Twin Cam Gearcase Upgrade

Part I: Installing Andrews cams, Feuling oil pump, and support plate

Though it's been over 20 years since the Twin Cam was introduced in 1999, there are still bikes on the road that have the original spring-loaded cam chain tensioners installed. This setup is found in all 1999–2006 Big Twins except the 2006 Dynas, which got the superior hydraulic tensioners in 2006. All other Twin Cam bikes were upgraded to hydraulic tensioners in 2007.

The function of the engine's two chain tensioners, both the spring-loaded and hydraulic versions, is to keep the chain that connects the rear camshaft to the pinion shaft and the chain that connects the rear camshaft to the front cam at the proper tension. To do that, these tensioners have a plastic shoe that rides against their chain (see Photo 14), just like the adjusting shoe in the primary system. The problem with the spring-loaded tensioners is that their spring always presses the plastic shoe against the chain at full pressure. In contrast, the amount of pressure a hydraulic unit presses its shoe against its chain is controlled by the engine's oil pressure. When the engine is at low rpm, the oil pressure is lower, so the shoes are not pressing against their chains as hard as when the engine is spinning at a high rpm, nor do they need to. This greatly reduces shoe wear.

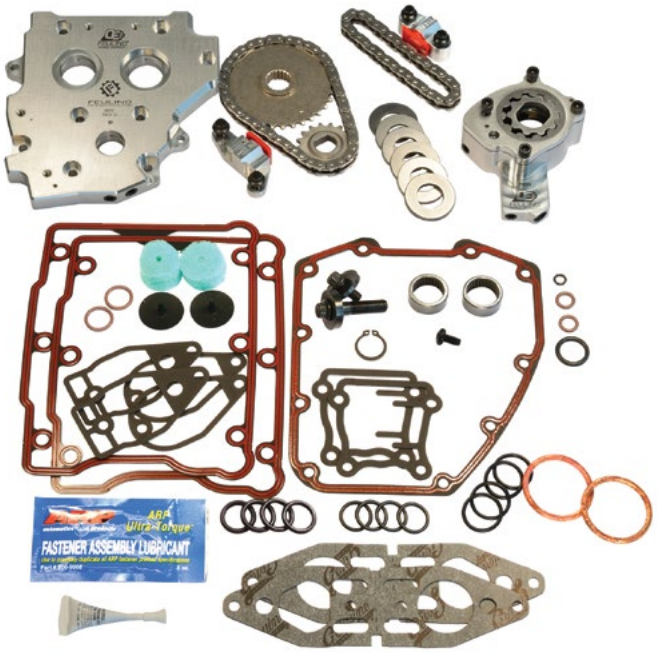
TOOLS NEEDED

- Blue Loctite
- Red Loctite
- Black marker
- Snap ring pliers
- 3/16" Allen
- 5/16" socket
- 1/2" socket
- Dial indicator
- Bearing removal tool
- Bearing installation tool
- Torque wrench (in-lbs.)

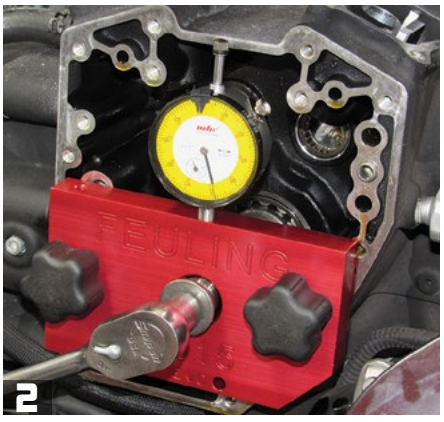
I personally have seen spring-loaded tensioner shoes wear out in 20,000 miles, but have many times seen them last until 40,000. That's because how much a spring-loaded tensioner's shoe wears is the same when the bike is traveling at 30 mph and its engine is spinning at 2500 rpm as when the bike is going 60 mph at the same rpm. However, at 60 mph the bike is traveling twice as far, which is why some shoes last 20,000 miles and others last 40,000. The shoes in bikes that are used mostly on the highway last much longer than bikes that stay around town. But this is not an issue with a hydraulic tensioner's shoe, which usually last more than 60,000 miles.

If your Big Twin, like the 2005 Touring Model used in this article, has not been upgraded/updated to the hydraulic units yet, you should check the tensioner shoes. To do this, you only have to remove the gearcase (cam) cover. The outer tensioner shoe is always the better of the two, so if the outer shoe is halfway gone, the inner chain shoe is worn about three-quarters of the way through. Once a plastic shoe

These Andrews 26N bolt-in cams fit 88–95 inch TC with stock compression ratio, and are great for two-up touring.

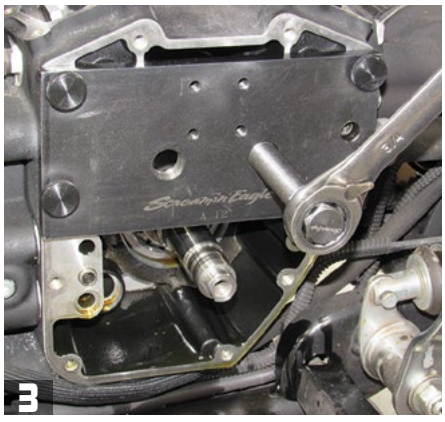


Here's our 2005 Electra Glide up on Dan's lift with the right side cover, front right floorboard, both saddlebags, and entire exhaust system removed. The gearcase compartment has also been emptied, and the lifters, pushrods, and pushrod tubes are also removed.



2

Dan uses Feuling tool #9015 fitted with a dial indicator to check the pinion shaft's runout to ensure the flywheel assembly is within Feuling's (0.025") and H-D's (0.012") usable limit. Our runout is 0.002".



3

Dan removes the inner cam bearings using H-D tool #94078-09. After coating the outer wall and rollers of the new bearings with lube, he installs the new Timken bearings (number side out) using H-D tool #94107-09A.

becomes very thin, it breaks, leaving just the steel arm that it was attached to. As you would imagine, having the metal tensioner arm rubbing against the metal cam chain is going to make tiny slivers of metal, which is never good to have in your engine's oil.

If you find that you need to replace your engine's chain tensioners, you have two ways to go. The first is to install new spring-loaded tensioners. This involves removing the cams and their chains from the cam support plate, as well as replacing the support plate's bearings. I would also recommend replacing the inner cam bearings at this time if your engine is close to the 40,000-mile marker. The same goes for the lifters. Many owners also install higher performance camshafts at this time, since the cams are literally on the table anyway. As for the stock oil pump, H-D has issued upgraded oil pumps since your engine was built, so this is an optional but recommended upgrade. Yup, it gets expensive quickly, which is why most owners go for the second way and just upgrade the whole gearcase section with all-new 2007–later style components and performance camshafts. And that's what we're going to show you how to do in this two-part series.

Special conversion camshafts must be used when upgrading a spring-loaded tensioner Twin Cam engine to a later-model hydraulic tensioner and cam support plate setup. Standard early- or late-style cams won't fit since the inner cam bearings in the spring-loaded tensioner engines are smaller than the ones in the later-style engines. The camshaft's outer bearing journal is also different, since the later engines use a parent-material (no bearing) cam support plate instead of the two-bearing support plate used on the early-style engines.

The good folks at Andrews offer several camshafts that are designed for this very upgrade and fit all Twin Cam engines originally built with spring-loaded tensioners. Since our bike is a bagger and the owner wanted a bit more pulling power, we went with Andrews 26N grind camshafts (#216826/$346). These are bolt-in (no headwork required) cams for 88–95 cubic inch engines with the stock compression ratio. Andrews' 26N cams are designed to increase engine torque and horsepower in the lower and middle rpm ranges and the dyno chart in Part II shows that's exactly what they delivered! Of course, our 2005 Big Twin is already equipped with a high-performance air cleaner and exhaust system, as well as having the fuel injection retuned. These upgrades must be done to a bike to get the full benefit of a performance camshaft, no matter the brand or grind.

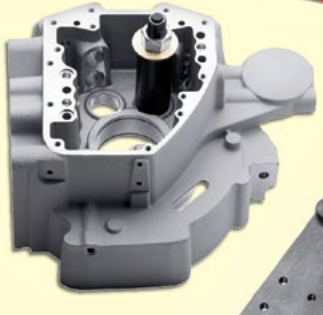
Since we wanted to upgrade the entire gearcase compartment, we contacted the crew at Feuling to get one of their excellent #7088 Hydraulic Cam Chain Tensioner Conversion kits, as well as a set of their hydraulic lifters. And though we're installing part of the Feuling kit in this article, we're going to give you all the particulars about the kit's components in Part II.

As we've done on so many builds, when it was time to pick a shop to do the wrenching for us, we went to see Rob and Dan at Rob's Dyno Service. Rob's Dyno is a full-service facility for all things Harley-Davidson, as well as Indian, Victory, and lots of metric brands. These guys are always a pleasure to work with and do high-quality work. And it makes things easy when the shop doing the performance work can also correctly retune the engine!

SPECIAL TOOLS

WE USE THREE special tools for this phase of the build. The first is used to check the flywheel assembly's pinion shaft's runout. As shown in Photo #2, Dan prefers to use **Feuling tool #9015** to do this check, which is fitted with a dial indicator. This tool can also be used to check the runout on Evo and Shovelhead engines, as well as the gear drive backlash on Twin Cam gear-driven cam setups. However, you can also check the pinion shaft runout using a dial indicator and stand, which are available from a number of tool suppliers.

The second tool needed is **H-D tool #94078-09**, which is used to remove the inner camshaft bearings from the right crankcase. The third one is **H-D tool #94107-09A** (Photo #3) and it's used to install the new bearings. Both these tools make their respective tasks much easier to do and reduce the risk of damaging the right crankcase or the new bearings. ■

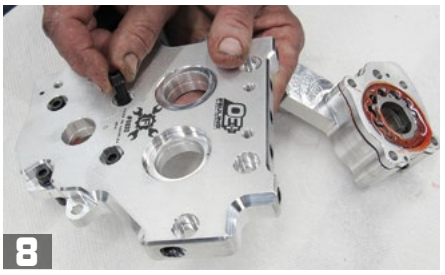


After covering everything with the Feuling-supplied assembly lube, Dan starts reassembling the Feuling oil pump by positioning the two Feuling scavenger (larger) gerotors inside the Feuling scavenger pump housing.

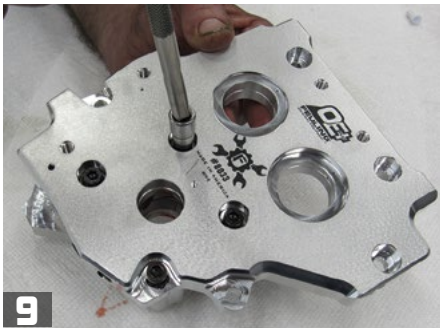
Once he has coated the Feuling scavenger gerotors with more assembly lube, Dan places the Feuling separator plate onto the scavenger pump housing and over the scavenger gerotors.

The Feuling pressure pump housing is then positioned over the separator plate and onto the scavenger pump housing.

After positioning Feuling feed (smaller) gerotors in the pressure pump housing with the flat sides in the inner gerotor's bore aligned with the flats on the inner scavenger gerotor, Dan coats them all with assembly lube.

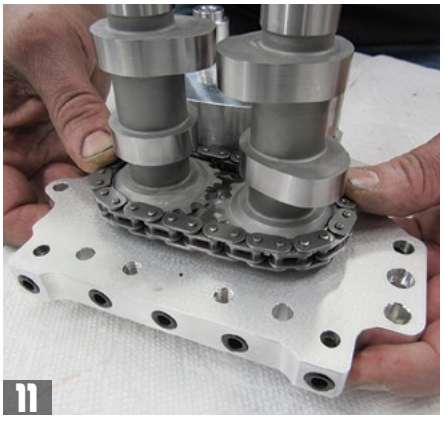


Once he has put some of the Feuling-supplied fastener assembly lubricate on the Feuling-supplied pump body bolts, Dan slips the bolts through the new Feuling cam support plate.

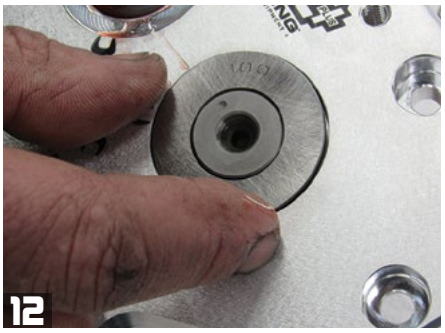


With assembly lube in the oil pump's channels in the cam support plate, Dan loosely secures the pump assembly onto the cam support plate by using a 3/16" Allen to just snug the four pump bolts down.

After highlighting where the alignment dots are on both sides of each Andrews camshaft's gear with a black marker, Dan positions the cams in the new Feuling inner drive chain with the dots aligned as shown.

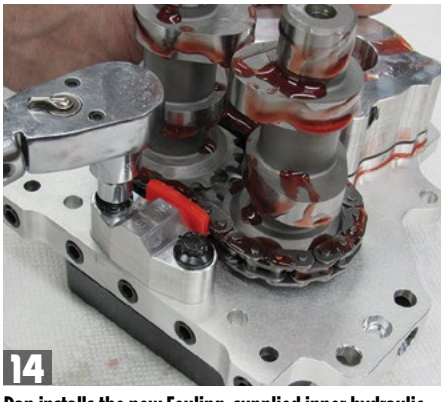


After coating the outer end of both Andrews camshafts with assembly lube, Dan slips the new camshafts into the Feuling cam support plate while keeping the alignment dots properly positioned.



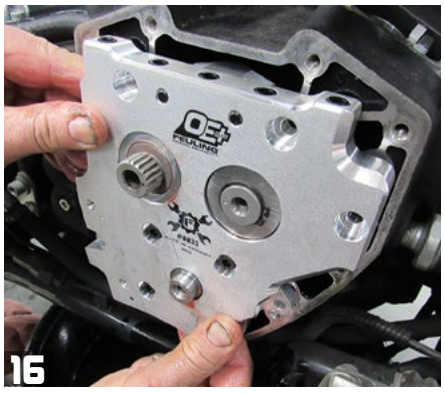
Dan positions a new Feuling-supplied 0.100" thrust washer onto the end of the front cam. He keeps the two alignment dots in position.

He then secures the washer and camshaft in place using a new Feuling-supplied snap ring and snap ring pliers.



Dan installs the new Feuling-supplied inner hydraulic tensioner using new Feuling-supplied bolts and fastener assembly lubricate. He uses a 5/16" socket to torque the bolts to 90–120 in-lbs.

After coating the Feuling-supplied O-rings with engine oil, Dan inserts them into the two oil ports on the left side of the gearcase, as well as onto the Feuling oil pump's scavenger oil pickup port.



Dan fully installs the cam support plate/oil pump assembly into the right case and then moves it in and out a couple of times (in a honing motion) to make sure the oil pump pickup port's O-ring is not rolled over.

After reinstalling the stock pinion shaft bolt and washer onto the pinion shaft, Dan loosely secures the support plate to the right case using a 5/16" socket, fastener assembly lubricate, and the six Feuling support plate bolts. AIM

SOURCES

Andrews Products
847/759-0190
AndrewsProducts.com

Feuling Parts
866/966-9767
FeulingParts.com

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