



## AMSOIL *E<sub>a</sub>* Air Filters

AMSOIL *E<sub>a</sub>* Air Filters represent a major breakthrough in filtration technology. For the first time, revolutionary nanofiber technology is available to the auto/light truck market.

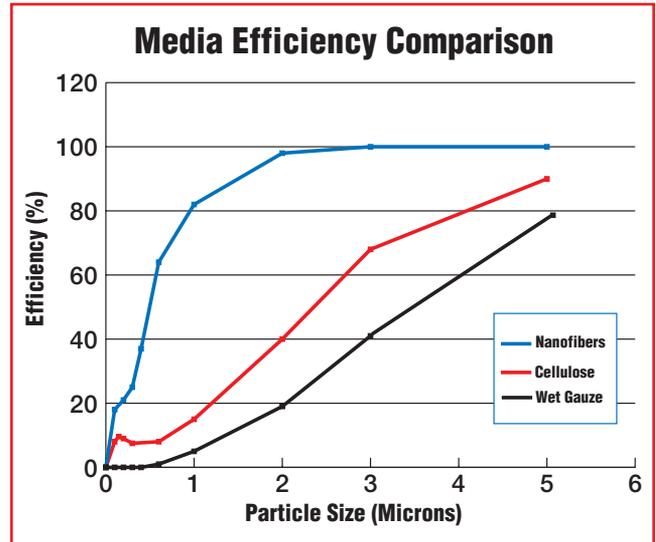
Nanofiber technology has been used exclusively in heavy-duty applications, including the US ARMY Abrams M1 tank. AMSOIL has brought this technology to the auto/light truck market. AMSOIL *E<sub>a</sub>* Air Filters provide the absolute best filtration for AMSOIL customers and with an unmatched four-year/100,000-mile guarantee, AMSOIL *E<sub>a</sub>* Air Filters save money!

## Revolutionary Technology

Nanofiber is a phrase generally referring to a fiber with a diameter less than one micron. Cellulose fibers, on the other hand, are larger than nanofibers and have larger spaces between the fibers, causing contaminants to load in the depth of the media and plug the airflow path, resulting in higher restriction and less capacity. AMSOIL *E<sub>a</sub>* Air Filters incorporate a specially constructed cellulose media with synthetic nanofibers applied to the surface. Dust and submicron particles are trapped on the nanofiber surface, preventing them from lodging in the filter media depth.

Here's how it works: Imagine two filtration media, a chain link fence and a mosquito net. Each is required to stop contaminants, in this case tennis balls.

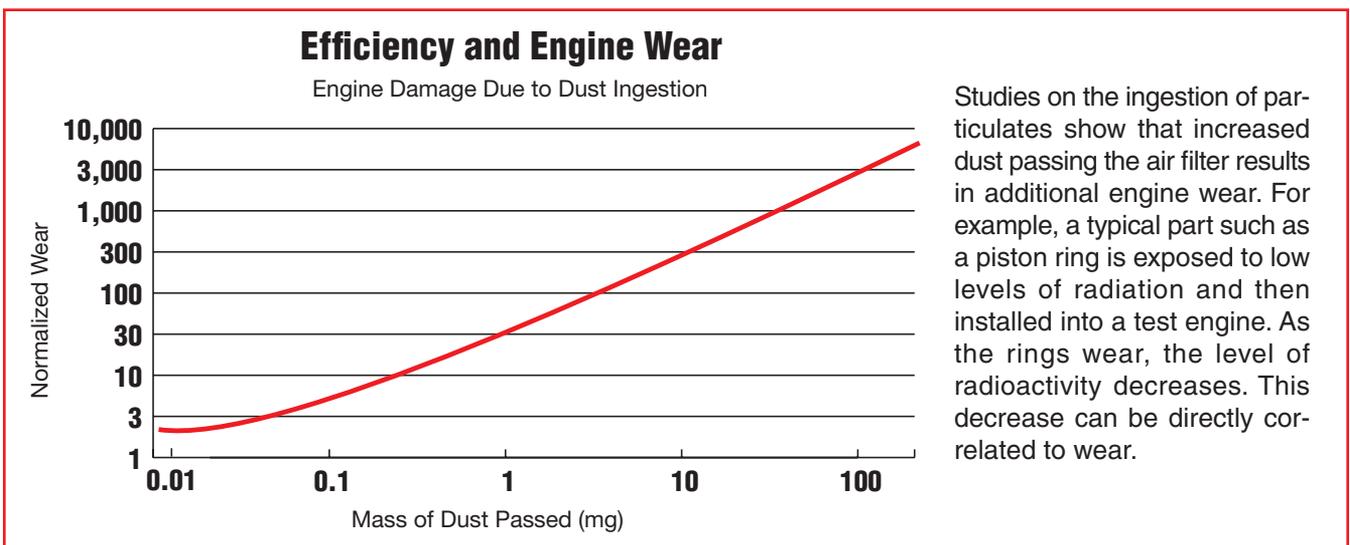
A tennis ball will fit quite nicely into an opening of a chain link fence, but will obstruct the hole almost 100 percent. Now, imagine a tennis ball covering a mosquito net. The tennis ball, at the point of contact with the netting, will obstruct much less filter area than the chain link fence example. In fact, air will flow around the tennis ball all the way to the point of contact. It will take many more particles to obstruct the netting surface area than the chain link fence.



## Air Filter Basics

An engine needs air in order for combustion to occur, but the air drawn in through the induction system is loaded with contaminants. There are over 400 tons of suspended dirt and other contaminants in a cubic mile of air over a typical city. The concentration can be even higher in rural areas where there is frequent travel on unpaved roads. The dirt and contaminants drawn into an engine are the leading cause of engine wear.

The function of the air filter is to trap and hold these wear-causing contaminants without restricting air flow. As the filter traps more and more contaminants, air flow becomes restricted, smothering the engine and diminishing performance. The more wear-causing contaminants a filtration media traps and



Studies on the ingestion of particulates show that increased dust passing the air filter results in additional engine wear. For example, a typical part such as a piston ring is exposed to low levels of radiation and then installed into a test engine. As the rings wear, the level of radioactivity decreases. This decrease can be directly correlated to wear.

the more contaminants the filtration media holds, while still allowing optimum air flow, the better the filtration media is.

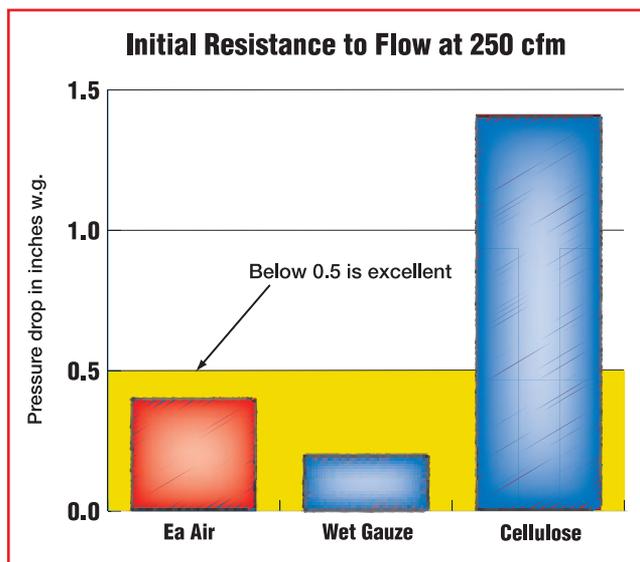
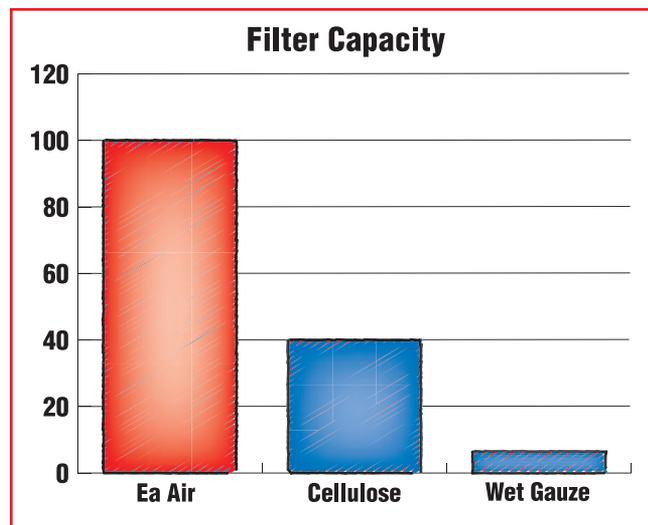
The nanofiber technology used in AMOIL *E<sub>a</sub>* Filters surpasses all other technology in efficiency, capacity and service life. With AMOIL *E<sub>a</sub>* Air Filters, dust and submicron particles remain on the surface and are trapped on top of the nanofibers, preventing particles from lodging in the filter media depth. This produces higher efficiency and higher capacity which extends engine and filter life and reduces engine wear.

### ***E<sub>a</sub>* Air Filters Capture More Dirt**

Efficiency is the ability of a filter to stop dirt and other airborne contaminants from entering the engine. The more efficient a filter is, the more dirt and contaminants it stops. Extensive testing proves that AMOIL *E<sub>a</sub>* Air Filters are more efficient than cellulose and wet gauze air filters.

### **Allows More Air Flow**

Proper air flow is vital to maximize performance and engine life. Air is required to release the energy from the fuel being used. It takes 1,200 cubic feet of air to combust one gallon of gasoline. Inadequate air flow can cause serious loss of power, poor performance and excessive fuel consumption. Tests



show that AMOIL *E<sub>a</sub>* Air Filters have more than three times the air flow of filters that use cellulose media alone.

### **Holds More Dirt**

A filter's ability to contain trapped contaminants determines how well an engine will run and how long the filter will remain effective. If the capacity is too low, the filter will have to be replaced constantly. When the filter is full, air cannot pass through at the rate necessary for proper engine performance.

AMOIL *E<sub>a</sub>* Air Filters hold up to 2.5 times more contaminants than cellulose air filters. Since the nanofibers in the media are so small there are more pores per square inch, allowing for higher dirt-holding capacity and lower pressure drop when compared to cellulose filter media alone. Thinner media fibers produce more uniform pore size distribution, improving the filter's overall quality and ability to capture and retain particles. Testing shows that *E<sub>a</sub>* Air Filters hold 15 times more contaminants than a wet gauze-type filter. The capacity is so great, in fact, that the new AMOIL *E<sub>a</sub>* Air Filters remain effective for a full 25,000 miles or one year before cleaning. This coincides with the AMOIL 25,000-mile/one-year motor oil drain interval, adding even more convenience for motorists by consolidating routine maintenance.

## AMSOIL *Ea* Oil Filters

AMSOIL *Ea* Oil Filters feature advanced full-synthetic nanofiber technology, making them the highest efficiency filters that are available for the auto/light truck market. AMSOIL is also the first in the industry to offer a full-synthetic media in a cartridge-style filter.

### Advanced Media Technology

Cellulose and blended media found in most oil filters have larger fibers than the synthetic nanofibers found in *EaO* Filters. They also have larger spaces between their fibers. This causes contaminants to load in the depth of the media and plug the flow of oil, resulting in higher restriction and less capacity.

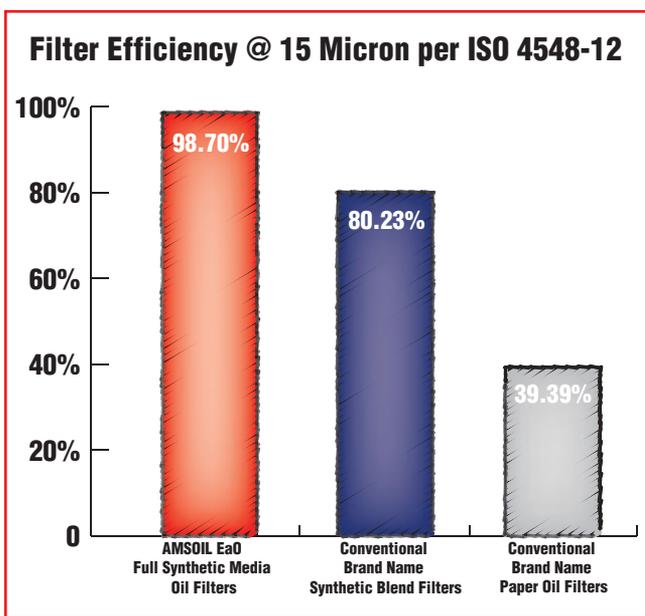
The smaller fibers in synthetic media also have a controlled size and shape. This results in greater efficiency and capacity than cellulose filters, as well as better durability. AMSOIL *Ea* Oil Filters provide a higher level of engine protection and extended filter change intervals.

### Oil Filtration Basics

Clean oil is vital to keep engines running properly. Oil must lubricate, cool and clean the engine as it circulates. In order to remain effective it must be filtered as it cycles.

The filter is connected to the engine sump, which contains the oil pump. Full-flow filters pass all the oil output from the pump through the filter.

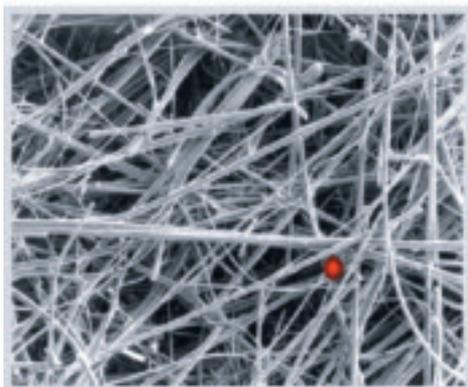
The function of the oil filter is to remove the contaminants introduced into the lubricating oil and prevent them from reaching sensitive engine parts without restricting normal oil flow to the various points requiring lubrication. Internal sources of contamination include wear products from the rubbing surfaces of the engine, blow-by gases leaking past the rings of the pistons and degradation of the oil itself. A filter must perform well in the areas of efficiency, capacity, flow and life.



### Absolute Efficiency

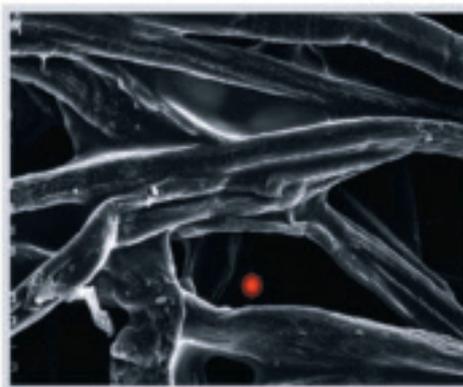
Efficiency is the filter's ability to capture contaminants. The more efficient a filter is, the more contaminants it will remove from the oil. To make a filter more efficient the spaces between the fibers in the media are made smaller, creating more resistance and limiting the oil's ability to flow through the filter. Achieving maximum efficiency along with limited resistance is critical to good filtration.

Extensive testing shows that AMSOIL *Ea* Oil Filters achieve a near-perfect absolute efficiency rating. The exclusive technology used in AMSOIL *Ea* Oil Filters provides filtering efficiency to 98.7 percent at 15 microns. *Ea* Oil Filters are the most efficient filters that are available for auto/light trucks.

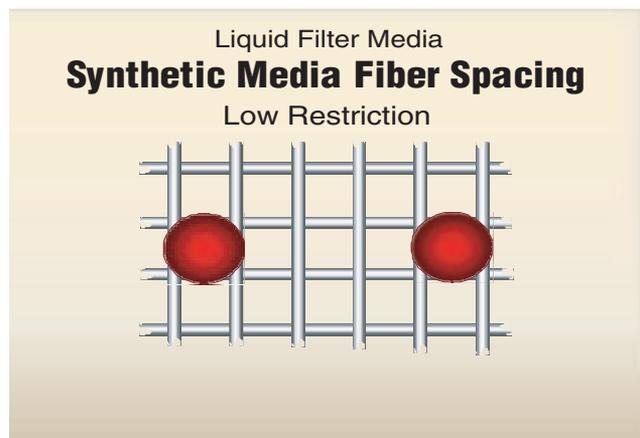
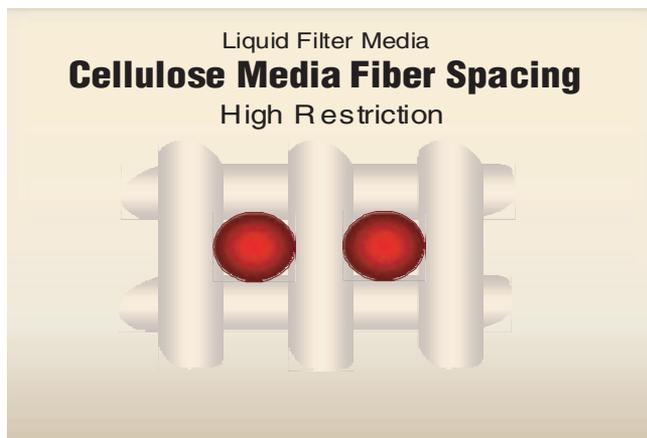


Small, consistent fibers trap smaller and hold more contaminants: restriction is lower.

10 microns



Cellulose fibers are inconsistent in size and shape: more contaminants pass through: restriction is higher and holding capacity is lower.



## Maximum Capacity

Capacity is the amount of contaminants a filter can hold and still remain effective. When a filter reaches maximum capacity the oil continues to flow through unfiltered, leaving harmful contaminants circulating in the oil. When a filter reaches maximum capacity it also reaches the end of its life and must be changed.

AMSOIL *E<sub>a</sub>* Oil Filters have greater capacity than competing filter lines. When used in conjunction with AMSOIL synthetic motor oils in normal service, *E<sub>a</sub>*O Filters are guaranteed to remain effective for 25,000 miles or one year, whichever comes first.

## Durable Construction

AMSOIL *E<sub>a</sub>* Oil Filters are made with premium-grade full-synthetic media. The strictly-controlled processing of this media ensures accurate fiber construction, and is what allows *E<sub>a</sub>* Oil Filters to deliver higher capacity and efficiency, along with better durability.

Over the service life of a cellulose filter, hot oil will degrade the resins that bind the media. *E<sub>a</sub>*O Filters' full-synthetic media technology uses a wire screen backing that is pleated with the media for superior strength.

*E<sub>a</sub>* Oil Filters are constructed with HNBR nitrile gaskets that are fully tested to extreme distances in numerous

severe environments. The filters also feature fully-tucked seams, a molded element seal, roll-formed threads and a long-lasting premium-grade silicone anti-drain valve.

## Improved Flow

Proper oil flow is essential to keep moving parts lubricated at all times. A filter without adequate flow properties can cause catastrophic engine failure.

Flow is restricted as the spacing in the filter media is made smaller to provide greater efficiency. The synthetic nanofibers in AMSOIL *E<sub>a</sub>* Oil Filters allow maximum efficiency without restricting flow. This provides unsurpassed cold-start performance and ensures proper levels of lubrication throughout the engine.

## Extended Service Intervals

AMSOIL *E<sub>a</sub>* Oil Filters are guaranteed for 25,000 miles or one year, whichever comes first, when used in conjunction with AMSOIL synthetic motor oil in gasoline and diesel vehicles in normal service. They are guaranteed for 15,000 miles for severe service. This coincides with the AMSOIL 25,000-mile/one-year motor oil drain interval, adding even more convenience for motorists by consolidating routine maintenance.



## AMSOIL *E<sub>a</sub>*BP Filters

AMSOIL *E<sub>a</sub>* By-Pass Filters are high-efficiency by-pass filters that also remove soot. They provide the ultimate in protection against wear, oil degradation and corrosion.

### By-pass Basics

By-pass oil filtration features a secondary filter with the purpose of eliminating nearly all contaminants in engine oil. They have high capacities and eliminate much smaller particles than full-flow filters, including soot. By-pass filters reduce engine wear and increase oil volume, but their high efficiencies mean they also have higher restriction and must be used in conjunction with a full-flow filter.

By-pass filters operate by filtering oil on a “partial-flow” basis. They draw approximately 10 percent of the oil pump’s capacity at any one time and trap the extremely small, wear-causing contaminants that full-flow filters can’t remove. By-pass filters have a high pressure differential, causing the oil to flow through them very slowly and allowing for the removal of smaller contaminants. It is called by-pass filtration because the oil flows from the by-pass filter back to the sump and bypasses the engine. This continual process will eventually make all of the oil analytically clean, reduces long-term wear and can extend drain intervals.

### Higher Efficiency

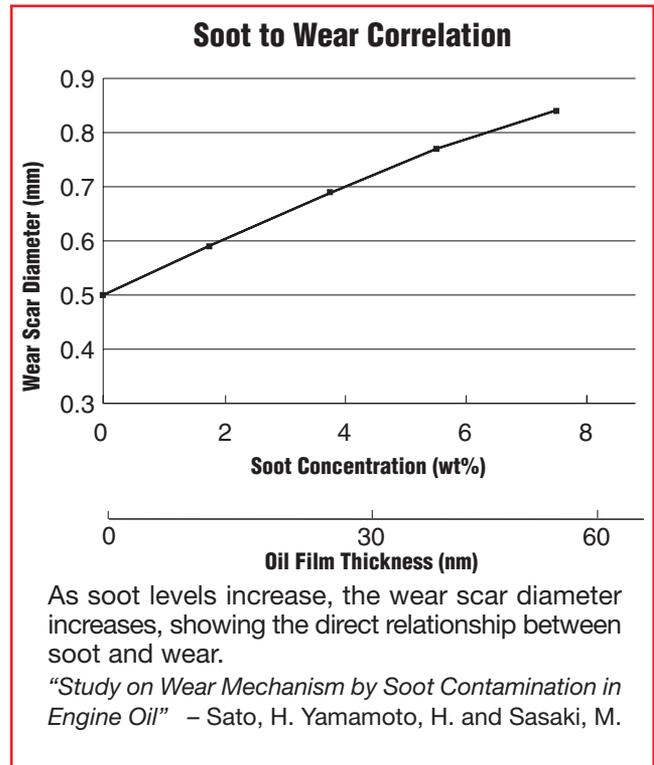
*E<sub>a</sub>*BP Filters provide higher filtering efficiency, soot removal and increased oil capacity due to superior media composition and configuration. AMSOIL *E<sub>a</sub>*BP Filters have an efficiency of 98.7 percent at two microns. At normal operating RPM the *E<sub>a</sub>*BP Filter will filter all of the oil in a typical five-quart sump in less than 10 minutes.

### Superior Construction

The superior construction of AMSOIL *E<sub>a</sub>*BP Filters provides better sealing and increased longevity along with superior corrosion resistance.

#### By-pass Filtration Benefits

- Dramatically Extended Drain Intervals
- Improved Oil Cooling
- Increased Filtration Capacity and Life
- Increased Fluid System Capacity
- Efficient Small Particle and Soot Removal
- Significantly Extended Engine Life
- Equipment Constantly Runs On Clean Oil
- Increased Engine Efficiency
- Remove Particles Less Than One Micron



### Longer Lasting

When used in conjunction with AMSOIL motor oil and an AMSOIL *E<sub>a</sub>*O or Donaldson Endurance™ Filter, *E<sub>a</sub>*BP90, *E<sub>a</sub>*BP100 and *E<sub>a</sub>*BP110 Filters should be changed every other full-flow filter change, not to exceed 60,000 miles. When used with other brands of motor oil or full-flow filters, *E<sub>a</sub>*BP Filters should be changed every other full-flow filter change. AMSOIL recommends using oil analysis when extending oil drain intervals. The *E<sub>a</sub>*BP120 should be changed every other full-flow filter change, not to exceed 90,000 miles.

### Increased Oil Capacity

The increased fluid system capacity and filtration life provides improved oil cooling and ensures that equipment constantly runs on clean oil. Engine efficiency is increased and engine life is extended significantly.

### Soot Removal

AMSOIL has designed a high-efficiency by-pass filter element that is also a soot removal device. AMSOIL *E<sub>a</sub>* By-pass Filters use a synthetic/cellulose sandwiched media. The inner layer of the element is composed of a highly efficient cellulose media covered with a full-synthetic media outer layer. These filters remove 39 percent of soot contaminants less than one micron. Soot removal efficiency can increase approximately 10 to 14 percent when *E<sub>a</sub>*BP Filters are used in conjunction with a standard full-flow filter, even higher in conjunction with *E<sub>a</sub>* Oil Filters or Donaldson Endurance™ filters.

## AMSOIL By-pass Oil Filter Units



### The Dangers of Soot

The combustion process in diesel engines creates soot. After fuel is injected, combustion occurs with soot as a by-product of the process, and the combustion particulates become trapped on the exposed oil film. The rings wipe the particulates into the oil and the fine particulates aggregate, increasing levels of soot in the oil.

Oil with dispersant additives will generally keep soot in the range of 0.002 to 0.5 microns in suspension; detergent additives prevent the build-up of sludge and act as an acid neutralizer, keeping soot in the range of 0.5 to 1.5 microns in suspension. These anti-wear additives work by providing a sacrificial chemical-to-chemical barrier. As the amount of soot suspended in the oil increases, the performance of these additives decreases.

### Soot Causes Wear

As an oil's soot dispersant additive levels increase, wear reducing additives become less effective. This creates a direct linear correlation between wear and soot concentration; the higher the concentration of soot, the higher the level of wear. Today's oil manufacturers are extending oil life by holding higher concentrations of contaminants, including soot, in suspension in the oil. They are also increasing fuel economy by reducing oil viscosity and oil film thickness, therefore reducing the critical contaminant size. This further necessitates the use of by-pass filtration, especially in diesel engines.

### Quality Construction

AMSOIL *EaBP* Filters have a marine powder-coated exterior. Their zinc-dichromate base plates increase rust protection, and are compatible with existing AMSOIL by-pass filter mounts. *EaBP* Filters have a nitrile HNBR gasket and an orange silicone anti-drain valve. The two-stage pleated and layered cellulose/full-synthetic media has an efficiency rating of 98.7 percent at two microns.

### *EaBP* Vital Statistics

AMSOIL offers four by-pass filters. All vehicles and applications that can accept AMSOIL BMK18, 21, 22, 23, 25, 26 and 27 filter mounts can use *EaBP*90, *EaBP*100 and *EaBP*110 Filters. Heavy-duty applications employing the AMSOIL BMK30 use the *EaBP*120 filter. Per AMSOIL by-pass installation instructions, AMSOIL recommends by-pass filters be mounted as close to vertical as possible. The filters, with the exception of the *EaBP*120, are equipped with an anti-drainback valve in the event they are mounted at an angle.

### Who Uses By-pass Filtration?

By-pass filtration comes standard on all heavy-duty turbo diesel engine applications from OEMs such as Cummins, Mack and many more. It has been available as standard equipment or as an option from OEMs like Caterpillar, John Deere, Case and others, but it isn't just for heavy-duty diesel operators. By-pass filtration is a valuable commodity for anyone that wants to extend drain intervals and prolong engine life. It is also beneficial to vehicles that are exposed to high levels of contaminants on a regular basis.

# AMSOIL *Ea* Filters Save Money

<b><i>Ea</i> Air</b>				
	<b>Fram</b>	<b>K&amp;N</b>	<b>AMSOIL <i>Ea</i></b>	<b>GM (OEM)</b>
Media Type	Cellulose	Wet Cotton Gauze	<b>Nanofiber</b>	Cellulose
Retail Cost	\$24.95	\$54.97	<b>\$38.10<sup>†</sup></b>	\$23.85
Number of Changes or Cleanings per Year (based on 25k/yr)	One Change	One Cleaning	<b>One Cleaning</b>	One Change
Cost for Four Years	\$99.80	\$74.92*	<b>\$38.10</b>	\$95.40
Cost Per Year	\$24.95	\$18.73	<b>\$9.53</b>	\$23.85

\*Cost of filter plus additional purchase of cleaning and oiling kits.  
<sup>†</sup>AMSOIL Dealers and Preferred Customers pay wholesale prices, saving even more.

<b><i>Ea</i> Oil</b>		
	<b>Conventional Filter</b>	<b>AMSOIL <i>Ea</i> Oil Filter</b>
Retail Cost	\$5.00	<b>\$18.30</b>
Number of Filter Changes per Year (based on 25k/yr)	8	<b>1</b>
Cost per Year	\$40.00	<b>\$18.30</b>

AMSOIL products and Dealership information are available from your local AMSOIL Dealer.

