

# S&S Oil Pump

*How to install a S&S oil pump onto an Evo, Shovel, or Panhead*

**O**WNERS CHANGE THEIR ENGINE'S oil pump for two reasons, the first being they're rebuilding/upgrading their engine and want to install a new or better pump. The second is because the pump has stopped working correctly or at all. In this article, we're going to show you how to replace the externally mounted oil pump on a Panhead, Shovelhead, or Evolution Big Twin. This pump is really two pumps in one since it contains the engine's feed and scavenger pump in one assembly. This pump is also the engine's easiest major component to assemble and install. That is, except for the retaining (snap) ring that keeps the oil pump drive gear on the inner end of the oil pump driveshaft. This part, which

is extremely important to install correctly, has been the cause of grief to many novice mechanics. However, a little bit of practice and a touch of finesse will have you installing one like a pro. Thankfully, the special clip/snap ring (H-D #26348-36) that goes onto the outer end of the oil pump driveshaft is easy to pop into its groove. But we'll get into all that in a minute.

As for the pump we're going to install, it's one of S&S Cycle's excellent billet aluminum units. We have a S&S complete oil pump kit for a 1954-69 H-D Big Twin. S&S offers oil pumps and complete kits for many Harley engines. We're installing this kit onto a S&S 93" P-Series motor that we'll rebuild in two future issues of *American Iron*. However, the process is basically the same as installing the correct S&S pump

onto any H-D Panhead, Shovel, or Evolution Big Twin, as well as any custom Big Twin fitted with S&S crankcases. Although the oil feed and return (scavenge) gears on these S&S pumps are the same width as the ones in a stock H-D aluminum pump, the S&S pinion and oil pump driveshaft gears are not and can increase oil volume by 25 percent over stock 1972 and earlier pumps.

These S&S pumps have an oil pressure relief bleed-off passageway that relieves pressure buildup on top of the valve to maintain consistent oil pressure. The pump's oil pressure bypass routes excess oil directly to the supply side of the pump to reduce the amount of oil returned to the tank, which creates less foaming and cavitation. The S&S standard pump cover allows you to position the oil feed and return fittings in a variety of ways to fit your installation. This pump kit comes with a complete oil pump assembly, pinion shaft pump

drive gear, oil pump drive shaft gear, steel breather gear, mounting hardware, fittings, gaskets, and instructions.

Okay, let's get back to those two retaining rings on the oil pump driveshaft and cover the easy one first. As previously stated, the special clip/snap ring (H-D #26348-36) that goes onto the outer end of the oil pump driveshaft is easy to pop into its groove. However, I would still buy two in case one is deformed when you try to install it. That said, start by getting one end of the clip caught in its groove. Then work the rest of the clip into place with your finger (see photo 7). The clip must fit snugly in its groove or it will pop off. That would be bad. You can't use the standard retaining ring here because that type of ring's ears, the ones you use a retaining ring pliers on, stick out and



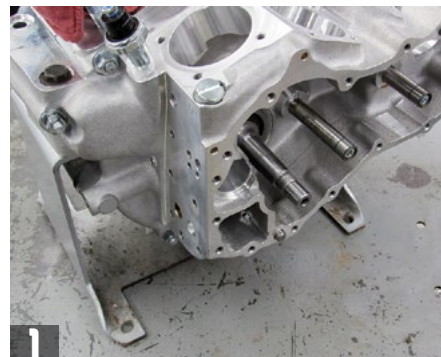
## TOOLS NEEDED

- Clean rags
- Blue Loctite
- Red Loctite
- Teflon tape
- 3/16" Allen
- Small needlenose pliers
- Small external snap ring pliers
- 7/16" wrench
- 1/2" wrench
- Large adjustable wrench
- Pinion nut socket
- Torque wrench (in-lbs.)
- Torque wrench (ft-lbs.)

## SOURCES

**Rob's Dyno Service**  
978/895-0441  
RobsDyno.com

**S&S Cycle Inc.**  
Oil pump kit  
#31-6393/\$524.95  
608/627-1497  
SScycle.com



**Here's our assembled crankcase with clean rags in the cylinder spigots to keep dirt out. Be sure to install either a plug or the correct hose fitting in the hole (arrow) in the right case next to the pump's mounting pad.**

will get squeezed between the pump body and cover when you tighten the pump bolts, which locks the pump shaft solid so it can't turn.

As for the inner retaining ring, it's much harder to install because you need a tool to get the ring started in its groove, you can't see what you're doing, and access is difficult. Of course, there are graybeards who have done this so many times they can pop that clip on in about a minute. If you're a novice at the ways of this retaining ring, I suggest you practice a bit before doing the deed for real, so buy about five of them, which should cost about five bucks or so. Test-fit the snap ring to the shaft before you install the shaft to make sure the retaining ring's gap is smaller than the width of the key slot in the shaft when the ring is installed. If it's not, the key could work its way past the retaining ring, immediately stopping the oil pump and the flow of oil through the engine. You also want to see how the retaining ring fits in its groove when properly installed and not deformed so you'll know if you got it right when doing the actual installation. Next, plug the center of the inner camshaft bearing with a rubber cork or something else that will not leave particles in the bearing. This is so that something like a popping retaining clip can't get through the bearing and into the flywheel assembly. Sure, there's not much chance of that happening, but if it does you could spend half a day trying to get it out. Or worst yet, it may go in there, but you don't know it because you think the clip fell on the floor. A stupid mistake like this can trash your motor at any point in the future, usually at the most inopportune time.

With the prep work done, slip just the oil pump driveshaft through the right crankcase and let the end protrude into the gearcase as it would if the oil pump were attached to it. Now slip the oil pump drive gear onto the end of the gear driveshaft without the woodruff key in the shaft (see photo 9). Then practice installing the retaining ring into its groove in the driveshaft using a snap ring pliers and your finger, as shown in photo 10, while you keep the shaft from moving with your other hand. Finesse and skill will get the job done here. Once you've got this skill mastered, you're ready to assemble the oil pump and properly install it. One last tip: Never reuse a retaining ring, especially one that became overextended.

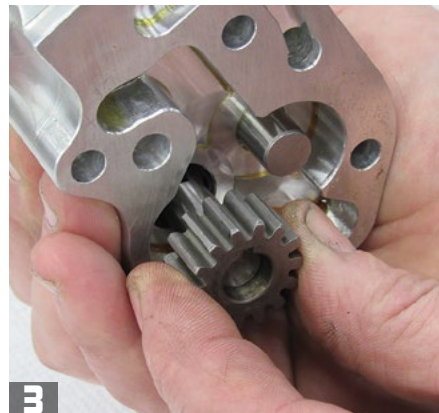
The retaining ring must fit snugly to the shaft or it will pop off.

When it was time to pick a shop to do this install, as well as the engine rebuild, we went to see our buddies at Rob's Dyno Service. As longtime read-

ers know, Rob and Dan have done the wrenching on many of our tech articles. These guys are great to work with and are excellent at what they do, be it spinning wrenches or dyno-tuning bikes.



**After oiling the seal and shaft, gently move the pump shaft side to side to work it through the pump body seal. Just shoving it through will allow the key slot to cut the seal. Then install a new key in the shaft's key slot.**



**Slip the feed gear onto the shaft and over the key. Then install the other feed gear onto the pump's idler shaft. Dan installs the special retaining clip once the pump is on the case (photo 7). You can do it now if you want.**

Disassemble and thoroughly clean the oil pump body and cover using a stiff-bristle bottle brush. Check that all passageways in the oil pump body and cover are clear and clean of dirt, metal shavings, or packing material. Also clean out all metal oil lines (if any are installed) and the oil tank/pan to remove any debris or metal from the old engine, which would damage your new motor. Install new rubber or stainless steel braided oil lines, which have rubber hoses inside. Yours wouldn't be the first motor to get chewed up by the metal remains of the previous engine.

#### **TIPS & TRICKS**

Place the new gaskets onto the oil pump cover, pump body, and right crankcase to check that all oil passages line up. If you use the wrong gaskets, oil flow will be restricted and engine damage usually occurs.

Once the pump body is assembled and flat against the crankcase, but before you install the oil pump driveshaft gear, move the oil pump driveshaft in and out and use a flat feeler gauge to make sure you have 0.010"-0.025" of free movement. If you don't have the minimum, the pump will bind when the engine heats up. To fix the problem, you must remove the oil pump and take a little material from the protruding inner end of the brass bushing that's in the crankcase for the oil pump driveshaft to get the needed amount of free movement. After putting a clean rag under the bushing to catch the filings, make a couple of passes with a fine flat file and then check the free movement again. Be sure to remove all metal filings from the engine before continuing with the installation.

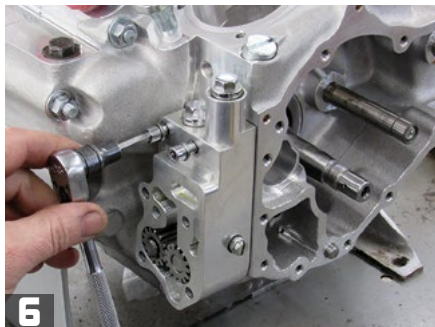
Here's the pump body bolt tightening procedure: Lightly snug the four long bolts in a crisscross pattern. Then do the same for the two top bolts. Now torque the four long bolts to 50 in-lbs. in a crisscross pattern. Then bring the top two bolts to 50 in-lbs. Next, torque the four bolts to 75 in-lbs. in the same pattern, then the top two. Go to the final torque of 110 in-lbs. in the same way. (H-D calls for 90-120 in-lbs.) As you're tightening the bolts during this procedure, spin the oil pump drive gear with your finger to check for any binding. If the pump does start to bind, gently tap the pump body on the side to reposition the body a few thousandths of an inch, so the gears can turn smoothly again. A slight resistance is normal, but if it's hard to turn the gear with your finger, you must reposition the pump. After about an hour, retorque all six bolts to 110 in-lbs. (or 90-120) again following the same procedure since the gaskets will settle, and the torque may decrease. ■



**4** With a new key in the pump shaft's key slot, slide the scavenger gear onto the shaft until it engages the key. Then check that all gears and keys are engaged by turning the shaft while trying to keep the gears from moving.



**5** Now put the other scavenger gear on the pump's idler shaft. After applying assembly lube onto the shaft and gears and in the crankcase's pump shaft bushing, position a new gasket on the pump body.



**6** Slip the pump's shaft through the case and position the pump against the case. Then loosely thread the two short S&S bolts with their washers and some blue Loctite on their threads into the case using a 3/16" Allen.



**7** After pushing the shaft slightly out to expose its groove, install a new special retaining ring into the groove. Then push in the shaft to position the retaining ring against the gear. Don't install a used/deformed retaining ring!



**8** After positioning a new key in its slot on the end of the oil pump shaft using small needle-nose pliers that have electric tape on their jaws to protect the key, slip on the new S&S oil pump drive gear.



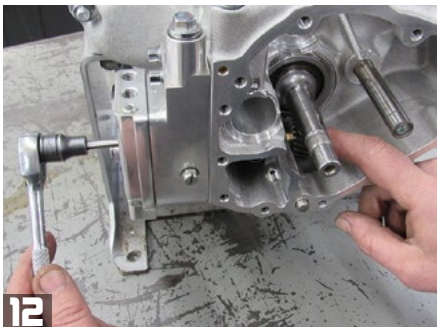
**9** Note the groove for the retaining ring and the key slot. When you install the new retaining ring make sure its gap is positioned 180 degrees away from the shaft's woodruff key slot.



**10** Secure the gear with a new retaining ring using a small external snap ring pliers and your finger. Then make sure the retaining ring is a tight fit on the shaft. Never install a used or deformed retaining ring!



**11** With a new gasket in place, position the S&S pump cover onto the pump body. Then thread in the four long S&S pump bolts with their flat washers and some blue Loctite on their threads using a 3/16" Allen.



**12**

Torque the pump bolts to 90-110 in-lbs. in a crisscross pattern as per the S&S procedure while spinning the oil pump drive gear to check for any binding. A slight tight spot is acceptable.



**16**

Slip the S&S pinion gear onto the pinion shaft, engaging its woodruff key, and against the pinion gear spacer. Then put some red Loctite onto the pinion shaft threads.



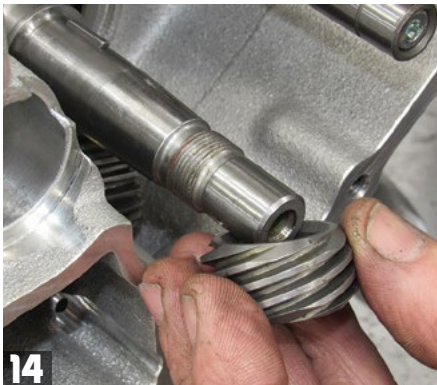
**13**

Position a new woodruff key in the inner key slot on the pinion shaft for the oil pump pinion shaft gear.



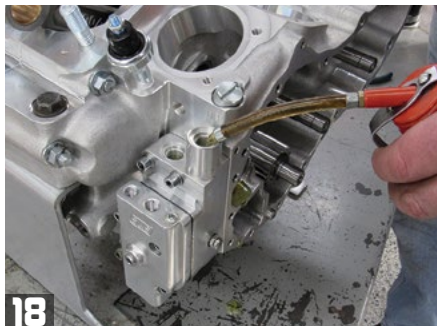
**17**

After screwing the reverse-threaded pinion shaft nut onto its shaft, use the special pinion nut socket to torque the nut to 50 ft-lbs. Use a large adjustable wrench on the sprocket shaft's splines to keep the engine from turning.



**14**

Then slip the new S&S oil pump pinion shaft gear, chamfered (tapered inner face) side in, onto the pinion shaft and over its woodruff key.



**18**

Remove the cap, spring, and ball for both the pressure relief and check ball valves using a 7/16" wrench. Then pour in some fresh motor oil to prime the pump. Once oil starts leaking out, reassemble both valves.



**15**

Next on is the pinion gear spacer, which is positioned against the oil pump pinion shaft gear. It doesn't have a special side. Then place a new woodruff key in the pinion shaft's outer slot.



**19**

With some Teflon tape on the threads, install the oil fittings into the ports you're using with a 1/2" wrench. On our pump, the inner ports are the oil return to the tank and the outer ports are the oil supply to the engine. **AIM**