TECH *by Chris Maida*

EARLY TWIN CAM UPGRADE

Part II: After installing the valvetrain we gained 11 hp and 7 ft-lbs. of torque!

As I told you last month, when a buddy told me his 1999 Road King still had the old-style (failure-prone) rear cam ball bearing setup and the original version of the oil pump. I told him it was time to update the entire gearcase section with all 2007 and later style components. Since he was also looking to get more power from the engine, it was a no-brainer to swap out the cams for a set of Andrews 26H .490-lift, bolt-in cams in the process. This upgrade would also get rid of the spring-loaded cam chain tensioners, which were probably due for replacement anyways, and use the modern hydraulic tensioners. (My buddy didn't want to go with a gear-drive, which eliminates the shoes altogether.) As promised, you'll find a list of all the H-D parts we needed to do this installation, including doing the rocker boxes.

The shop that did the deed and will finish things up this month is Rob's Dyno. Longtime readers know we've used Rob for many dyno tests over the years. And though he would sometimes also do a light install for us, he's now expanded his operation into a full-service shop with the help of Dan. Dan has been a mechanic at Harley-Davidson dealerships for over 18 years, so he knows his way around Harley motors, be they Twin Cams, Evo, or Shovelheads.

This month you'll see how Dan buttons up the rocker boxes and reinstalls the stock valvetrain. Dan wanted to pull

TOOLS NEEDED

- Assembly lube
- Blue Loctite
- Brake cleaner
- Muffler cement
- Pick tool
- Flat-bladed screwdriver
- 3/16" Allen
- 3/8" socket
- 7/16" socket
- 1/2" socket
- 9/16" socket
- Torque wrench (in-lbs.)
- Torque wrench (ft-lbs.) ■

1 Here's our 1999 Road King where we left off last month. The gearcase section is assembled, and the cam cover is installed.

2 Dan pumps fresh engine oil into each of the four new H-D lifters through the oil hole in the side of the lifter until the oil comes out of the oil hole in the top of the lifter.

hog pro

pro guard

mystry design

3 He then drops a lifter into each of the bores in the right case with one of the flat sides on the lifter against the side of the case where the alignment pin will rest.

4 Yup, the alignment pin is the next part in. Dan then cleans off any oil that dripped onto the lifter cover gasket surface. He then positions a new H-D gasket onto each lifter cover base.

5 Dan reinstalls the stock lifter covers to the right case using the stock bolts, a little blue Loctite, and a 3/16" Allen. He torques the bolts to 90-120 in-lbs. in a crisscross pattern.

national cycle

6 Dan then inserts new H-D O-rings into both heads, lifter covers, and all four stock pushrod tubes. Note the order of assembly for the pushrod tubes. The O-ring is the last one (arrow) on the upper tube.

7 Dan positions the pushrod tubes in the engine and extends the tubes using a flat-bladed screwdriver, but he doesn't pop in the top clips. He then lays a new H-D lower box gasket onto each head.

8 Once a stock lower rocker box is on each head, Dan secures them using the stock hardware, blue Loctite, and a 7/16" socket. He torques the bolts to 150 in-lbs. as per the procedure in the H-D service manual.

9 After spraying brake cleaner through the oil hole in each stock pushrod and letting it air-dry, Dan drops the black (longer) exhaust pushrods and silver (shorter) intake pushrods into their respective tubes.

10 After putting a new H-D O-ring into its groove in the lower rocker box, Dan replaces the stock oil breathers with new setups, which he positions in each rocker arm support.

H-D PARTS USED

- #65324-838 Exhaust seal (2/$6.50 each)
- #7593 Exhaust flange nut (4/$0.50 each)
- #10038A Hose clamp (1/$1.25)
- #17386-99A Rocker cover gasket (2/$5.40 each)
- #17025-03A Breather assembly (2/$13.95 each)
- #11270 O-ring (2/$0.95 each)
- #11145A O-ring (4/$0.95 each)
- #11132A Filler plug O-ring (4/$1 each)
- #11293 O-ring (4/$0.95 each)
- #16719-99B Rocker housing gasket (2/$6.45 each)
- #18635-99 Tappet cover gasket (2/$2 each)
- #18538-99C Roller tappet (4/$29.95 each)
- #24017-10 Cam bearing assembly kit (1/$14.95)
- #65296-95A Muffler clamp (2/$7.25 each)
- #26037-06 Oil pump assembly (1/$194.95)
- #25355-06A Cam support plate assembly (1/$78)
- #4741A Cam support plate mounting screws (10/$0.50 each)
- #11461 Retaining ring for front cam (1/$1)
- #25683-06 Inner roller chain (1/$37)
- #39969-06 Inner chain tensioner (1/$39.95)
- #4740A Inner chain tensioner mounting screws (2/$1 each)
- #25675-06 Outer roller chain (1/$39.95)
- #39968-06 Outer chain tensioner (1/$39.95)
- #942 Outer chain tensioner mounting screws (2/$0.50 each)
- #25729-06 Cam alignment spacer (0.100") (1/$5)
- #25731-06 Cam alignment spacer (0.110") (1/$5)
- #25734-06 Cam alignment spacer (0.120") (1/$5)
- #25736-06 Cam alignment spacer (0.130") (1/$5)
- #25737-06 Cam alignment spacer (0.140") (1/$5)
- #25738-06 Cam alignment spacer (0.150") (1/$5)
- #25673-06 Crankshaft pinion shaft 17-tooth sprocket (1/$34.95)
- #25244-99A Outer cover gasket (1/$5.90) ■

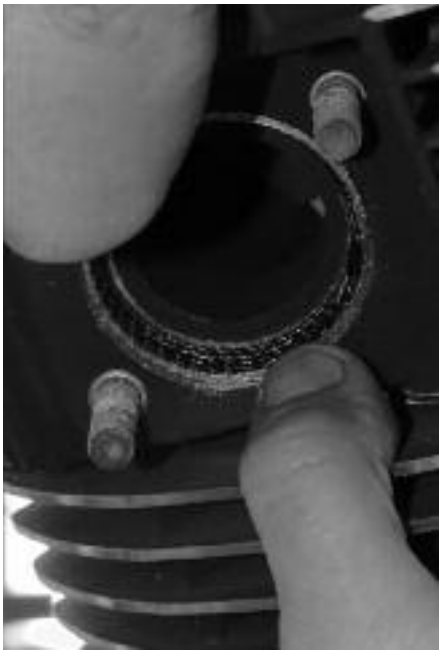
pirelli

11 With this head's lifters at their lowest points, Dan secures the stock rocker assembly to its box using the stock hardware, blue Loctite, and a 1/2" socket. He torques the bolts to 15-18 ft-lbs. in a crisscross pattern.

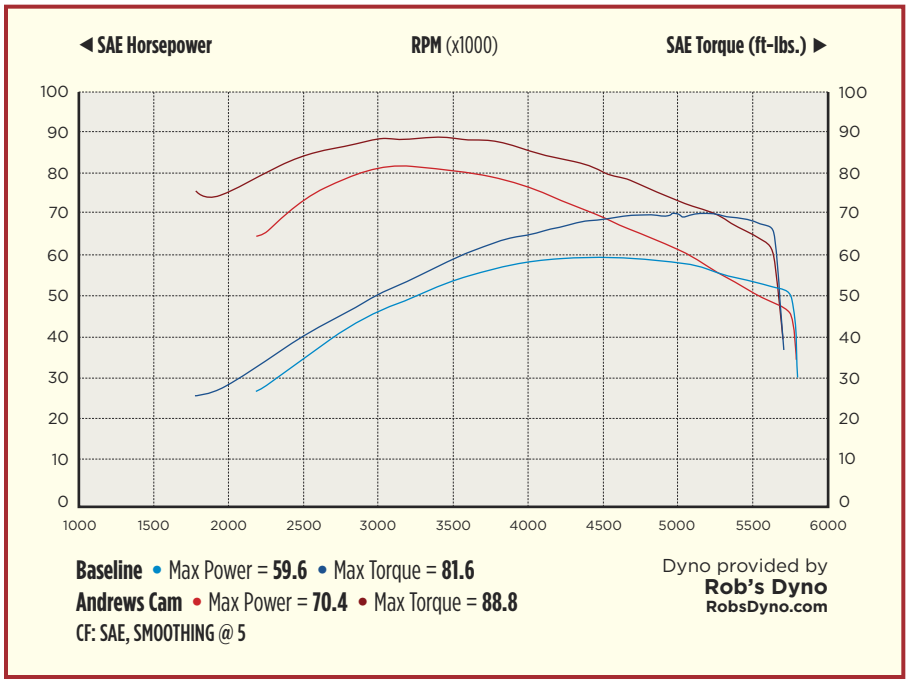
12 While the lifters are bleeding down, Dan torques the oil breather bolts to 120 in-lbs. using a 3/8" socket. Once he can spin the pushrods with his fingers, Dan rotates the engine and does the same for the other head.

13 Dan can now pop the top clips into all four pushrod tubes using a flat-bladed screwdriver. After he coats everything with assembly lube, Dan rotates the engine and checks rocker operation.

14 With a new H-D gasket on both bottom boxes, Dan reinstalls the stock covers using the stock bolts, blue Loctite, and a 7/16" socket. He torques the bolts to 150 in-lbs. in a crisscross pattern.



15 After removing the old exhaust gaskets using a pick tool, Dan places a new H-D exhaust gasket in each head before reinstalling the exhaust system.



Baseline • Max Power = **59.6** • Max Torque = **81.6**
Andrews Cam • Max Power = **70.4** • Max Torque = **88.8**
CF: SAE, SMOOTHING @ 5

Dyno provided by
Rob's Dyno
RobsDyno.com

TIPS & TRICKS

BEFORE ASSEMBLING ANYthing, Dan makes sure all old gasket material is removed from the stock parts and cases. He also uses a Q-tip soaked in brake cleaner to break down and remove any oil trapped in the boltholes.

When laying a new H-D lower box gasket on each head, be sure you have the proper side facing up. The rear head gets its lower rocker box gasket with the word *Rear* on the top; the front one gets the word *Front* on top. It's the same gasket, just oriented differently.

When reinstalling each rocker arm assembly, you must first rotate the engine so the lifters for the head you're working on are at their lowest points. You can then secure each rocker arm assembly into its original rocker box using the stock hardware (the long bolts go on the pushrod side, while the shorter ones go on the spark plug side), blue Loctite, and a 1/2" socket. Note: you must let the lifters bleed down before you rotate the engine to do the same for the other head. The lifters are bled down when you can spin each pushrod with your fingers. ■

hhi

avon

16 Dan insists on using new H-D clamps on the Y-pipe and mufflers to prevent leaks. He also coats the joints with high-temperature muffler cement for the same reason.

17 Before we hit the dyno to retune the engine, Dan removes the old oil and filter. He then refills the engine with 4 quarts of Amsoil and screws on a new H-D filter.

18 Rob is using a TechnoResearch fuel tuner to dial this engine in. Check out the accompanying dyno charts to see what gains we achieved with this upgrade.

the boxes instead of using adjustable pushrods for two reasons. First, the rocker boxes were starting to weep a little oil from their seams. Second, since these Andrews cams are bolt-in units, he can reuse the stock pushrods, which he prefers to do anyway. As you'll see in the accompanying dyno chart, Andrews designed this cam profile specifically for two-up touring with increases in both torque and horsepower output across all rpm ranges. Once you've swapped the stock cams out for a set of performance ones, you must use a fuel tuner to get the air and fuel mixtures correct. Our choice for this build is a TechnoResearch DirectLink Flash-Tuner. This module allows you to alter the fuel table, spark advance table, and other calibration table values. You can also get real-time fuel table and spark table cell tracing. The DirectLink (Flash-Tuner) communicates directly to the stock EFI module, so there's no wiring changes or additional modules to install. **MB**

SOURCES

ANDREWS PRODUCTS
847/759-0190
AndrewsProducts.com

HARLEY-DAVIDSON MOTOR COMPANY
414/343-4056
Harley-Davidson.com

ROB'S DYNO SERVICE
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