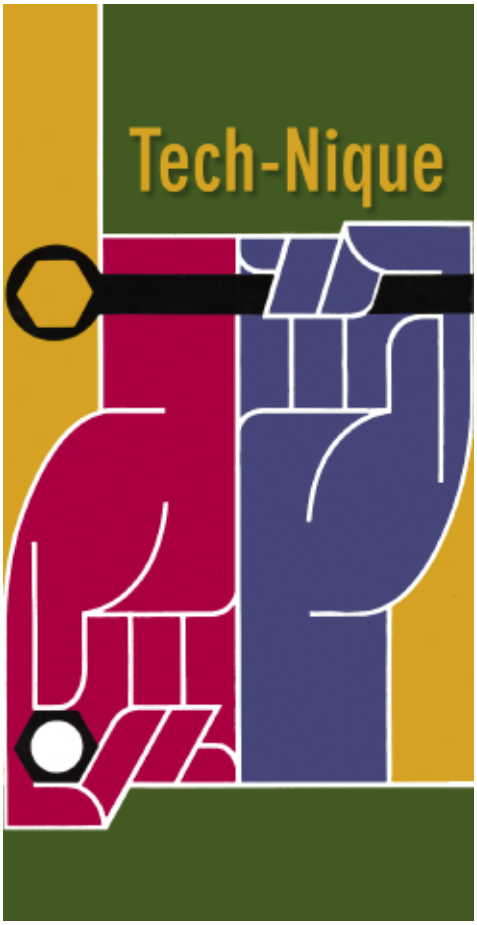
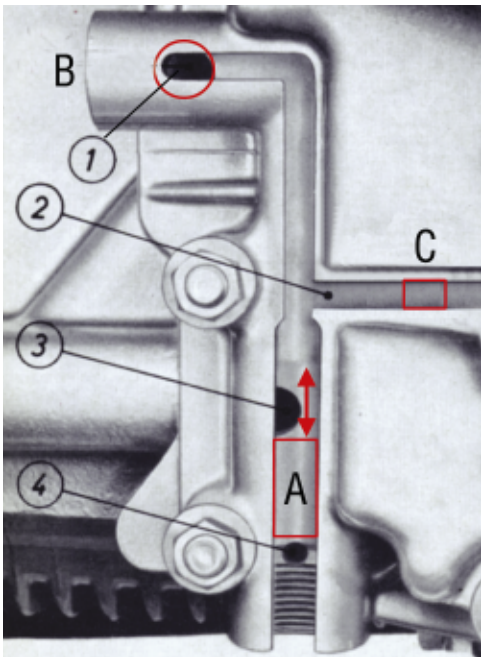


Full-Flow Oil Filtration and the 356 Lube System

By Ron LaDow



The bypass oil system. The plunger (A) would cover the main oil galley (3) during warm operation.

Clean oil helps engines live a long and enjoyable (for us) life. Most all of us want our engines to last as long as possible. As pointed out in the article *Stock Oil Filtration Effectiveness* (Vol 28-4, Nov/Dec 2004), in stock form, "92% of the pump output, oil and dirt, go right to the various engine bearing surfaces." The stock 356 oil filtration system was very good in the 1950s, but engine life can be greatly improved without ruining your car's originality by fitting a full-flow oil filter. There are various designs and methods available which will provide full oil filtration to your engine, and they all have advantages and disadvantages. As a 356 owner, you probably have more options than any other vintage car owner.

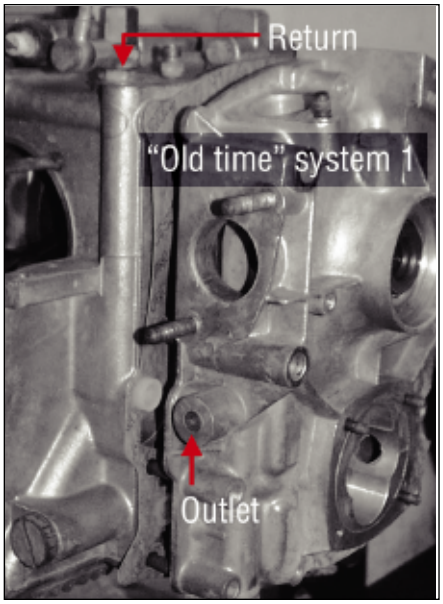
To fit a full-flow oil filter to a 356, you must break the lube circuit somewhere between the oil pump and the main galley which feeds the stock oil cooler and the bearings. On either side of the break, some sort of inlet/outlet fittings direct the oil to the new filter and then return it to the engine. While simple enough in the abstract, the design of the engine cases and the lube system make the solution more difficult than it at first appears. We want to provide clean oil, but at the same time we don't want to cause any collateral harm.

Complicating the matter is the 'bypass' circuit in all post-1958 356s (illustration of timing cover at left). This was a successful change in which on start up, high-pressure oil from the pump (2) forces the bypass valve piston (A) down, opening the main oil galley (3), effectively bypassing the cooler passage (1)—when the oil was cool anyhow—and delivering pressurized oil directly to the bearings. Once bearing lube pressure was established, a feed-back line (4) closed off that circuit by moving the piston back up over the main galley (3) and the oil then flowed through to the cooler (at 1) before going to the bearings.

Today, most aftermarket full-flow systems perform quite well in providing quick *and* clean oil if installed correctly. One old-time (late '60s, early '70s) custom design, however, gave up filtration on start up to provide quick pressure to the bearings.

Different Approaches

To cover the alternatives chronologically, we'll start with the 'old-time' system, which is still a workable arrangement. Here, the break is where the main galley enters the left side case half from the timing cover (red circle at 1); drill, tap and plug the timing cover or the case half. The outlet is on the side boss, half-way up the left side of the timing cover (B); it requires at least drilling and tapping, perhaps welding. If welding was part of the design, either a male or female hose fitting can be mounted, and any angular clearance



The "old time" system (let's call it system 1) has an outlet on the third piece at B, below left. The return is on the case as shown above.

issues are resolved by trimming the fitting before welding.

The return is on the left side case half, top, far left, rear; you can see a plug on top of the case. This requires drilling, likely welding and perhaps machining the cases as a result of possible warpage during the welding. Again, the 'sex' of the fitting and the physical direction can be driven by other requirements.

As mentioned, this system delivers un-filtered oil at start up (let's call it a 99.9% full-flow), but delivers pressure to the bearings quickly regardless of any fill-up time required by the cooler/filter system. It also offers design flexibility, and as a result was used on racers of that vintage. Given the flexibility, this system can be fitted to any tach-drive arrangement or exhaust system.

It does require hoses and various components/mounts (like a remote filter head and/or coolers) plus the artful routing of the hoses. And there are other design issues related to noise. There's no reasonable chance the engine can be returned to stock appearance.

The parts are available from any speed shop or race car parts seller, but the design and fabrication labor is either yours or bought from the shop you use.

The Pump Cover Outlet Systems

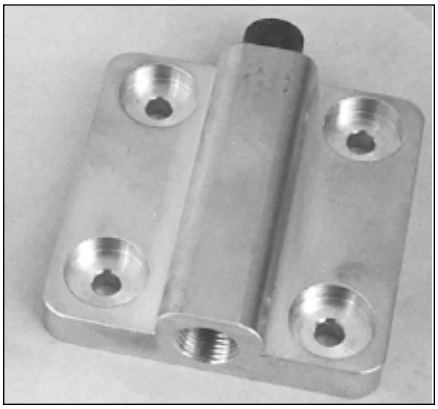
Some time in the late '70s or early '80s a clever soul looked at this process, considered the modification hassles and had a better idea; the oil pump cover/outlet was born. We'll call it system 2. Oil is driven from the pump to an external line through a redesigned pump cover. The original route from the oil pump is plugged at the pump outlet (C at left); drill, tap and plug.

Pump cover modified for outlet, system "2." Return is at boss on third piece, where outlet is on system 1.
Below from left: CSP unit, Skirmants' unit with integral pressure relief, welded tach drive cover.
Bottom: The original oil system, shown at op temp, and a sysytem 2 with external filter and cooler.

That boss, half-way up the left side of the timing cover now becomes the return rather than the outlet, and no modifications to the main case half are required. The return can be drilled and tapped into the side of the timing cover (B) without welding - unless someone leans on the wrench too long while tightening the fitting, when welding repair becomes necessary.

Again, separate components, mounts, hoses/routing and noise need consideration and/or fabrication. Just about any exhaust system can be accommodated. While it would be possible to regain absolutely stock engine appearance on removal, the only change is hidden under the tin, so it's rarely required.

These parts are offered by 356 Enterprises, Classic and Speed Parts, Competition Engineering, and maybe others in a variety of specific designs. Shasta Design has a new cover, similar in appearance to the others, but with a carefully fluted 90 degree angle to the internal oil channel. This smooth transition not only aids flow (especially at cold temps) but cuts down on the noise associated with pulsations.

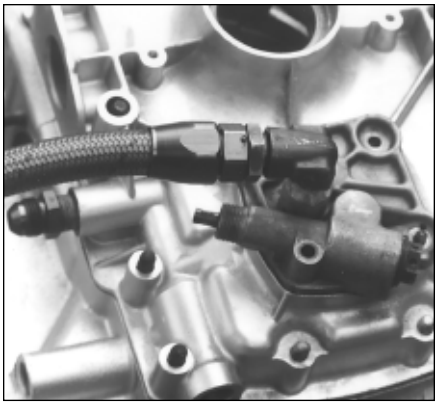


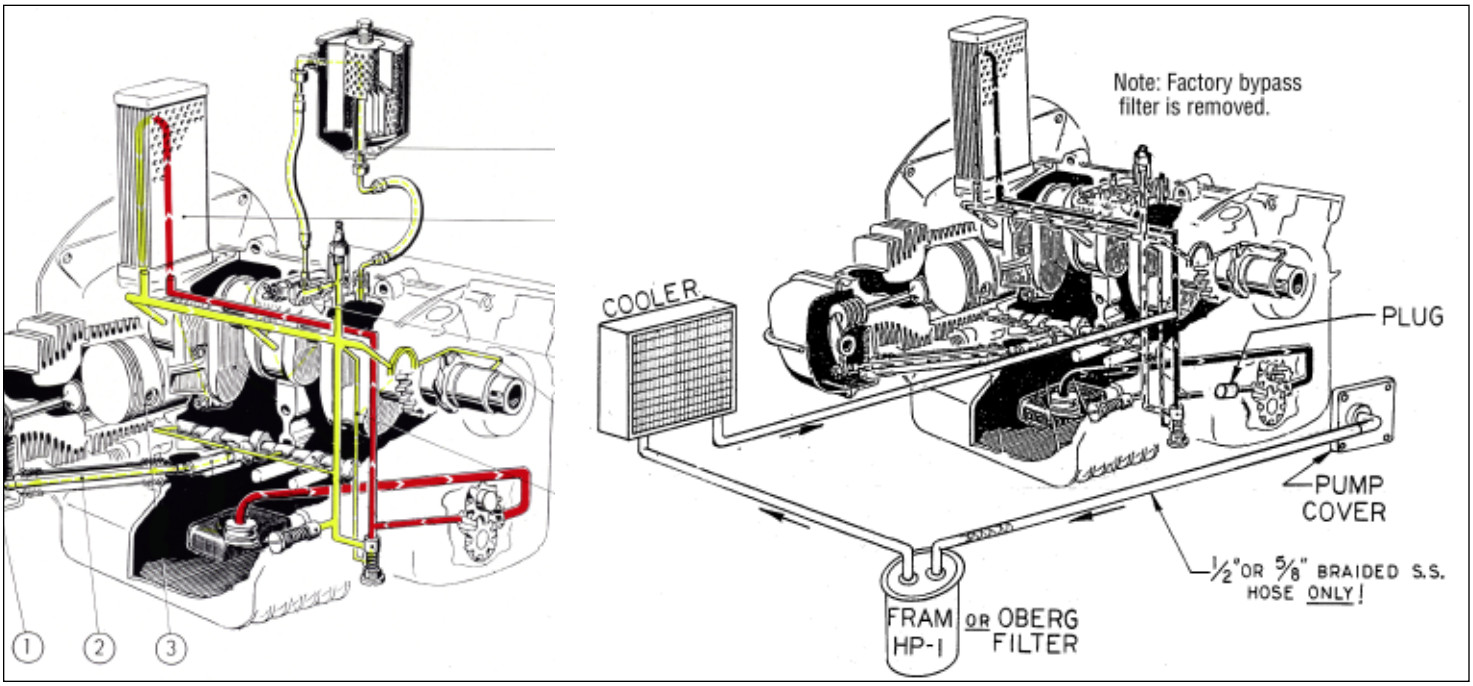
Some are provided with internal reliefs, some to fit mechanical-tach cars, etc. For reasons that escape me, many seem to need modification to the engine tin where more careful design would make none required. Again, the overall system design and labor do not come with the parts.

An improved pump cover design

Several years ago, a new design took a bit better advantage of the given engine features in post '60 ('large-pump') engines. Here the break and the inlet/outlet happen within the oil pump itself. A clearance 'notch' is cut and hidden inside the pump cavity, and there is no other modification nor any possible need of welding. The 'return fitting' is also the 'plug', breaking the circuit inside the pump cavity. The engine has no external changes, so any later return-to-stock means simply replacing the original pump cover on removal of the system. Unlike some of the other pump cover outlets where the round sheetmetal pulley cover interferes with the center of the cover outlet, no additional tin clearancing is required.

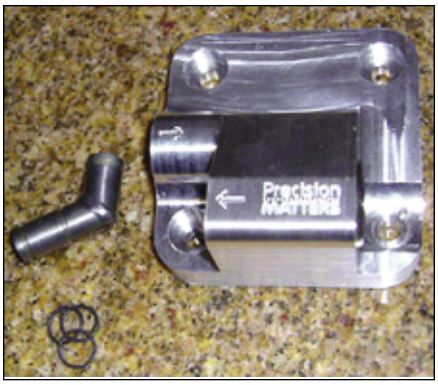
This technology is applied to two separate

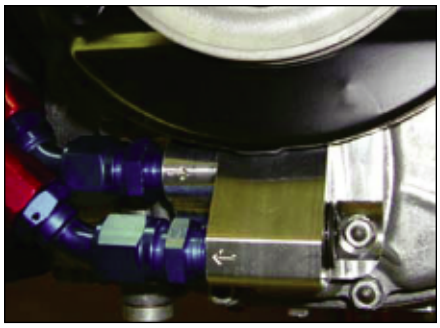




systems. So far, space limitation has resisted application to mechanical-tach drives.

The first system has the filter mounted directly to the oil pump cover, eliminating any additional hoses or components. It was designed for C-type cars and fits only with electric tachometer drives and stock (or similar) exhaust systems.





From top: Precision Matters' all-in one full flow filter, and their remote oil adapter showing the kit and the installed unit.

No other design or fabrication is required upon fitting.

The second design is smaller and held closer to the timing cover to accept exhaust systems which use the space devoted to the filter in the first instance. Again, electric tach drive only. This product requires separate design and mounting of the filter and/or cooler, plus the hoses as per earlier systems. These two are available only from Precision Matters or dealers.

Noises Off

If you are planning to use any of the systems requiring hoses and separate mountings of components, there are design issues which need attention:

All high-pressure hydraulic pumps deliver fluid in pulses. Because the 356 lube system is, in effect, a high-pressure hydraulic system, the fluid pulses in time with the pump. Any system with hoses and auxiliary mounts will vibrate in tune, and you won't like it if they transfer that 'music' to the car's structure. Pay very careful attention to flex-mounts, avoiding wide, flat panels as mounting locations, etc. Mount everything such that the parts and hoses can vibrate a bit without transferring that movement to the car structure.

Other Design Issues

In all but two systems (the 'old time' and the Precision Matters Full Flow), fill-up of the external circuit can take time from pressurizing the bearings on start-up. Make that time as short as possible. If all the components are below the sump fill line, they will never drain and will need no fill-up.

If you mount components higher than that, you might consider a one-way, anti-drain-back valve to keep them full. Eric Nichols designed such a system and posted the design at http://members.rennlist.org/eric_nichols/, Or per Bruce Baker, mount a pressure switch at the coil to prevent engine starting until the bearings have oil pressure.

Almost all full-flow systems will yield a reduction in engine oil temperatures, since the surface area of the lube system exposed to cool air is increased. But too cold is as bad as too hot; consider that engines need some reasonable temperature to expand the parts to running clearances. If you will hang that 28-row oil cooler in the nose, consider a thermostatic by-pass valve. Coolers also need careful selection, as do filters. Fresh, cold, large-pump 356 engines can easily surpass 300 psi oil pressure near the pump output. Most coolers and filters are not designed for that amount of pressure, and certainly the cheapest of the lot are not.

Regardless of the system, budget somewhere in the range of $500 to $1,000 for a complete system done with good quality parts and materials. Talk to the parts suppliers and/or the shop you use, but compare that to the cost of a crankshaft or early rebuild.

Like planting a tree, the best time to fit good filtration is either 10 years ago or right now. An engine rebuild is the obvious opportunity, but engines with some thousands of miles on them can live a longer usable life by adding it now. Most systems require removal of the engine or at least the timing cover for installation. The Precision Matters units are designed to allow installation with the engine in the car, but even those are easier to install with the engine out. If done during a rebuild, add anywhere from one hour to a week or so to the time frame, depending on the system.

With all the options available, your engine can have the benefits of truly clean oil. The vintage of your engine/car and your tastes will decide which alternative is the bet fit.

Thanks to Duane Spencer of Shasta Design for use of photos from his books *The Complete Porsche 912 Guide* and *Porsche 356 Performance Guide.*