

Hydraulic Cam & Lifter Break-In

Updated procedure for hydraulic roller and flat tappet camshaft break-in

BY LAKE SPEED JR.

While many think break-in procedures are just for flat-tappet cams, testing has shown that today's close-tolerance hydraulic lifters greatly benefit from a dedicated break-in procedure. A recent two-year study of valve train break-in procedures has discovered a new direction in proper cam and lifter break-in. The following describes the procedures and recommended products.

Important things to know:

1. Diesel oils are no longer a safe bet for engine break-in. As of December 2016, oil formulations have changed and some diesel oils now have lower levels of ZDDP. In fact, Ford Motor Company does not recommend the new CK-4 diesel oil for their engines.

2. ZDDP Additives are not 100% guaranteed to work. Recent testing of CK-4 diesel oil plus a ZDDP additive still produced failing results. Additionally, testing shows ZDDP additives produced worse ring seal results than fully formulated break-in oil.

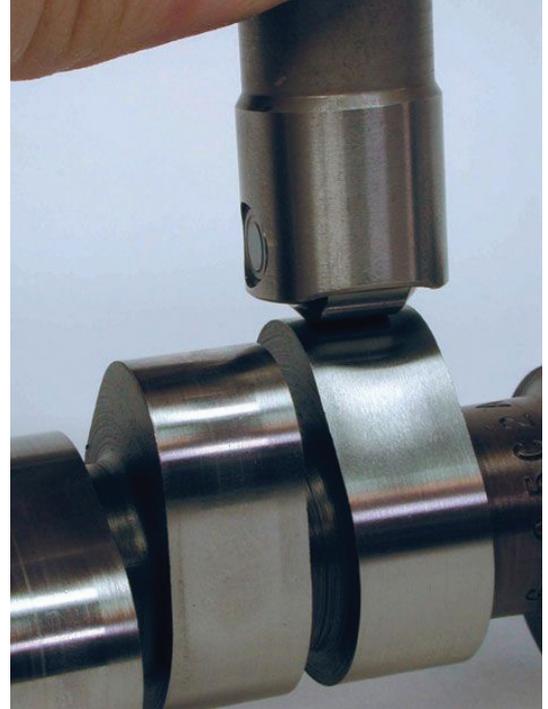
3. Break-in oil works best. Repeated break-in testing produced zero flat tappet cam failures with 150 lbs of seat pressure using Driven's Break-In Oil (Part # 00106) in conjunction with Driven Assembly Grease (#00732) to pre-lube the cam and lifters.

4. Heat cycles help. The least amount of recorded break-in wear occurred when the engine was ran at 2800 rpm for ten minutes, allowed to cool, and ran again for another ten minutes. This is now recommended for all camshafts - bushing and needle bearing lifters, or flat tappets.

Why the correct viscosity and a proper break-in oil is important for hydraulic roller cam break-in:

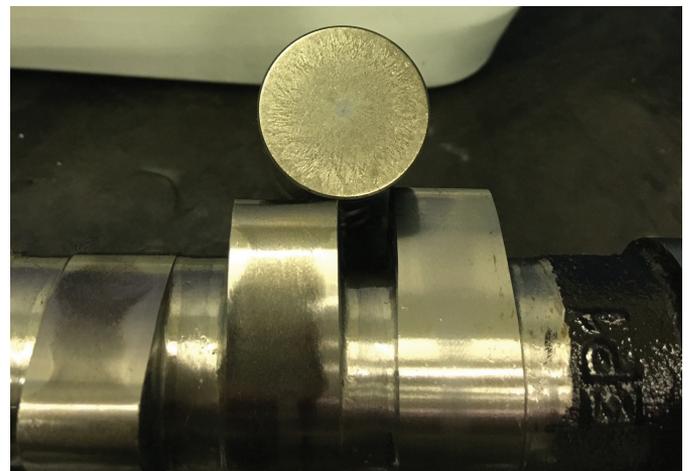
1. Today's hydraulic roller lifters respond best to 10W-40 oil (Driven part number 03706). Many noisy lifter complaints are actually from using the wrong viscosity. A thicker, higher viscosity oil like 20W-50 will not flow enough oil into the lifter and too little viscosity, like a 5W-30, will allow the lifters to "bleed down" easily. While there is a common misconception that performance engines need a 20W-50, results show 10W-40 provides the correct viscosity for hydraulic lifters.

2. The best protection for hydraulic roller lifters is to use a fully-formulated break-in oil. Another reason for noisy lifters and poor



performance is debris caught in the lifter. Ten times more break-in particles are produced during break-in, most of which will go through the lifters. A proper break-in oil (Driven part number 03706) will not wear in parts aggressively enough to cause excess debris. Change the oil and filter after break-in and again in 500 miles to get wear particles out of the engine before they do lasting damage.

3. These same recommendations apply to engines with stamped steel rocker arms. The pivot point's high friction level generates significant heat, so proper lubrication is critical to their break-in.



Wiped cam lobes can be avoided by using the correct assembly grease and break-in oil.

A few practical assembly and break-in steps to avoid problems:

1. Clean and degrease parts. Use a foaming degreaser to remove the greasy rust-preventative film parts are coated with before shipping. The film seals out moisture but also traps fine particulates. Make sure the metal surfaces have been cleared of these abrasive particles before applying assembly lubricant to avoid lifter damage.

2. Apply a calcium-sulfonate grease instead of ZDDP before assembly. ZDDP requires heat to activate while calcium-sulfonate activates at room temperature. While ZDDP is important, calcium-sulfonate grease provides critical extreme

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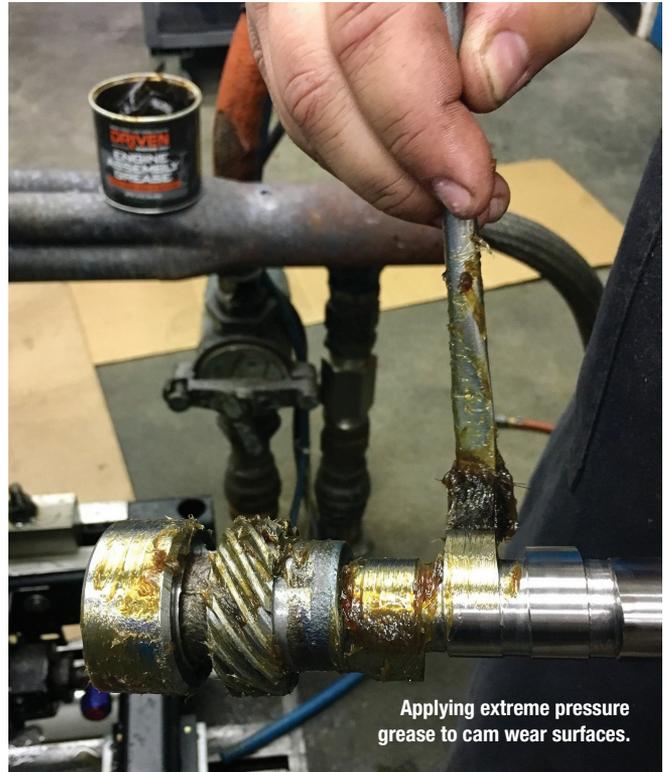
pressure protection and lasting lubrication during the assembly process and initial start-up. Apply the calcium-sulfonate grease (Driven part number 00728) to the thoroughly cleaned camshaft, flat tappet followers, distributor gear, pushrod ends and rockers. For roller lifters, clean them with mineral spirits and soak in break-in oil (Driven part number 01806). Soak hydraulic lifters for several hours on their side with the oil hole pointed up.

3. Use a finer micron filter during break-in. Generally, production vehicle filters have a finer micron rating than racing filters. For example, a WIX 51061 Chevy small block filter has a nominal micron of 21 with a flow rate of 11 GPM. A WIX 51061R racing filter has a nominal micron of 61 and a flow rate of 28 GPM. WIX also offers a specific break-in filter for dry-sump systems.

4. Prime the pump before starting the engine. The oil system must be primed and the cam and lifters need a full supply of oil at startup to avoid “dry starting.” Use a lighter viscosity oil on systems unable to be primed to improve oil flow during the critical moments of initial start-up. Unprimed engine testing reveals a 50% reduction in valve train wear using a 5W-30 break-in oil versus a 15W-50 break-in oil.

5. Do not let the engine idle. Much of the camshaft is lubricated by oil slung from the crankshaft so start the engine and immediately bring it up to 2,800 RPM. Vary the speed by a few hundred RPMs over the course of the next 30 minutes’ total, stopping the engine after the first ten minutes to let it cool down.

(continued)



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Re-start and bring it back up to RPM and repeat through two more 10-minute run sessions to complete the heat-cycle break-in process.

6. Change the oil filter after the initial 30-minute break-in process. Tighter micron filters during break-in catch larger particles but flow less. After break-in, the ideal filtration is tight enough to catch clearance-sized particles while flowing enough oil to supply the engine's required volume. Replace the break-in filter with a higher flowing race filter before making dyno runs or racing.

7. In addition to the filter, change the oil. The engine creates 10 times more wear metals in the first 30 minutes than over the next 3 hours of operation. Always use a high ZDDP break-in oil (Driven part number 03706) to reduce the amount of particulate created during break-in and change the oil and filter immediately after initial break-in to avoid clogging in hydraulic lifters. ZDDP break-in oil is like a primer for the engine that builds off the anti-wear film established by the calcium sulfonate grease. This creates a chemically-matched foundation for lasting protection.

8. After break-in, change the oil again after 500 road miles or the initial dyno runs in a competition engine. Continue to use high quality oil designed for the application and follow normal change intervals. Keeping clean, high quality oil in the engine is insurance against lubrication-related problems. ■

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