

ENGINE SENTRY™ — TECH BULLETIN

Engine Sentry™ has a very powerful magnetic field, and must be handled with all the appropriate cautions including: persons wearing pacemakers or artificial heart valves should not handle them; they should not be placed near magnetic storage media such as credit cards, computer disks, etc. Engine Sentry™ attracts, and is

attracted to, iron. To avoid possible injury: don't allow any body parts between Engine Sentry™ and iron. Iron Horseman Technologies™, its employees, agents, and assigns are not responsible for any physical injury, damage, or any other loss or losses caused by the handling or use of its products.

INSTALLATION INSTRUCTIONS



Step 1: Hold the new Engine Sentry™ firmly between the thumb and index finger. Move Engine Sentry™ to the threaded lip of the hole in the end plate as shown in the Step 1 photo.



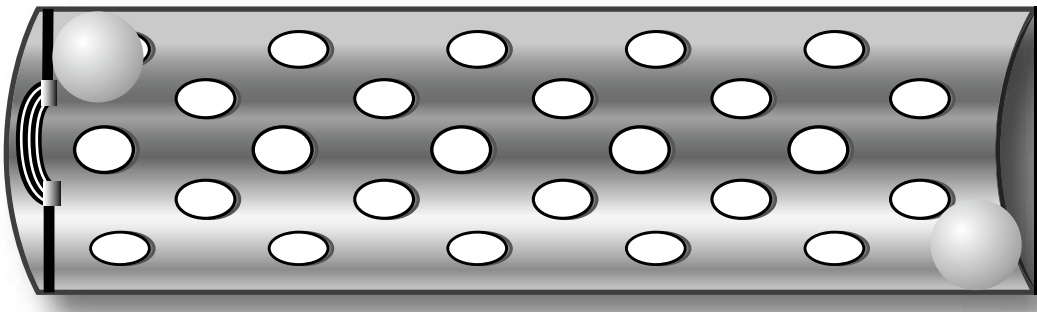
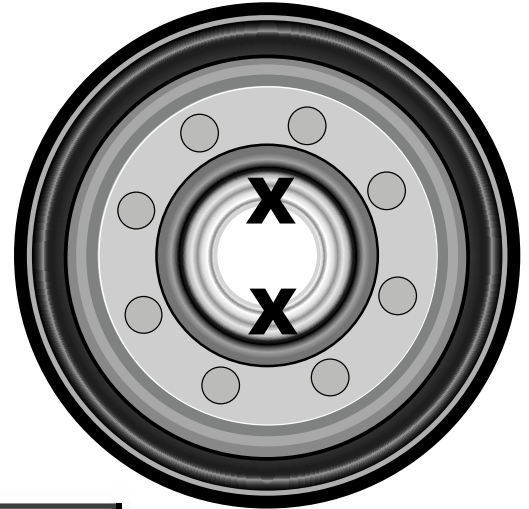
Step 2: Place Engine Sentry™ onto the lip of the threaded opening in the oil filter end plate. The Engine Sentry™ will now be sitting on the threads themselves, as shown in the Step 2 photo.

Step 3: Use the tip of a finger, a wooden pencil, a plastic pen, or a wooden dowel rod to roll the Engine Sentry™ inside the filter and onto the perforated core. It attaches itself to the core and/or end plate. It only needs to attach at one point in order to be securely held in place. The Step 3 photo shows an installed unit partially exposed in the bottom of the threaded opening. The inset in the photo is an enlargement of the installed Engine Sentry™. This placement, even when more of the Engine Sentry™ is visible, will not impede necessary oil flow back to the engine. The Engine Sentry™ may also be pushed all the way to the rear of the core, if preferred.



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Installing Two Units: Repeat steps 1–3. Suggested placement of 2nd unit is across from the 1st. Photo at right shows end-on locations marked by "X." The illustration below shows a side cutaway view of the two units placed inside the perforated core: one to the front of the core, and one to the rear.



FAST ENGINE CLEAN-OUT PROCESS

Suggested for older engines, higher mileage engines, and hi-performance engines that have already changed out their break-in oil.

1) Change your oil at the next regular interval. Use a quality oil, but it does not have to be the finest available for your vehicle. **2)** Install an Engine Sentry™ into your filter as per the instructions. **3)** Run the engine 1,000 miles and then change oil and filter again, adding a new Engine Sentry™. This time use your best quality oil. (Be sure to check out the used Engine Sentry™ from your filter — that's what has been passing right through your filter and destroying your engine.)

NOTES

- Unless you're installing Engine Sentry™ into a new engine, be sure to monitor your oil pressure closely after installation. Engine Sentry™ collects a vast amount of steel, other metals, and miscellaneous debris from older engines, and the mass of this debris could cause oil flow to the engine to become inhibited. Should this happen, change your oil, filter, and your Engine Sentry™.

- When removing Engine Sentry™ from its package, hold it firmly and keep it at least 3" away from iron. Don't drop Engine Sentry™ onto hard surfaces. Engine Sentry™ is not fragile, but it will break if it strikes a hard surface with adequate force.

- Engine Sentry™ is hydrodynamic and won't interfere with proper oil flow, springs, or by-pass valves in your disposable, spin-on, steel-core oil filter.

- Engine Sentry™ requires only one surface to be securely held inside the core of a disposable, spin-on, steel-core oil filter. If given an alternative between the threaded end plate and the steel core, Engine Sentry™ should be placed onto the core of the filter for the best results.

- Engine Sentry™ can be placed anywhere in the core. Once inside the core, Engine Sentry™ can be moved around easily using a wooden pencil, a plastic pen, or a wooden dowel rod. **Do not force** Engine Sentry™ to fit between any two parts.

- To avoid injury: Do not try to clean a used Engine Sentry™. Attempting to clean an Engine Sentry™ can cause small particles of severely contaminated metal to be lodged under the skin.

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Engine Lubrication & Wear

While today's oil filters are as efficient as possible, due to the thick viscosity of engine oils, they're not capable of filtering out smaller abrasive particles, in fact, few filters can consistently remove anything below 20 micron particles. This is so the engine gets the proper flow of oil needed for good lubricity. This leaves all these smaller abrasive particles inside your engine's oil system. These very destructive abrasive particles are constantly created as the engine is run normally. It starts during the critical break-in – and they remain continuously in the engine, constantly being re-circulated to wear down critical engine parts. The films of oil that protect moving engine parts from wear are customarily 2-5 microns in thickness. Ergo, for example, as the pistons move up and down against the cylinder walls, particles that are as much as 3-10 times thicker than the protective oil film are squeezed between the piston and cylinder wall. These particles are aggressive abrasives, and thereby cause **substantially** accelerated engine wear.

Engine Sentry™ is a specially formulated and processed, high-temperature, nickel-coated, sphere-shaped magnet that exhibits on the order of 3.5 million units of energy. It is installed manually (without tools) into any steel oil filter core in under a minute. Once installed, Engine Sentry™ immediately attracts and holds any and all steel particles that pass near it. The surface of Engine Sentry™ very quickly becomes cluttered with these small, jagged steel shavings, which creates “traps” for numerous other contaminants including sludge, salts, carbon, nickel, chromium, silver, copper, aluminum, and magnesium (see diagram on page 5).

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Benefits of Use: extended engine life; cooler engine oil temperatures; improved lubricity; improved oil filter performance; extended oil life; more usable horsepower to the drive train, improved fuel mileage.

Application: A new Engine Sentry™ is installed at each oil change.

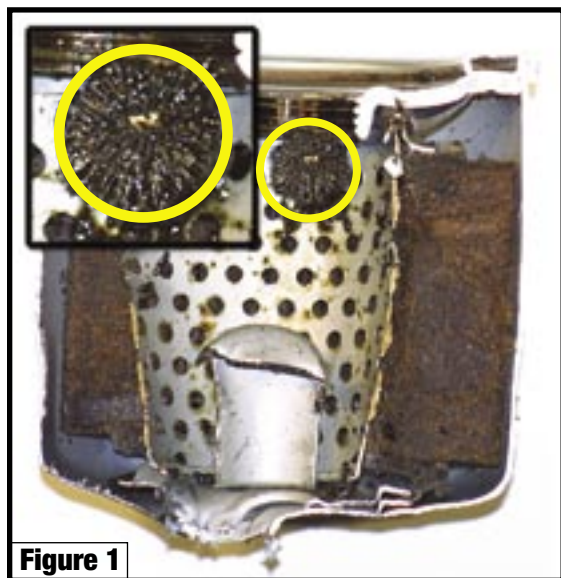


Figure 1

PHOTO LEGEND

Figure 1: Used oil filter removed from a 2001 Honda Valkyrie with 9,200 total miles. Oil used and then changed after 2,500 miles. Yellow circles indicate Engine Sentry™ location. Inset is close-up of the used Engine Sentry™. Note: minor shifting of some matter occurred during machine cutting of the used filter.

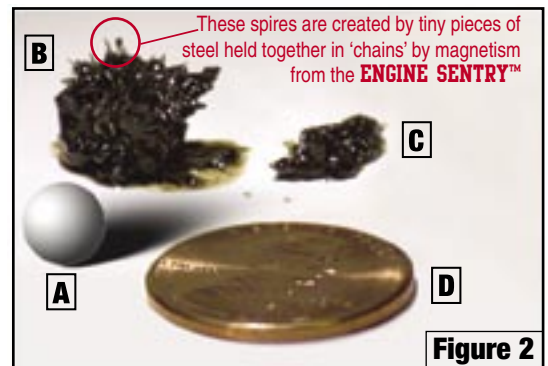
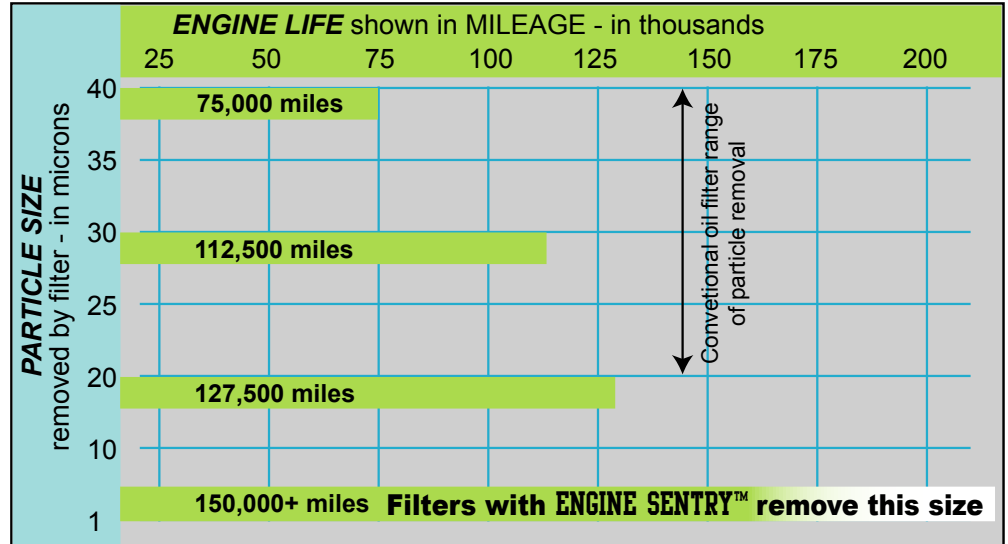


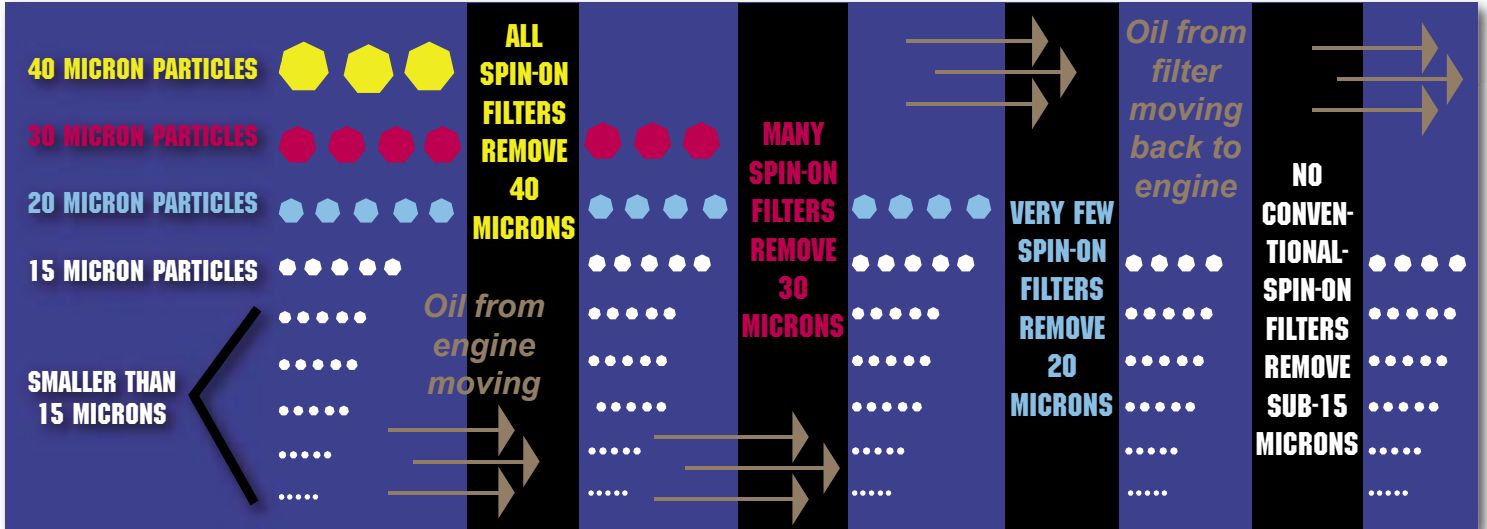
Figure 2

Figure 2: Debris removed from the filter shown in Figure 1. **A)** To scale art showing size of the Engine Sentry™ that is underneath the debris in **B.** **B)** The Engine Sentry™ with debris attached. **C)** Contaminants scraped from near the Engine Sentry™. **D)** Penny shown for scale.

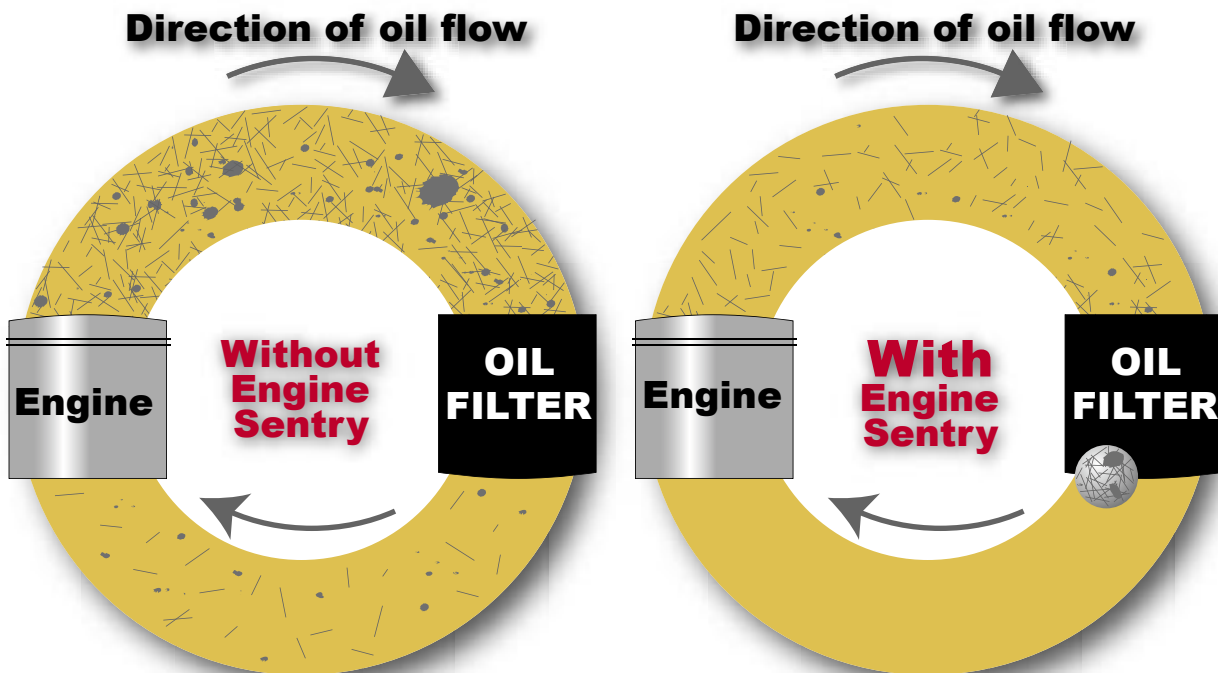
Graphed Results of Society of Automotive Engineers (SAE) Testing



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Particles of steel, other metals and debris in the 1-20 micron size range will continuously be re-circulated right through your filter and back into your engine. It is this aggressively abrasive mixture that accounts for about 60% of your engine wear. This is what **ENGINE SENTRY™** removes. In other words, **ENGINE SENTRY™** removes 60% of the reason your engine wears out. Now, how long do you think your engine will last if you insist on **ENGINE SENTRY™** at every oil change?

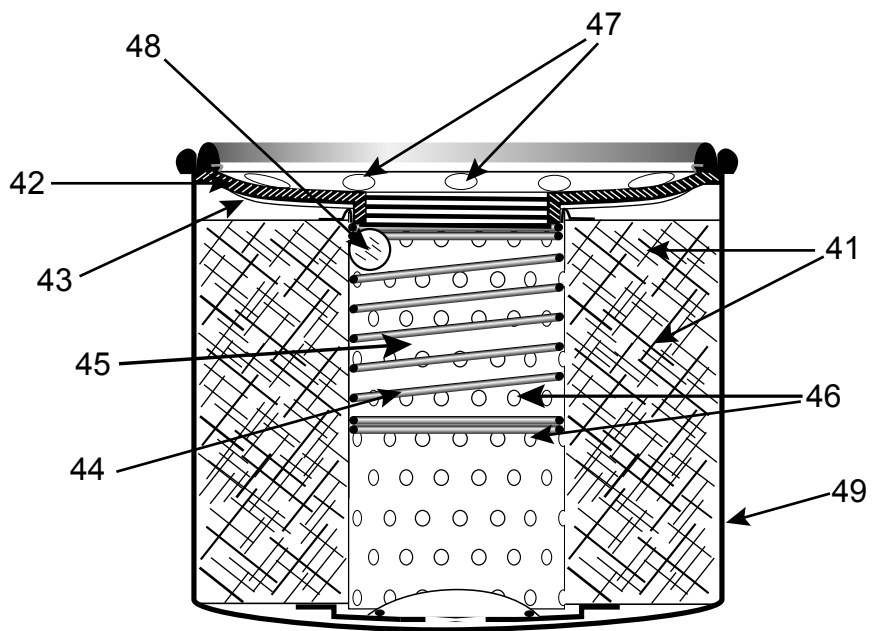


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Disposable, Spin-on Oil Filter Nomenclature

A cross sectional view of a typical disposable, spin-on oil filter configuration

- 41-Factory installed filter media
- 42-Threaded end plate (also called the "cap")
- 43-Deflector plate
- 44-Core spring for threaded end plate (optional)
- 45-Filter core
- 46-Filter core inlet holes
- 47-Threaded end plate inlet holes
- 48-One possible location for locating an Engine Sentry™
- 49-Filter Canister (also called the "can")



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RESOURCES AND TECHNICAL TESTING DATA

— Society of Automotive Engineers

The Society of Automotive Engineers (SAE) is the premiere world resource for the design, manufacturing, operation, and maintenance of automobiles, aircraft, space vehicles, off-highway equipment, trucks, buses, trains, marine craft, engines, and self-propelled vehicles. The largest automotive and aerospace standards-setting body in the world, SAE offers technical information in the form of papers, books, magazines, meetings, conferences, professional development seminars, workshops, expositions, continuing education programs, and Internet products. Excellent SAE papers on engine wear and oil filters: SAE Paper #881827; SAE Paper #881825; SAE Paper #952553. These are highly technical papers, and the SAE charges fees to purchase them.

— Mr. Kenneth E. Banister of **Lubrication for Industry**: Over one-third of ALL the energy produced in the world is consumed in overcoming friction.

— Mr. Kenneth E. Banister of **Lubrication for Industry**: Less Friction = Less Wear = Greater Fuel Economy • Also because of a very low coefficient of friction it means little or no metal is worn off parts. Which in turn means that piston rings will seal better and proportionately less combustion by-products (blow-by which also = less Exhaust Stream emissions) will get down into the oil and increase contamination and shorten the oil's service life.

— Clean Oil = Better Fuel Economy and Reduced Emissions: See *Oil Life Extension Program* (US Environmental Protection Agency)

Test DDA 6V-53T Engine Performed by AC Delco Division of General Motors (GM). **Conclusion**: Control of particles in the 3-10 micron range had the greatest affect in reducing engine wear. **Conclusion**: It was found reducing contamination from 0.016% by weight (standard oil filter) to 0.0025% with an extended filter, reduced engine wear by a factor of 14. Most significantly, friction was reduced by 2.9% when operating with clean oil. This fraction was equated to an increase in fuel economy of up to 5%. As a comparison, this significantly exceeds the 0.6 - 0.9% fuel economy gain experienced when converting from SAE 40 to multi grade lube oil. **Conclusion**: Based on the relationship between dynamic oil film and size of wear generating particles, the most important particle size range is 0-10 microns.

*When a machine is well designed and well manufactured, the causes of failure can generally be reduced to machine misapplication or contamination. And, among these two, contamination is clearly the most common and serious failure culprit. A great deal of laboratory proof and field confirmation now are available to support this **fact**.*

A. According to the bearings division of TRW, "contamination is the number one cause of bearing damage that leads to premature removal."

B. Machine Design Magazine reports that "less than 10 percent of all rolling-element bearings reach the fatigue limit because contamination usually causes wear or spalling failure far earlier."

C. According to Caterpillar, "dirt and contamination are by far the number one cause of hydraulic system failures." J. I. Case states that "one thing holds true about hydraulic systems: the systems must be kept clean -- spotlessly clean -- in order to achieve the productivity they're capable of."

D. Protractive studies by the U.S. Navy show that the cost of contamination on marine and aviation equipment per operating hour exceeds 60 percent of the cost of fuel per hour on the same equipment.

E. Massachusetts Institute of Technology states that "six to seven percent of the gross national product (\$240 Billion) is required just to repair the damage caused by mechanical wear." Wear occurs as a result of contamination.

F. Oklahoma State University reports that when fluid is maintained 10 times cleaner hydraulic pump life can be extended by 50 times.

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Types of Contaminant-Induced Failures (By: James C. Fitch, P.E.)

Of the failure types, abrasive wear, caused by solid particles, is substantially the most serious. According to the **Vickers division of Trinova/Aeroquip**, “abrasive wear accounts for about 90% of failures due to contamination.” This abrasive wear is the result of particles (too small to be seen) that cut and plow rolling and sliding surfaces.

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