

Oil Filter Cross Reference

Quaker State QS3614
Fram PH966B
Purolator L10028
AC PF53
Mobil M1102
Bosch 3330

Engine Oil Filters Overview

Recommended Filters, Filters To Avoid

Description

This page now contains my *personal* slant on oil filters. It is largely based on the things I discovered in the Oil Filter Study I started several months ago. Since there was concern about the influence of some of the subjective information on that page, it has been removed and put into this page. Again, these are my personal opinions and I am just a concerned automotive enthusiast that is tired of being toyed with by these manufacturers. In reality, I am an Electrical Engineer with no qualifications in the area of filtration analysis. However, I have eyes and some common sense, which has proven to be enough to accomplish what I set out to do.

What Makes A Good Filter?

Engine oil filter have one purpose in life: to filter out the particles that enter the oil so that they don't act as abrasives when the oil recirculates. The filter is a cellulose (paper) or synthetic media that is usually contained in a steel can. The front of the can typically has a threaded center with surrounding holes. Oil enters through the surrounding holes, passes through the filter media, and exits through the threaded center. The filters usually screw right onto the engine block using an o-ring gasket to prevent leakage. Many filters have an anti-drainback valve to prevent dirty oil from backwashing back into the oil pan. They also have a pressure relief or bypass valve that will allow oil to bypass the filter element in the event that it becomes too plugged to pass enough oil. This prevents engine oil starvation and the possibility of destroying the element, allowing pieces of it and the junk it filtered to enter the engine. Also, when the oil is cold and very thick, it will tend to bypass the filter through the pressure relief valve because it cannot pass through the element until it thins out somewhat. If it did not do this, the filter element media would tear open.

A good filter has a strong steel can to withstand the high oil pressure (60-80psi when cold), an anti-drainback valve that actually works without creating too much backpressure, a pressure relief valve that doesn't leak, and a strong paper element and cap that can with stand the pressure and flow of oil without falling apart. The element media has to be able to trap small particles, but without restricting the flow too much. Cellulose (paper) media is used on economy filters and works OK. The fibers in the paper acts as a mesh to block particles down to a certain average size, while allowing the oil to pass through. Some manufacturers add other media, such as cotton, to the cellulose to improve its performance. There is synthetic fiber media

for the high-end filters that has smaller passages to trap smaller particles, but can pass more fluid through it because it has more of them. There is also media that is a blend of these two. There are also "depth" filters that are usually made of synthetic material that has a passage size gradient to it. In other words, the deeper into the element the oil goes, the smaller the passages get. This way, large particles are trapped in a different spot than small particles, which allows the filter to hold more particles before it "blocks" (becomes too restrictive).

All filters have to undergo SAE (Society of Automotive Engineers) tests to prove that they meet the engine manufacturer's requirements. The SAE J806 test uses a single-pass test, checking for contaminant holding capacity, size of contaminant particles trapped, and ability to maintain clean oil. As an amendment of the J806 test, the multi-pass test also looks for filter life in hours, contaminant capacity in grams, and efficiency based on weight. The efficiency of the filter is determined only by weight through gravimetric measurement of the filtered test liquid. Typical numbers for paper filter elements are 85% (single pass) and 80% (multi-pass). A new test, the SAE J1858, provides both particle counting and gravimetric measurement to measure filter capacity and efficiency. Actual counts of contaminant particles by size are obtained every 10 minutes, both upstream (before the filter) and downstream (after the filter), for evaluation. From this data filtration ratio and efficiency for each contaminant particle size can be determined as well as dust capacity and pressure loss as a function of time. Typical numbers for paper element filters are 40% at 10 microns, 60% at 20 microns, 93% at 30 microns, and 97% at 40 microns.

Recommended Filters

Based on the simple criteria above and the information I gathered in the Oil filter Study, I have found some filters that are readily available and are of good quality. I have disassembled many filters and made observations and measurements on them. Sadly, some of the most common and popular filters don't cut it in my book. Those filters are described in the next section. The filter names are also links to the Oil Filter Study page, which gives the intimate details of that filter in the Ford 5.0L V8 version. You will find all the hard data for these filters there. What follows are filters that I recommend in alphabetical order:

[AC Delco Duraguard](#)

This filter does not appear to be AC Delco's original design, but it is still pretty good. It has one of the highest filter element surface areas with fewer, but very deep pleats. It also has strong, metal end caps with a nitrile rubber diaphragm-type anti-drainback valve and steel bypass valve. It is one of the better filters you can get for \$3.

I have had some feedback about these filters leaking at the seam between the backplate and the can. Often this was in situations where the engine was modified. Also, during a recent oil change, I found that this filter did not have the best anti-drainback valve. It is better than Fram because I have very little valve train noise at startup (I had a lot with Fram). I now have a NAPA Gold filter on it,

which gives me no noise at all.

[AC Delco Ultraguard Gold](#)

This filter appears to be a Champion Labs filter. This is not suprising given that Champion Labs also manufacturers other AC Delco filters for some european vehicles. See the [German Oil Filter Study](#).

[AMSOIL](#)

No real information yet. I have cut it open and it looks like a very nice filter. The manufacturer appears to be Baldwin.

[Baldwin](#)

No information yet. One is being delivered.

[Bosch](#)

This is yet another Champion Labs filter that is sold at AutoZone.

[Car And Driver](#)

This is a Champion Labs filter that is sold at Target.

[Deutsch](#)

This is a Champion Labs filter that is sold at AutoZone.

[Fram Tough Guard](#)

Even with all the problems of the other Fram filters, this one is not too bad. It has a heavier filter element with more surface area, a silicone anti-drainback valve, the cheap pressure relief valve, but with a clever integral screen to keep out large particles, and enough inlet holes for good flow. The only other drawback to this filter is that it is capped on each end with cardboard instead of metal. Looking in through the center outlet does not reveal any paper end caps, but they are there.

[Hard Driver](#)

This is a one of the few oil filters that uses a synthetic filter element. It's has a dual-density layering "depth" filter element. The construction of the filter is what you

would expect from a quality filter with steel filter element caps and special epoxy-coated steel mesh retainers to keep the element from flexing. It also has a good flowing, strong steel case and a zinc-coated backplate to prevent pre-installation corrosion. I have disassembled but have not measured this filter. I have not been able to find this filter at any retail stores.

Mobil 1

This filter is made by Champion Labs and uses a synthetic fiber element that can filter out very small particles. It is rated by the manufacturer at just under the Purolator Pure One as far as filtering capability, but is still very much above conventional paper filters. It also has a very strong construction to withstand high pressure spikes during start-up. Given the choice between the Purolator Pure One and the Mobil 1 filters, I would choose the Mobil 1 because of the restriction concerns of the Pure One. However, as with all Mobil 1 products, expect to pay 2 - 3 times as much for this filter. I have seen this filter sold at AutoZone and K-mart.

Though I have never had problems, I have received feedback from a few people that these filters may leak at the base. It seems that the seal between the backplate and can may burst under high pressure (at startup). These were on Ford engine applications.

Mopar Filters (various)

These filters are Frams, Purolators, or Wixes. Mopar does not manufacture it's own filters, nor do they require anything special from these manufacturers. Since they basically paint them a different color, stamp them with a Mopar logo, and double the price, there is no reason to buy them. Sadly, the Mopar Severe Duty 53020311 filter is actually the worst filter of them all. It is a [Fram Extra Guard](#).

Motorcraft

This was a Purolator hybrid. It had the Premium Plus case (anti-drainback valve, gasket, etc), but with a Pure One filter element. This is a cheap way to get a Purolator Pure One. It is sold at many locations including AutoZone, Pep Boys, etc.

NAPA

They sell two lines of oil filters: NAPA Silver and NAPA Gold. They are both made by Dana (Wix) and there is no obvious difference between them. They may have different elements, but NAPA does not state that this is true.

PowerFlo

This is a Purolator Premium Plus that I have seen at Murray's Auto Supplies.

[ProLine](#)

This is a Purolator Premium Plus that I have seen at Pep Boys. Pep Boys also sells the Purolator Premium Plus brand, which is pretty dumb (to be selling both).

[Purolator Premium Plus](#)

The Purolator is a solid design. It seems to have one of the tougher paper filter element of them all and the bypass valve is built right into the cartridge. There are no internal sealing problems with this filter at all. There is an assembly string that is wrapped around the filter element, probably to hold it in place while the glue cures in the end caps. In the [ProLine](#) (one of the Purolator clones), the string was wrapped too tightly and had damaged the filter element. All the other Purolator-made filters (8 in all) had no trouble, and even the damaged one would probably have been fine.

[Purolator Pure One](#)

This is an interesting filter design made by Purolator. Most of the construction of the Pure One is the same as the Purolator Premium Plus. The big difference is the filter element itself. It has a dense paper/fiber filter element that can filter very small particles. The result of this is cleaner oil exiting the element, but more oil restriction. Purolator addressed this by adding more filter material (more and deeper pleats). After seeing one of these filters cut open, I am apprehensive about this filter. It seems to have so many pleats that it is almost a solid chunk of filter element. It seems like it would end up restricting the flow, more than anything. Purolator has plenty of data on the filtration abilities of this filter and I don't doubt it, but they have no flow data. Even so, I don't see any major problems with this filter. It also sports a silicone anti-drainback valve and a PTFE treated nitrile rubber gasket.

[STP](#)

This is a Champion Labs filter that I have seen at AutoZone and Walmart.

[Wix](#)

Another quality oil filter similar in design to the Purolator. It has metal end caps on the filter element, a standard nitrile anti-drainback valve, and a seemingly good flow. They are manufactured by the Dana corporation. These appear to have a depth gradient filter element, which uses cotton fibers to progressively trap smaller particles as they get deeper in the filter. This helps maintain good flow as the filter gets plugged.

Filters To Avoid

The following list of filters have known problems. You will see well-known names here and will probably be disappointed. This is because many of these brands have stopped making their own filters and buy from a common manufacturer.

[Fram Extra Guard](#)

Years ago Fram was a quality filter manufacturer. Now their standard filter (the radioactive-orange cans) is one of the worst out there. It features cardboard end caps for the filter element that are glued in place. The rubber anti-drainback valve seals against the cardboard and frequently leaks, causing dirty oil to drain back into the pan. The bypass valves are plastic and are sometimes not molded correctly, which allows them to leak all the time. The stamped-metal threaded end is weakly constructed and it has smaller and fewer oil inlet holes, which may restrict flow. I had one of these filters fail in my previous car. The filter element collapsed and bits of filter and glue were circulating through my system. The oil passage to the head became blocked and the head got so hot from oil starvation that it actually melted the vacuum lines connected to it as well as the wires near it.

[Fram Double Guard](#)

Another bad filter idea brought to you by your friends at Fram. The filter itself is a slightly improved design over the Fram Extra Guard, but still uses the same filter element. It has a silicone anti-drainback valve, a quality pressure relief valve, and enough inlet holes for good flow. The big problem is that they are trying to cash in on the Slick 50 craze. They impregnate the filter element with bits of Teflon like that found in Slick 50. As with Slick 50, Teflon is a solid and does not belong in an engine. It cannot get into the parts of the engine that oil can and therefore does nothing. Also, as the filter gets dirty, it ends up filtering the Teflon right out. Dupont (the manufacturer of Teflon) does not recommend Teflon for use in internal combustion engines. Please do not waste your money on this filter.

[Penzoil](#)

This filter is a Fram! It is the exact same design as the Fram Extra Guard filter and it is junk. On the up side, it costs \$1 less than the Fram version.

[Quaker State](#)

This is another Fram Extra Guard that I have seen at K-mart. It used to be a Purolator, but Quaker State is now owned/controlled by Penzoil...

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