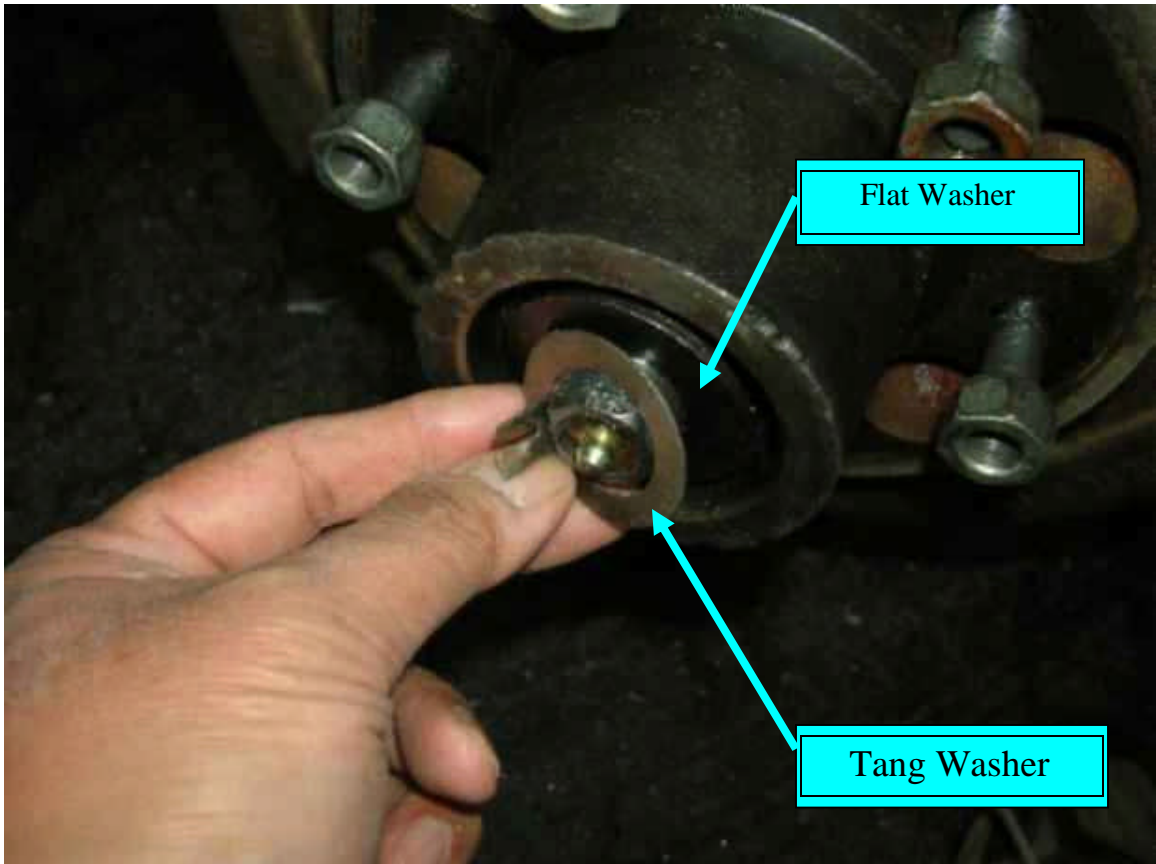


Inner bearing and Seal in place...

Repeat the packing process with the smaller cone. Put the packed cone aside in a protected place. Lift the hub with the installed rear bearing and new seal onto the spindle. Be careful not to damage the seal lips on the spindle threads or sharp edges. Slip the smaller cone onto the spindle and into cup in the hub.



Slip the washer / washers in place and tighten the nut up to 50 foot / pounds (pliers with full hand force) while slowly turning the hub by hand. Then loosen the nut to remove the torque while holding the hub from turning. Finger tighten the nut until just snug. If a cotter pin or tang washer lines up with the slots in the nut you're set. If not, back the nut off until the first castellation lines up. This procedure will provide a minimal amount of end play as recommended by Dexter. This end play is essential to the longevity of the bearing's life. Insert the cotter pin, bending the ends around the spindle opposite each other to secure it. Alternately, bend a tang of the tang washer into the castellation slot. OR Align the spring retainer to the flat on the spindle and press the retainer on to the nut. The retainer should snap into place. Once in place the nut and retainer should be free to move slightly. In all cases, the nut should be free to move within the restraint of the cotter pin/tang washer/ spring retainer.





Replace the bearing cap and you're done! At least one wheel is done... Remember to check the lug nuts after a few miles. It would be a shame to have all this time and effort go for naught, by forgetting to tighten the lug nuts. It is a good practice, even for just changing the tire.

“Keep that Trailer Rolling! ...”