

## **Subject: Flat Tappet Camshaft Failures (Hydraulic & Solid/Mechanical)**

**Recent changes in oil and engine technology are likely the cause of premature camshaft failure; here's how you can protect your engine!**

Premature flat tappet camshaft failure has been on the rise recently and not just with one brand or type of camshaft. In almost every case, the hardness or taper of the cam lobe is suspected, yet most of the time that is not the problem. This growing trend is due to factors that are completely unrelated to camshaft manufacture or quality control. Changes in today's oil products and "advancements" in internal engine configurations have contributed to a harsher environment for the camshaft and a potential for failure during break-in. But there are several things you can do to curtail this discouraging trend.

### **Engine Building Tips & Parts Selection**

Engines are great at providing oil to every engine component except one – the camshaft. Windage trays that limit oil's ability to reach the cam and lifters, modification of connecting rod side clearances for less oil splash and special oil pans further complicate both the break-in process and camshaft lubrication in general. Careful and informed selection of your engine components and lubricants can greatly reduce your chances of having a failure.

#### **Lifter Selection**

COMP Cams® offers flat tappet lifters (solid/mechanical) with oiling holes in the cam contact face, which will increase oil flow to the lifter face to camshaft lobe contact point. Furthermore, using a lifter grooving tool (COMP Cams® Part #5003 for GM engines; see catalog or website for other engine makes) will enhance oiling throughout the camshaft and valve train. As we all know by now, better oil flow means better initial break-in and increased camshaft durability. Additionally, make sure you purchase only high-quality lifters from reputable sources. Most lifters look alike, but you don't really know where they were produced. "Imported" flat tappet lifters often times use inferior lifter castings and **DO NOT** deliver the durability of COMP Cams® high-quality, US-built lifters. COMP Cams® lifters are built to strict tolerances on the diameter and linear dimensions and designed to fit each application with the highest level of quality. This ensures the lifter rotates properly and decreases the potential for failure. Additionally, COMP Cams® flat tappet lifters have the correct oil band depth, width, and location to properly regulate the internal oiling of your engine.

#### **Camshaft Nitriding**

Nitriding is recognized by metallurgists worldwide as one of the most effective ways to increase the case hardness and lobe surface lubricity of flat tappet cams, all in an effort to enhance both

break-in and long-term durability. Pro Plasma™ Nitriding is a patented process that uses pulsed nitrogen plasma to infuse nitrogen ions into the part – strengthening and fortifying the material on a molecular level, through a depth of approximately 0.010 of an inch. Once again, COMP Cams® has proven their technological leadership by becoming the first aftermarket valve train company to own and operate a Pro Plasma™ Nitriding service in-house.

Available for any COMP Cams® flat tappet camshaft, this customer-requested service (COMP Cams® Part #1-111-1) has been proven to deliver unmatched wear resistance and uniform case hardness. In addition, nitrided versions of the most popular flat tappet grinds from COMP Cams® are now on the shelf and available for quick delivery.

## **Lubrication**

### **Engine Oil Selection**

Another major factor in the increase of flat tappet camshaft failure is your favorite brand of engine oil. Simply put, today's engine oil is just not the same as it used to be, thanks to ever tightening environmental regulations. The EPA has done a great job in reducing emissions and the effects of some of the ingredients found in traditional oils; however these changes in the oil have only made life tougher on your flat tappet camshaft. The lubricity of the oil and specifically the reduction of important anti-wear additives such as zinc and phosphorus, which help break-in and overall camshaft life, have been drastically reduced. In terms of oil selection, we recommend oil with the proper level of "ZDDP", Zinc Dialkyl Dithiophosphate additive fortification. Recent market trends and misinformation have led to a new and adverse side effect known as "Overloading on ZDDP". When overloading on ZDDP, the additive can actually cause blocking of other important additives, such as friction modifiers or detergent agents. It is imperative that the ZDDP level is carefully specified and blended to correct concentrations.

### **Engine Oils, Supplements, & Additives**

Making certain that the camshaft and lifters are properly lubricated upon installation will guarantee that they are protected during the critical start-up of your newly-built engine. COMP Cams® offers the right product for this job (COMP Cams® Part #153), and it is available in several different size containers for engine builder convenience. COMP Cams® also has a line of Break-In Oils (COMP Cams® Part #1590 [10w30] and #1591 [15w50]) which have a proprietary formula that includes the proper amount of critical additives, including ZDDP (Zinc & Phosphorus), Molybdenum, detergents and high grade base oil to give you the most optimum oil for the break-in and long-term running of all your purposefully chosen performance engine components. If you have a preferred oil with which you feel comfortable, we strongly recommend the use of COMP Cams® Break-In Oil Additive (COMP Cams® Part #159) during break-in. While this additive was originally developed specifically for break-in protection,

subsequent testing has proven the durability benefits of its long term use. This proprietary blend of anti-wear ZDDP fortification, anti-friction Molybdenum, and extreme pressure additives promotes proper break-in and protects against premature cam and lifter failure by replacing some of the beneficial ingredients that the oil companies have been forced to remove from off-the-shelf oil. These specialized COMP Cams<sup>®</sup> lubricants are the best “insurance policy” you can buy, and are the first step to avoiding durability problems with your new flat tappet camshaft.

## **Proper Camshaft Break-In**

Proper flat tappet camshaft set-up and break-in, as any engine builder knows, are keys to the life of a camshaft, both short and long term. The correct procedure allows the lifters to establish rotation and develop a good wear pattern.

### **Pre-Installation**

Remove the camshaft from the box, and clean it with mineral spirits or a parts washing solvent, then perform a visual inspection immediately. Look carefully for dings, dents, deep scratches, or any other defect that may be detrimental to the break-in or long-term life of the camshaft. Pay special attention to the lobe and journal contact surfaces and distributor gear. Before installing the camshaft apply an ample amount of the supplied camshaft and lifter installation lube (COMP Cams<sup>®</sup> Part #153) to the lobes, journals, distributor gear, and lifters.

### **Break-In Preparation**

Always remove the inner spring during break-in when using dual valve springs, or if you have a high load single spring, use a lighter spring (110-120 lbs. seat load and 260-270 lbs. open load). An alternative solution that addresses this same concern is using a set of low-ratio break-in rocker arms. Both of these solutions provide your best chance of proper camshaft break-in and long term durability. While these tips may be a slight inconvenience, a little time and effort on the front-end is much better than destroying your new engine.

### **Proper Procedure**

As soon as the engine fires, bring the rpm up to 2000 to 2500 during the first 30 minutes of operation. Slower engine speeds will not supply the camshaft with an adequate amount of oil for the break-in period. The engine rpm may be varied periodically from 2000 to 2500 to direct oil splash to different areas of the camshaft. After the 30 minute break-in period, change the oil and filter again to be sure all contaminants and break-in lube are removed from the engine. The inner valve springs should now be replaced and the correct rocker arms installed.

If you have any questions concerning the break-in procedure, please contact one of our CAM HELP® technical consultants toll free. We'll be glad to help you with any problems or questions you may have.

### **Six Steps To Increase Flat Tappet Camshaft Durability**

- 1.** Double check your camshaft and lifter set-up using COMP Cams® Lifter Centerline Tool (0.842" diameter – Part #5019; 0.875" – Part #5020; 0.904" – Part #5021) prior to the break-in process, and use an ample amount of the supplied assembly lube on all lobes, distributor gear and the bottom face of each lifter.
- 2.** Use flat tappet lifters with face oiling provisions, such as COMP Cams® Part #800-16 (GM) or #817-16 (Ford). Always use high-quality, U.S.-built COMP Cams® lifters to make certain you are receiving the best quality lifter you can buy. Avoid “brown bag” lifters.
- 3.** Use a COMP Cams® Lifter Bore Grooving Tool (Part #5003 for GM engines; see catalog or website for other engine makes) to increase oiling.
- 4.** Nitride your new flat tappet cam to increase the case hardness and lobe surface lubricity; available as an added service for any COMP Cams® flat tappet camshaft (COMP Cams® Part #1-111-1).
- 5.** Use high-lubricity, high-ZDDP COMP Cams® Break-In Oil (Part #1590 or #1591) to help during the break-in process and while running or use COMP Cams® Camshaft Break-In Oil Additive (Part #159).
- 6.** Always remove inner valve springs from dual valve springs or use low load springs (110-120 lbs. seat load and 260-270 lbs. open load) in place of higher load springs during break-in. In addition, COMP Cams® offers low ratio break-in rocker arms to give you an additional measure of camshaft break-in protection.