



# Separating Fiction From Fact

## Bypass Filtration Systems

While diesel engine bypass filtration has been used for over 30 years, the recent EPA changes and their subsequent impact to the lube system have caused renewed interest in this type of filtration. Due to this fact, it is important for anyone planning to add bypass filtration to understand how to appropriately separate performance and benefits versus false claims. Since Fleetguard was one of the first in the industry to provide the addition of bypass filtration on mobile engines, Fleetguard has the leadership position to provide an unbiased approach to assist in separating fiction from fact.

- **What is add-on bypass oil filtration?**

It is a secondary filtration unit with the purpose of super-cleaning engine oil. It has high contaminant-holding capacity and filters out the smallest particles to include sludge and soot in special cases. It also reduces engine wear and may increase oil volume.

- **Where is bypass filtration used today?**

Bypass filtration is standard on all Cummins automotive heavy-duty and larger turbo diesel engines and on Mack Applications. It has been used as options and/or standard on Caterpillar, Detroit Diesel, Case, John Deere, DAF, Scania and RVI applications for years.

- **Do I need add-on bypass oil filtration?**

The answer to these questions will guide you:

1. Would I like to extend my operating engine life?
2. Would I like to extend lube oil & service intervals?
3. Do I have contamination (sludge, soot, fine-particulate, etc.) issues?

### Common Manufacturer Claims vs. FACTS

#### **Claim #1: *We filter down to 0.25 microns.***

**Fact:** Particles can only be measured accurately down to about 2 microns. Most filters remove some particles smaller than 2 microns. The question is: **What is the efficiency of the product at removing 5-micron particles?**

Many companies quote a micron size without stating the efficiency. In this case, it is impossible to understand the benefit of the product. In many cases, the filter may not provide any efficiency gain versus the full flow oil filter.

#### **Claim #2: *We provide longer filter service intervals.***

**Fact:** The addition of bypass filtration by itself will not necessarily increase service intervals. Service intervals are a function of many factors, including oil quality, engine duty cycle, fuel dilution, engine soot production, oil sump capacity, full flow filter construction and capacity, and bypass filter construction and capacity. The question is: **What determines the bypass lube filter service interval?**

The decision to push oil and filtration service intervals past OEM recommendations should include the OEM, the oil supplier, and the filtration supplier. Each company is affected by the interval extension and may have warranty concerns.

Since a bypass filter can remove the agglomerated soot and sludge from the oil, (depending on the type) the capacity of the filter determines its service life. If the filter becomes plugged, it may rupture and release contaminant into the system. Otherwise, it will just stop filtering, losing whatever benefits it was providing to the system. For full flow filters, when cellulose is placed in severe duty applications or in less than perfect operating conditions, it will begin to break down and lose integrity. The typical service interval recommendation on light duty applications using cellulose medium is 25,000 or fewer miles or 300 or fewer hours. The aggressive nature of CH4/CH4 plus oils also requires the use of special gasket materials for extended service intervals to ensure gasket integrity. Once an extended service interval has been agreed upon, all parties should be willing to warrant their products (engine, oil, filtration).

**Claim #3:** *We provide a heater that causes liquid contaminants like fuel, water and coolant to evaporate and vent-out to the atmosphere.*

**Fact:** The typical engine oil operating temperature is above 200 degrees F. This system oil temperature will cause a small quantity of water or fuel to evaporate. For a distillation heater to contribute to this process, it must be capable of raising the temperature above the engine operating temperature. However, the product must also be controlled to prevent heating the oil above its design limits. The question is: **If a system includes a heater, is data supporting both heater effectiveness and its effect on oil performance provided?**

Be sure to ask for data concerning distillation heater operating temperature. Ask your oil supplier about the impact of this heater on oil degradation.

**Claim #4:** *Our filter neutralizes and removes acid.*

**Fact:** Filter media is not capable of significantly altering oil chemistry or modifying acid or sulfur content in the oil. These are chemistry changes that require a chemical reaction. The question is: **How exactly does a filter media change a chemical property?**

Ask your supplier for a detailed description and supporting test data to prove this claim.

**Claim #5:** *Our product changes or maintains certain chemical properties through a special chemical release process.*

**Fact:** There is no published data to support a proven method to slowly release oil additives into the oil to extend the oil life. The question is: **Has the product been subjected to a standard battery of API oil quality tests to verify its performance?**

When such technology is developed, two concerns will be:

1. Controlling the add rate to maintain a certain level without overloading the system.
2. Ensuring compatibility with industry oils. The addition of untested chemistry opens the door for unexpected oil performance problems.

**Claim #6: *Our product attracts and filters soot particles.***

**Fact:** Soot particles dispersed in lube oil are extremely small-about the size of a human virus (0.03 micron). The only proven filtration method to remove soot at a rate that maintains soot content levels in oil is high-speed centrifugal separation where centrifuge performance is further enhanced by cone stacks or similar technology. Passive filtration, including depth bypass filters, will remove some soot as a result of removing agglomerated soot. However, the soot level is generally not controlled and continues to increase becoming a major contributor to increased oil viscosity and engine wear. This same agglomerated soot, along with sludge (made up of resins and combustion by-products), is what the bypass filter is designed to capture and will eventually plug the bypass filter when left in service beyond a proper service interval. The question is: **What industry or engine company standard lab and field test data proves that the particular product filters soot particles?**

The only real method known to prove this is a soot draw down test. In this test, a batch of previously sooted oil is placed in a heated test sump and is repeatedly pumped through the centrifuge (or filter). The flow exiting the centrifuge (or filter) dumps back into the test sump, where it mixes and then repeats the loop hundreds of times, allowing the exceedingly low "single-pass" soot removal efficiency (<0.5% typical) of the centrifuge (or filter) to compound over time and cause a measurable reduction of soot in the sump. The soot level in the oil is constantly measured by an on-line infra-red absorption technique (FTIR), and soot removal rate is determined by calculating the slope of the soot decrease during a 5-25 hour period, depending upon efficiency of the device being tested. An industry standard test is currently being drafted by ISO.

**Claim #7: *Customer testimonials prove our product performs well.***

**Fact:** Mere use of a product, or testimonial claims based upon non-scientific facts, do not necessarily prove the product functions as claimed. Many times perceived positive results are due to other variables not attributed specifically to the function of the product. The question is: **Is field test data, including engine tear-down analysis of wear provided?**

Product performance should be supported by controlled field tests. A valid test program will include a "control" engine run with the current practices. This includes engine tear-downs to determine the condition of critical components. This comparison should be to both the control engine and new engine dimensions to determine relative wear. The condition of the test and control engine should be compared. Ideally, field tests should be run based on a statistically sound number of engines and operating conditions. Make sure you ask for this type of data from any potential supplier.

**Claim #8: *Our Add-on Bypass filter does not cause any additional wear.***

**Fact:** The majority of engine wear occurs during cold starts. This is due to the time it takes for full oil pressure to reach critical components. The question is: **What is the impact of the add-on system on cold start wear?**

Although wear points will still have a residual coating of oil even when the sump has been drained during oil change, full oil pressure is required to prevent additional wear. The pressure drop associated with the filtration system impacts the time it takes for full oil pressure to reach all components. Also, since add-on bypass systems are filtering the oil in a bypass loop to the sump, the cleaner oil returns to the sump instead of the engine. The benefit of the cleaner oil is not directly seen by the engine components.

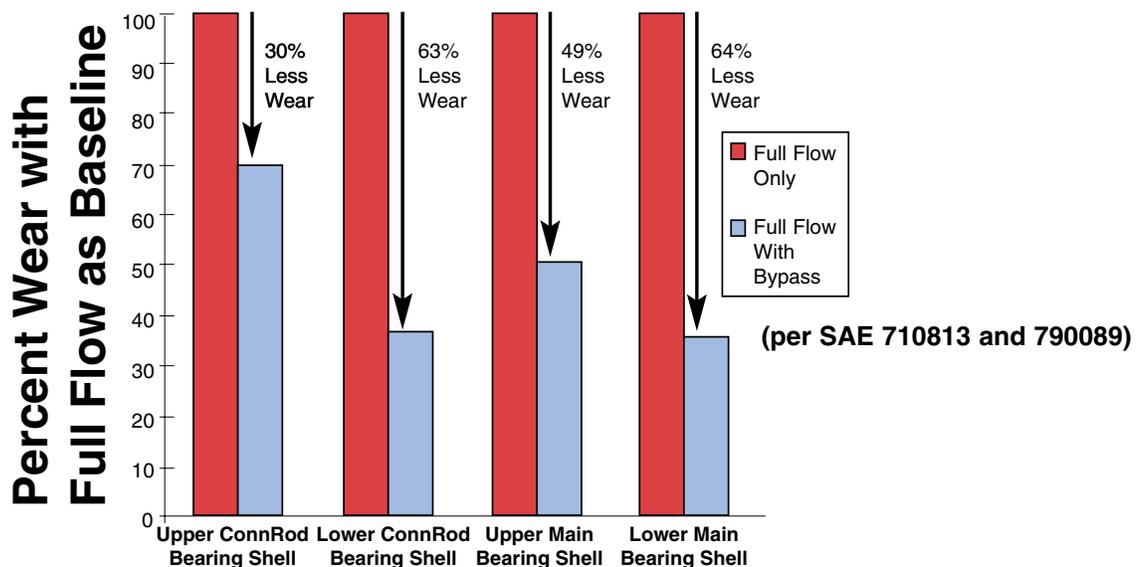
**Claim #9:** *All claimed benefits are a result of the filtration system.*

**Fact:** The total benefits of the system are related directly to the design of the total system, including the filtration element used. If the system is not properly designed, the benefits of the system will have little to do with the actual filtration performance, and more to do with other variables, the largest of these being the additional oil sump capacity. The question is: **What are the true benefits of the system?**

Any add-on bypass system could provide some benefit by the addition of extra oil capacity. This added capacity provides some extended oil life due to the fact there is more oil. If the unit requires this added capacity to be replaced at the time of bypass filter service, the system will benefit from the addition of new clean oil with fresh additives. These two positive effects are often the only true benefits an add-on bypass system provides.

All major SAE publications relating to bypass systems have used standard testing that includes flow rates of approximately 10% of the oil flow rate or 2-4 gpm, depending upon the engine size. As with any filtration system, the use of “Real World” and on-engine tests is key to comparing benefits. As the leader in bypass filtration, as well as the business unit of an engine manufacturer that provides bypass filtration as a standard component of the filtration system, Fleetguard has literally written the book on bypass filtration. The chart below shows results from these “Real World” tests.

## Bypass Filtration Reduces Engine Wear



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## Fleet Maintenance Evaluation Questions Before Adding Bypass Filtration

- How much flow rate can the engine give up as parasitic loss? \_\_\_\_\_
- What is the engine oil volume or capacity size? \_\_\_\_\_
- Does the potential product achieve a sump turnover rate of 5-12 minutes (like major OEMs design their systems to work)? \_\_\_\_\_
- Does the product filter 100% of flow entering bypass filter or does it allow part of the flow to bypass the filter media? \_\_\_\_\_
- What is the product's efficiency at a given micron rating? \_\_\_\_\_
- Does the product meet every test specification for OEM bypass standards? \_\_\_\_\_
- Does your bypass filter effectively remove soot (sub-micron contaminants) even while the oil has the ability to keep it dispersed? \_\_\_\_\_
- Does the product have enough capacity to effectively handle the proper recommended/planned service interval? \_\_\_\_\_
- Is the product environmentally friendly? \_\_\_\_\_
- How long does it take to service? \_\_\_\_\_
- How clean is product servicing? \_\_\_\_\_
- Is the product easily retrofittable? \_\_\_\_\_
- How much oil volume or capacity does it have? \_\_\_\_\_
- What is the service frequency and what does service require? \_\_\_\_\_
- Does the product take out sludge (agglomerated contaminants generally large enough to be filtered)? \_\_\_\_\_



For more technical information, call your Customer Assistance Representative  
24 hours a day at **1-800-22FILTER** (1-800-223-4583), fax 1-800-999-8664 or  
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