ANDREWS INDIAN 111 CAMSHAFTS

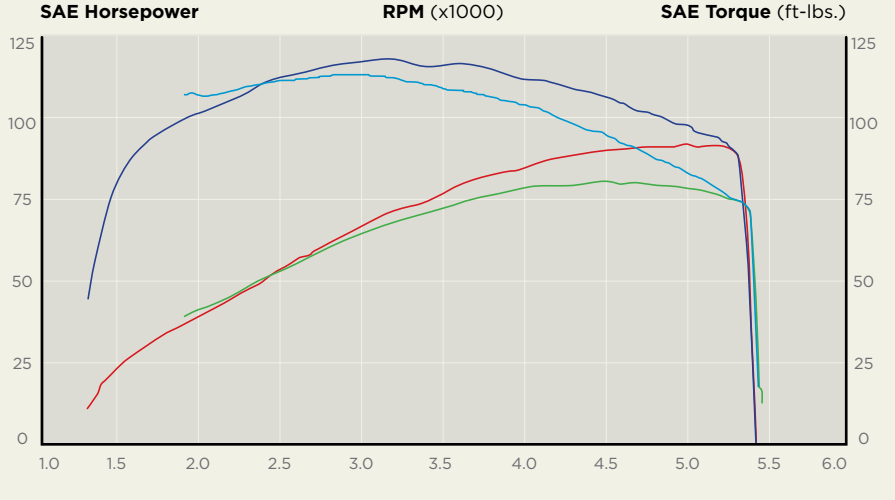
Part II: Installing the cams and getting an 11 hp gain and a much stronger torque curve!

IN THE LAST ISSUE, WE SHOWED YOU HOW TO REMOVE THE three camshafts on an Indian 111 engine. Normally, we start a camshaft installation with the camshaft compartment already emptied. However, doing a cam swap on the Indian 111 is not similar to any H-D engine or any other previous modern Indian engine incarnation, which are all Harley Evo-based designs. The Polaris Indian 111's camshaft compartment internals are totally different from any Harley-Davidson. (Actually, the 111 is very similar to S&S Cycle's X-Wedge engine design, but none of the parts are interchangeable.) On the 111, you must be careful when pulling the cam drive gears off their camshafts. The same goes for removing the old camshafts from the engine and installing the new ones. If a lifter drops down even a little out of its bore when the camshaft that controls it is removed, the upper end of its pushrod will disconnect from its rocker arm in the top end of the engine. If this happens, the engine must be removed from the frame, and the outer and inner valve covers removed. This is the only way to re-engage the upper end of the pushrod with its rocker arm. And that's a big job, usually taking about 10 hours! And forget about getting the pushrod re-engaged with its rocker arm via the camshaft compartment. I was there when a pushrod disconnected from its rocker arm. Two mechanics and I tried to come up with some way to re-engage it, but it's impossible. The only way is to remove the engine from the frame. That means you must use a special tool to hold the lifters off their camshafts and in their bores during the swap. As you can see, this is not a simple process, which is why it was necessary to show you how to disassemble the camshaft compartment and use this special tool in the last issue. We also showed you how to transfer the stock camshaft's compression release components to the new Andrews cams we'll be installing in this issue.

The motorheads at Andrews have come out with two new camshafts for the Indian 111: the TS 550 and TS 570. Andrews has been a major player in designing quality aftermarket components for both motorcycles and cars for decades. Andrews is well-known in high-performance circles for a full line of excellent camshafts and transmission gears and shafts for many Harley-Davidson engine designs, as well as for Victory models. For this installation, we went with the TS 550 camshafts (#269150/$551.52), which have a .550 valve lift on both the

TOOLS NEEDED

- Assembly lube
- Blue Loctite
- Clean rags
- 5mm Allen
- 6mm Allen
- External circlip pliers
- Flat-bladed screwdriver
- Plastic mallet
- 15mm wrench
- 10mm socket
- 15mm socket
- Torque wrench (in-lbs.)
- Torque wrench (ft-lbs.)
- RDS Indian camshaft tool



Base Line: ● Max Power = **80.1** ● Max Torque = **113**

Andrews 550 cams: ● Max Power = **91.4** ● Max Torque = **117.6**

CF: SAE, smoothing @ 5

Dyno time by
Rob's Dyno Service

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With some assembly lube on its inner bearing surface and cam lobe, Dan installs all three of the new camshafts into their bearings in the right crankcase.

intakes and exhausts. For our readers who like a bit more in the way of cam specifications, duration for the intakes is 218 degrees, while the exhausts are open for 222 degrees (@ .053"). Valve timing on the intake valves is 8/30 and 33/4 for the exhausts.

As we did when removing the camshafts, we must use a special tool to reinstall the new camshafts. In fact, this tool is still in the engine holding the four lifters in their bores. There are only two camshaft tools currently on the market for the Indian 111. The first is from Polaris Indian, and it's an excellent tool, though it's only available to Indian dealers. The second is offered by my buddy Rob at Rob's Dyno Service (RDS). This is the tool we're using for this installation for two reasons: we're doing this cam swap at his shop, and it's the only one you'll probably have access to. Rob's version ($550, or rented for $100) is also excellent and is CNC-machined from billet aluminum. However, I think it's the better of the two since it also helps prevent the camshafts from coming out from under their lifters when you're pulling the drive gears off their camshafts. We covered that in Part I, and this is usually when a lifter can potentially drop down.

So when all the work is done, what kind of power gains can you expect? As the title says, we got about 11 more horsepower with these cams on a bike equipped with a performance air cleaner and exhaust system. Yup, the same formula used on any piston-powered performance vehicle applies here. For the biggest gain, you must first get the intake and exhaust systems flowing air the best they can before swapping out the camshafts. And though a peak horsepower gain of 11 ponies is a nice power increase, the big story with these cams is the much longer and stronger torque curve. Check out the dyno chart, and you'll see what I mean. Though the "peak" torque number is only 4 ft-lbs. higher than the stock cams, look how much longer the Andrews cams (red line) stays up that high compared with the stock (blue) cam torque line, which starts to drop at 3000 rpm, your shift point. The Andrews torque curve is still up there, and it maintains a much higher number all the way to the rev limiter; ditto for the horsepower power curve. Bottom line: these Andrews cams deliver more power (both horsepower and torque) from 2400 rpm, the engine's rpm sweet spot, all the way to the rev limiter!

The accompanying photos and captions show how Dan at Rob's Dyno installs these new Andrews cams into our Indian 111 test engine using the RDS tool. Of course, he also shows you how to reassemble the camshaft compartment.

TIPS & TRICKS

BEFORE INSTALLING the two exhausts cam gears, rotate the camshaft gear retainer to reveal a hole in the two gears. By prying the split gears so that the holes in the two gears line up, you can hold them in place by putting a 5/32" drill bit through both gears. You can now install the exhaust cam gears onto their shafts. If the exhaust cam gears do not engage completely with the center intake cam gear, use a large flat-bladed screwdriver to move the spring-loaded gear teeth on the exhaust cam gear, so they align with the teeth on the center gear. It helps to have a buddy push in on the exhaust cam gear, not the shaft, as you do this. Then do the same with the other exhaust cam gear.

To get the stock cam bearing carrier back onto the outer ends of all three camshafts, place it on the center intake camshaft first. Then, with slight pressure to overcome the valve springs, gently use a large flat-bladed screwdriver to move one of the other camshafts (one of the exhaust cams) so it aligns with its hole in the carrier. Then carefully tap the carrier slightly over the end of the exhaust camshaft using a plastic mallet. Once you have done the same for the other exhaust camshaft, tap the carrier fully onto all three camshafts. ■

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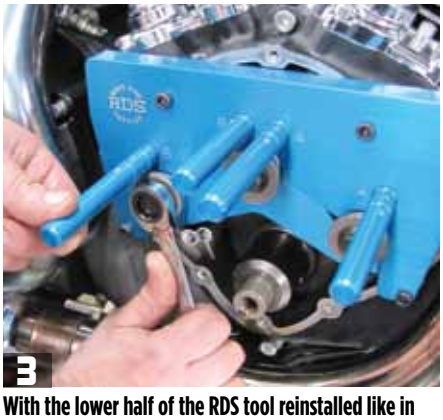
Dan now reinstalls the RDS tool's spacers, with the stock thick washers and bolts, onto the camshafts just as they were when he used them to remove the stock cams in the last issue. He then snugs all three bolts using a 15mm wrench.



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With the lower half of the RDS tool reinstalled like in last issue's Step 20, Dan uses a 15mm wrench to rotate each camshaft clockwise so the cam's lobe pushes its lifter up so he can pull out each RDS retaining pin. One of the intake cam retaining pins will be removed by turning the 15mm wrench counterclockwise.

4

After removing just the spacers, thick washers, and bolts from the engine, Dan checks that the camshafts are properly positioned so the stock gears will be properly timed when reinstalled. Note how the holes and pins are positioned.


5

Once he has carefully and completely removed the rest of the RDS tool from the engine without disturbing the camshafts and placed a clean rag in the cam compartment, Dan reinstalls the stock woodruff keys in their slots in the camshafts.

Dan then slips the center gear onto its shaft first, followed by the front cam gear, which gets its timing marks aligned (as close as he can at this point), to the center gear. The rear gear can go in last, with Dan also noting its timing marks as shown in Photo 2 in the last issue.

To get the stock cam bearing carrier back onto the outer ends of all three camshafts, Dan places it on the center shaft first. He then uses a flat-bladed screwdriver to move the other two camshafts so they align with their holes in the carrier as he gently taps the carrier on with a plastic mallet.

Dan positions the cam sprockets in their chain, noting that the dark links are facing out and are aligned with their marks (arrows) on the sprockets. He then reinstalls the pinion shaft woodruff key in its slot on the shaft.

To fully install the exhaust camshaft gears, Dan uses a flat-bladed screwdriver to move the spring-loaded gear teeth on the exhaust cam gear so they align with the teeth on the center gear. He then does the same with the other exhaust cam gear.

After tapping the cam bearing carrier fully onto all three camshafts, Dan secures the carrier to the right crankcase using the stock bolts, blue Loctite, and a 6mm Allen. He then torques the bolts to 15 ft-lbs.

Once he has positioned the center cam sprocket partway onto its shaft with the locating pin in its hole in the sprocket, Dan turns the sprocket as needed to align the woodruff key in the shaft with its slot in the pinion sprocket.

Dan uses a 15mm socket, blue Loctite, and the stock bolts and their thick washers to secure the sprockets to their shafts. With the tranny still in first gear to keep the engine from turning over, he torques the bolts to 52 ft-lbs.

After slipping the chain tensioner onto its pivot shaft, Dan uses a flat-bladed screwdriver to push the tensioner's spring onto its pin like it was before. He then uses external circlip pliers to reinstall the tensioner's circlip.

While still holding the piston in, Dan reinstalls the chain tensioner mechanism using the stock bolt, blue Loctite, and a 6mm Allen. He then torques the bolt to 15 ft-lbs.

Dan reinstalls the stock chain guide block onto the camshaft bearing carrier using the two stock bolts, blue Loctite, and 10mm socket. He torques the bolts to 71 in-lbs.

Dan must first compress the spring-loaded chain tensioner mechanism before reinstalling it. To do this, he presses in the release on the side of the mechanism with his thumb while pushing the piston in with his finger.

Dan uses a 15mm socket and some blue Loctite to reinstall the stock bolts and thick washers onto the front and rear exhaust camshafts. After he torques the bolts to 52 ft-lbs., he cleans the cam cover's gasket surface.

After positioning a new gasket on the crankcase, Dan uses the stock bolts (they're two different lengths), blue Loctite, and a 5mm Allen to reinstall the stock cam cover. He torques the bolts to 89 in-lbs. **AIM**

SOURCES

Andrews Products
847/759-0190
AndrewsProducts.com

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