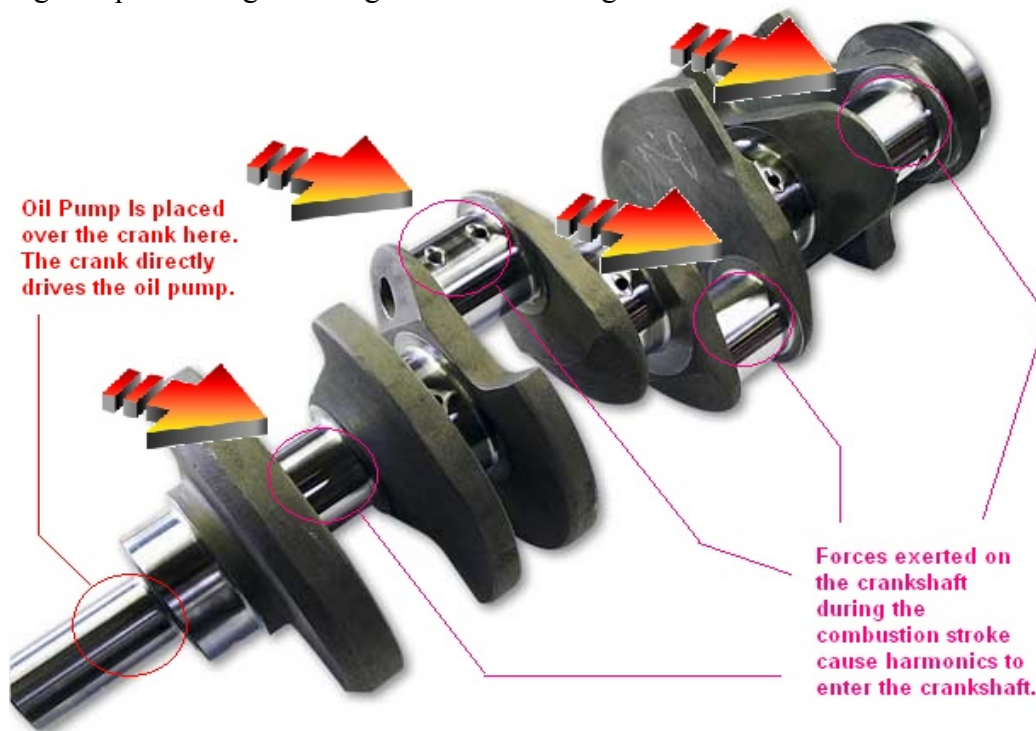




## HIGH OUTPUT / VOLUME EXTERNAL WET SUMP OIL SYSTEM – BOLT ON APP - FORD MODULAR 2V/3V/4V exc. 03+ Cobra

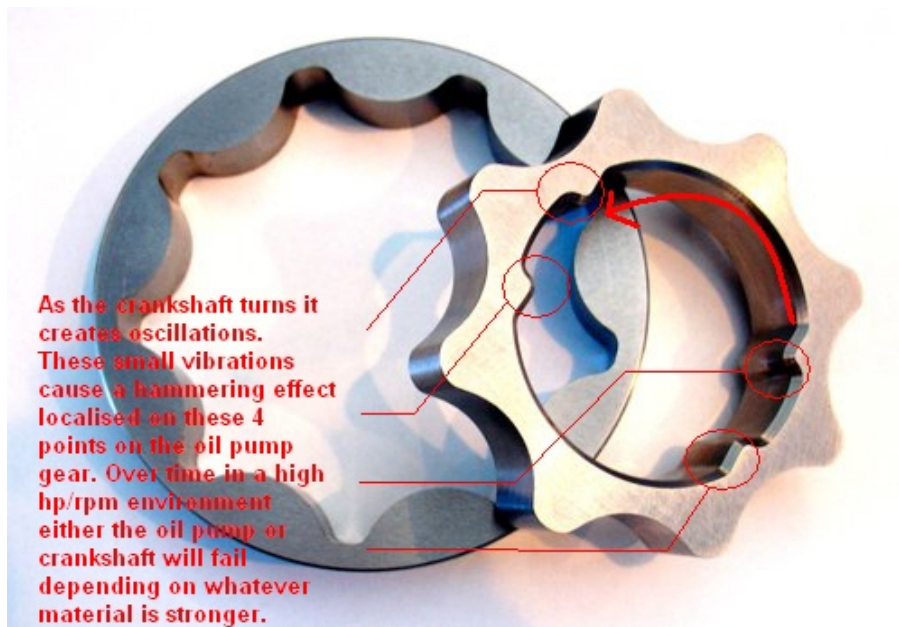
In the search for ultimate oil control while maximizing power output WeaponX has developed a no-compromise external wet sump system to address all issues with the Ford modular engine. To understand why WeaponX has gone through all the effort we have come up with this technical documentation to explain why we felt the external wet sump oil pump is the best system for use on high output and high revving Ford modular engines.



The stock oil pump is a crank driven system and the drive mechanism is the pump itself. It is a very efficient design but at the cost of reliability in a high hp or revving environment. The Ford system uses a weaker metal in the oil pump vs the material of the crank itself. There is a sound reason behind this, harmonics control. Harmonics are high frequency oscillations in the engine, these high frequency oscillations are transferred directly to the oil pump drive mechanism. High frequency oscillations are created by the pistons/rods and the forces being created on them. These frequencies are then transferred to the crank. The oscillations on the crank then creates a small chattering or hammering effect on the stock oil pump drive.

Now why would Ford not use a cryo or billet metal gear? The answer is simple. Oscillations or harmonics in the crank cause this vibrating and oscillation on the oil pump drive. The softer metal of

the oil pump can usually flex without damaging the crank or the oil pump itself since steel is a true elastic material. The problem with the soft metal is that at elevated RPM and power levels the oscillations can be so intense that the pump may actually break causing an internally damaged oil pump with broken gearing which can potentially damage the engine.



The modular scene has been rectifying this problem by using billet or cryo treated gears. This is a fine solution when the gear is machined properly so that engine oil pressure does not drop and when used with an extremely expensive and durable harmonic damper. Be leary of new gears which are not CNC'd properly and can cause a massive drop in oil pressure at idle. This can be potentially damaging to the engine. WeaponX has also found that extremely tough oil pump gears can strip and damage the crank itself since the tougher gears have no flex characteristics like the OEM pump gearing. When a billet gear is stronger than the crank the hammering effect of the harmonics causes the crank to eventually strip. Before the crank strips metal filings can be lodged and are present everywhere in the engine requiring a total engine rebuild. A good harmonic damper will remove the oscillations and harmonics in the crank preventing wear and tear on the system. The problem with an oversized harmonic damper is that engine rev speed is compromised as well as power output.

These damaging frequencies are removed in the system through the use of a harmonic balancer. The harmonic balancer or harmonic damper remove unwanted frequencies and oscillations by allowing an external weight to absorb the frequencies. These frequencies travel through the crank to the damper where an elastomer material allows an external weight to move freely. The vibrations are then absorbed through by the weight and the frequency energy is lost through heat and movement of the external weight. The bigger the weight the more frequencies the damper can absorb. The problem with this is that large weights cause rotational losses in the engine much like a heavy flywheel. Keep in mind the OEM damper is designed for OEM power levels and rpm. Also, when replacing the stock oil pump with billet gears the harmonic damper is not adjusted to absorb the proper damaging frequencies as the stock damper is set up for the stock oil pump characteristics.

Not content with having to make due with reduced power levels and reliability WeaponX went to the drawing boards to create a high performance oil system With our 4V engine being a high revving, high output NA 4V we needed a means of creating an efficient oil system all while reducing crankshaft

harmonics, reducing rotational losses, improving power output and improving oil flow, which also protects the engine.

The first step in the design was to develop a harmonic damper to prevent any internal damage to parts that are connected to the harmonic source such as the oil pump and timing gear. WeaponX's solution was to remove the oil pump leaving only the timing chains and timing gear. So we developed our harmonic damper to absorb any harmful harmonics that primarily effect the timing gear and timing chains. This also allowed us to create an underdrive pulley that allowed for an increase in power output since there are less components that can be affected by system harmonics.

Once that harmonic damper was developed we turned our attention to the oil pump. We used a Peterson external wet sump oil pump, optimized the gear ratio for optimal oil pressure and reduced rotational drive losses. This allows the engine to rev freely and frees up extra horsepower at the same time. Since the oil pump is cog belt driven it also removes the oil pumps natural frequencies and oscillations in the system. They are now isolated and removed by the elasticity of the drive belt. Not only does our system remove unwanted resonance in the system, it also provides precise oil control, improved throttle response and increased power output all while improving engine reliability. The WeaponX External Oil Sump is the ultimate no compromise bolt on oil system setup for the Ford modular engine (2V, 3V and 4V excluding Cobra) and is about the same price as upgrading the stock oil pump with billet gears and installing a high end external damper.

