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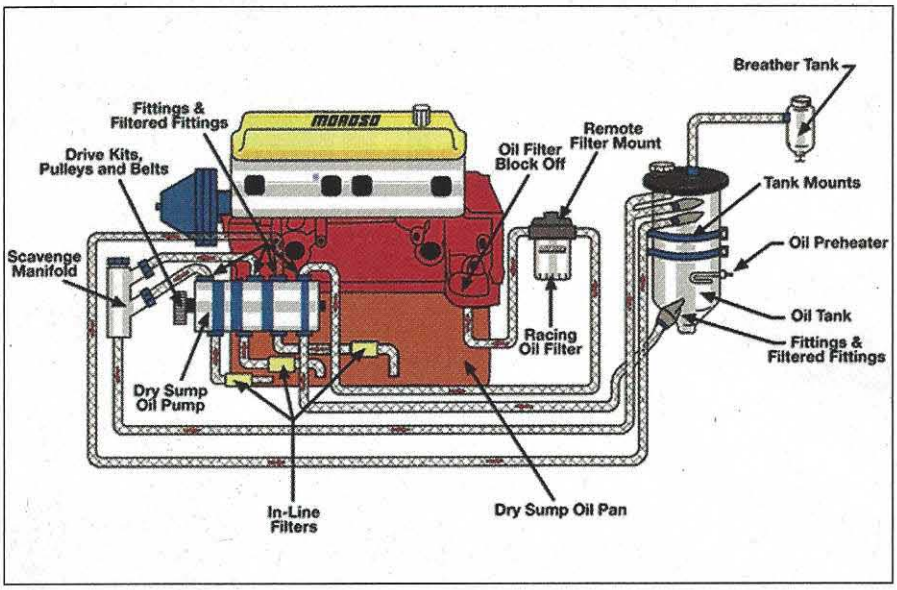
stacked together (usually 3 or more), there's usually enough scavenging action to suck not only the oil out of the engine but also air from the crankcase. Pulling a vacuum in the crankcase reduces windage and drag for more horsepower. In a high revving engine, pulling vacuum may increase the engine's power output up to 10 horsepower or more.

The oil pan usually has two to four suction ports that are connected to the scavenge pumps with hoses. The oil pan is also quite shallow since it doesn't have to hold any oil. This increases ground clearance under the engine and allows the engine to be mounted lower in the chassis for a better center of gravity. The oil pan may be cast aluminum, or welded steel or aluminum.

Gary Armstrong of Armstrong Race Engineering says his company makes a wide variety of cast aluminum dry sump oil pans. "Our most popular pan right now is for the LS1-LS7 Chevy applications. These are all bolt-on pans that use the stock gaskets."



With a dry sump setup, popular with most ProStock drag racers as well as NASCAR and circle track racers, there is no oil in the pan. One or more scavenge pumps suck the oil out of the pan (and lifter valley in some cases) as fast as the oil flows through the bearings and lifters. The scavenge pump(s) route the oil to an external storage tank, which may hold anywhere from one to five or more gallons of oil. The external tank serves as a reservoir and allows air to separate from the oil. A vent allows air to escape.

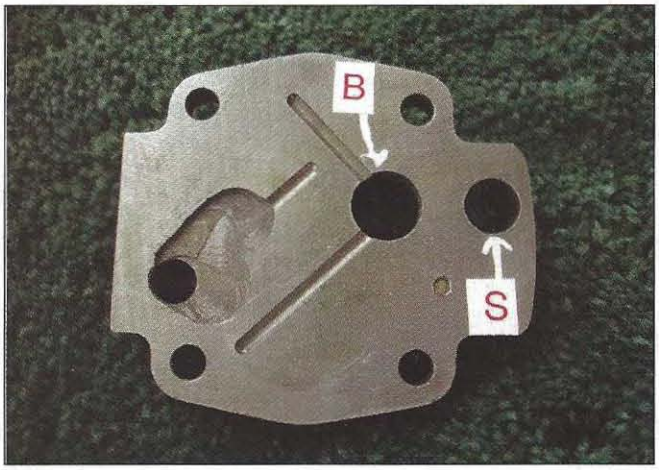
To push the oil back into the engine, a dry sump system uses an external pressure pump, which is usually mounted in the same stack as the scavenge pumps (all share a common dri-

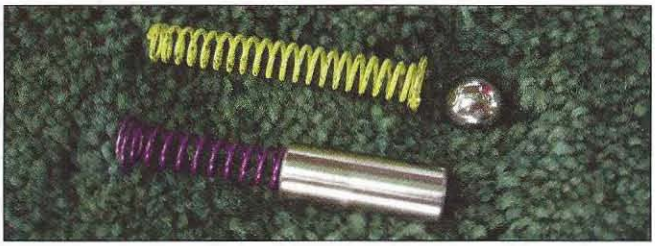
veshaft that runs down the middle of the assembly). The pump's output is routed directly to the engine's crankshaft bearings with hose fittings and an adapter that fits over the old spin-oil filter mount, but some of the oil can also be routed through a valve block or manifold to provide lubrication direct to the valvetrain and/or turbocharger.

The dry sump pumps are usually mounted on the side of the engine and driven with a cogged belt off the crank pulley. On some applications (sprint cars, for example), the pump assembly may be mounted on the front timing cover and are driven off the cam.

Because most 3-stage dry sump systems do not have enough suction to pull vacuum in an engine, racers who want to minimize windage and drag usually go with a 4-stage, 5-stage or 6-stage setup. Tim Mangus of Mangus Precision Pumps says "Bigger motors need more scavenging if you want to pull vacuum in the crankcase.

"With a 4-, 5- or 6-stage dry sump setup, you can also separate the top and bottom of the engine, and pull oil out of





Schumann's new "Dual Feed" oil pump for Chevy small block circle track applications is a "wet pump with a dry sump attitude," according to the company's leader. The new pump has a second side inlet port that allows the pump to maintain oil flow at high rpm (inside of cover shown at left). The pump uses a spring-loaded steel check ball to control internal oil pressure instead of a cup valve (below). The check valve design won't jam or stick like a cup valve can if the pump sucks in any debris.

OIL PUMPS

engines where the oil pump is mounted inside the front cover and is driven directly off the crankshaft, stock pumps tend to leak a lot of oil at higher rpms. "Some of these pumps look like a fire hose at 6,000 rpm," says Osterhaus. "For these applications, we've redesigned the pump ports, tightened the clearances and hard anodized the housings and backing plate to improve the durability and performance of the oil pump."

Vern Schumann of Schumann Sales & Service is introducing a new "Dual Feed" oil pump for Chevy small block circle track applications that is a "wet pump with a dry sump attitude." The new pump has a second side inlet port that allows the pump to maintain oil flow at high rpm. The pump housing has been extended on the side to accommodate the second supply port, which provides oil at higher rpms when the gear teeth are passing by the primary supply port too quickly to fill the space between the gear teeth with oil. This can cause a drop-off in oil output and pressure at higher rpms.

"Our dyno tests have proven that this pump doesn't suffer any loss of flow as engine speed increases, so the engine can't outrun the pump," says Schumann. The new Dual Feed pump will sell for around $100 (which is much less than a billet pump or a wet sump system).

Schumann's new Dual Feed pump as well as his other pumps also use a spring-loaded steel check ball to control internal oil pressure instead of a cup valve. The check valve design won't jam or stick like a cup valve can if the pump sucks in any debris.

The oil pumps also come with a choice of four different color coded springs so the bypass pressure can be adjusted by swapping springs. Removing a small screw allows the spring to be easily replaced. Schumann says he uses a $4000 digital spring tester to check the calibration of every bypass spring. "If the spring rate is not linear when the spring is compressed, we don't use it. Bad

WHAT IS A DRY SUMP SYSTEM?

Dry sump systems are usually described by the number of stages (pumps) they have, such as 3-stage, 4-stage, 5-stage, etc. Typically, the external pump assembly will include 2 to 5 scavenge pumps mounted in a row, with the pressure pump at the back end of the stack.

In a very simple 2-stage dry sump system, two pumps are stacked together: a scavenge pump to suck oil out of the oil pan, and a pressure pump to feed oil back into the engine from the reservoir. When multiple scavenge pumps are stacked together (usually 3 or more), there's usually enough scavenging action to suck not only the oil out of the engine but also air from the crankcase. Pulling a vacuum in the crankcase reduces windage and drag for more horsepower. In a high revving engine, pulling vacuum may increase the engine's power output up to 10 hp more.

springs can cause erratic oil pressure or a loss of oil pressure."

Schumann's oil pumps also have an external dump for the oil bypass, with a diffuser screen so the oil doesn't splash up toward the crankshaft. The hole for the gear shaft is also beveled and has an oil supply groove and rifling inside the hole to lubricate the shaft.

Another interesting item Schumann makes are thin copper gaskets that fit between the oil pump and engine block in SB and BB Chevys. Stock pumps have no gasket here and can leak pressure and air.

Jim Bianca of Moroso says his company is introducing a new line of external dry sump oil pumps. The scavenging manifold is built right into the pump assembly, which simplifies the plumbing and installation. The pumps also have a more efficient design to pull more vacuum. "You can install this pump on the biggest drag motor and still pull 15 inches of vacuum in the crankcase." Moroso also makes a wide variety of wet sump oil pans as well as wet sump oil pumps for small block and big block Chevys.

OTHER CONSIDERATIONS

Some racers use a vacuum pump to pull vacuum in a wet sump engine. The theory is pulling air out of the crankcase reduces windage and drag (which is one of the advantages of running a dry sump oil system). But in a wet sump engine, a certain amount of positive pressure created by blowby from the cylinders actually helps push oil toward the bottom of the oil pan and into the oil pump pickup tube. So pulling vacuum may be counterproductive if the pump is starving for oil at high rpm. A better approach might be to use a full length solid windage tray under the crankshaft to keep the crankshaft from churning up the oil in the pan.

Another device that may be used with either a wet or dry sump oil systems is an oil pressure accumulator, such as the Accusump made by Canton Racing Products. An accumulator is essentially a self-pressurized auxiliary oil reservoir. Inside the tubular accumulator is a spring-loaded piston that traps oil pressure when the engine is running. The compressed air behind the piston then pushes the oil back out of the accumulator to the engine if the oil supply is interrupted because the oil pump is cavitating or sucking air. The accumulator can also continue to supply oil to the bearings and/or turbo after the engine is shut off to help with cool down. It can also pressurize the oil system when the engine is cranked to prevent a dry start. Such a device can add an extra measure of insurance to any oiling system. EB

For additional contact information about these or any other supplier of oil pumps, visit our exclusive interactive ***Engine Builder Buyers Guides****, on the Internet at:* ***www.enginebuildermag.com***