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Press Release

## Assisting Fleets with Eco-Friendly Oil Filters

**ROSWELL, GA – 21 July 2008:** Green Path, a distributor of unique green and eco-friendly products, adds the microGreen™ Extended Performance Oil Filter to its line. microGreen™ filters are designed to extend oil changes up to 30,000 miles rather than the conventional 3,000-5,000 miles, saving both money and the environment.

SOMS Technologies is the developer and manufacturer of the microGreen™ oil filter, which is covered by US patents 6,605,215 and 7,048,848 and additional patents pending.

Debbie Young, President of Data Integration, Inc., which is the parent company of Green Path states “We are very excited with the addition of the microGreen™ to our eco friendly line. We now have a solution for our clients that operate fleets which will enable 65-70% of savings in oil maintenance costs while saving the environment and our natural resources.”

Miles Flamenbaum, CEO of SOMS Technologies LLC explained: “Our current focus is to expand use of the microGreen™ oil filter in the fleet market. We are excited to work with Green Path and to provide a product to their fleet clients that reduces operating costs and improves environmental efficiency.”

The microGreen™ filter is unique in that it is rare for a product to enter into the automotive market with a technological advancement that is very easy to adopt. The microGreen™ oil filter has a patented microfilter system that is contained within a conventional spin-on filter canister. Therefore, the microGreen™ filter provides 2 filters in 1, significantly improving filtration efficiency and oil cleanliness. The microGreen™ filter is in a position to leverage the demands of end-users for more convenient and less expensive maintenance, making a positive change in vehicle lubricant maintenance practices. With widespread use the microGreen™ filter will be a key component in reducing oil consumption and dependency on our natural resources, as most engine oil is a by-product of refining crude oil. The microGreen™ filter also reduces the amount of hazardous waste oil generated, protecting the environment.

### About SOMS Technologies:

SOMS Technologies LLC is based in Valhalla, NY and provides affordable engine oil filtration products that significantly reduce maintenance costs and protect the environment by eliminating hazardous waste and decreasing dependence on precious natural resources. For more information, please visit [www.microgreenfilter.com](http://www.microgreenfilter.com) and/or call 1-877-757-7667 or send an e-mail to [info@somstech.com](mailto:info@somstech.com)

### About Green Path:

Green Path is a subsidiary of Data Integration, Inc. located in Roswell, Georgia. Data Integration, Inc. is a privately held minority-owned company. Founded in 1996, they are a worldwide distributor to the Utility, Hospitality, Healthcare and Banking industries. They are also a federal contractor for the United States Army. They currently offer products and services across the globe. Green Path grew out of the current market needs from their customers to be educated on the Green movement. Customers and prospects are more and more demanding that products they purchase have initiated Green Programs. They are helping their customers take a proactive approach by promoting their efforts and executing on these initiatives.

For more information, please visit [www.di-order.com](http://www.di-order.com) and/or [www.green-path.net](http://www.green-path.net), call 1-888-323-2462 or send an E-mail to [info@green-path.net](mailto:info@green-path.net).

# Engine Oil Filters

## *Purpose of Engine Lubricating Oil and Oil Filter*

Lubricating oil is used to minimize the friction between the moving parts in an internal combustion engine. The crankshaft, bearings and rods connecting the pistons to the crankshaft, as well as the piston rings and cylinder walls, all require this protection. Engine oil also serves to dissipate heat generated by combustion and can have a detergent effect to prevent the buildup of residues and sludge. During use, friction and contact amongst the internal engine parts cause metal particles to be discharged into the engine oil. The oil is further contaminated by soot (internalization of combustion by-products) and dust not captured by the air filter. These particulates cause damage to the engine by increasing wear and friction that may ultimately cause the engine to fail.

Engine lubricating oil is necessary for all internal combustion engines. This includes 'on-road' engines such as passenger vehicles and light trucks, motorcycles, commercial and freight trucks, buses, farm equipment, construction equipment and military vehicles. Off road engines include power generators, lawn care equipment, boats, and locomotives. Even new hybrid, hydrogen or biodiesel vehicles, which use alternative fuel sources, require conventional engine lubrication.

The oil filter is used to prolong the oil life by decreasing the rate of build-up of particles within the engine, reducing wear and friction, and protecting the engine. A vast majority of oil filters for both general and industrial automotive vehicles, as well as off-road engines, are based on the 'spin-on' filter design. The conventional spin-on filter is an enclosed metal canister containing a 'full-flow' filter media - usually pleated paper, cellulose or fibrous materials - that is screwed or 'spun-on' to a connection on the engine block. The design is intended to ensure that all the engine oil passes through the filter while also enabling a fast and easy change of the filter.

## *Conventional Oil Filter Performance*

Conventional spin-on oil filters were introduced in the 1950's and current filters are based on designs and advances that have been in place since the 1970's. Since that time, incremental innovations of the pleated filter and use of synthetic or semi-synthetic filter materials have nominally improved performance. Most engine oil filters require changing to a new filter after a relatively short engine operating period. A familiar refrain is to change the oil filter and engine oil after an interval of 3,000 miles of engine use. Some manufacturers of oil filters, engine oils and vehicles claim that this operating period can be extended to 5,000. Some European luxury vehicle manufacturers claim a change interval up to 10,000 miles by using better filter materials and synthetic lubricants. It is important to note that whatever the change interval, the motor oil itself remains viable but is contaminated by particulates that have not been captured by the oil filter and which wear and damage the engine.

Conventional motor oil filters are inefficient at capturing particles below 25-40 microns. This is due to the design and structure of the 'full-flow' filter. In order to filter all the oil as it passes through the filter, the pores in the filter media cannot be too restrictive, or the oil pressure will increase and the engine will have diminished lubrication. Therefore, the pore openings allow smaller particles through which remain suspended in the oil,

resulting in engine wear and friction. These particles also loosen the fibers and binding resin of the oil filter media, further reducing the filtration capability. This vicious cycle leads to a failing oil filter and 'dirty' oil that must be removed and replaced.

## **Cost of Conventional Oil Filter Performance**

### ***Environmental Impacts***

One of the greatest costs of the short oil and filter change cycles is impact on the environment and depletion of natural resources. It is estimated that 2007 US lubricating oil sales totaled approximately 600 million gallons. Lubricating oil is derived from crude oil. Although crude oil is initially processed for fuel and other products before making lubricants, it takes 42 gallons of crude oil (1 barrel) to produce 2.5 quarts of new, high-quality lubricating oil.

Used oil and used oil filters are considered one of the highest environmental impact concerns. The EPA estimates that 'Do It Yourself' (DIY) oil changes generate in excess of 200 million gallons of used oil each year, threatening drinking water and the environment. One gallon of used oil pollutes one million gallons of water, equivalent to the water supply consumed by 50 people for one year. Additional facts provided in Appendix A-1.

It is estimated that there will be 485 million used oil filters generated in 2008, but only about half of these will be properly recycled. These filters contain residual engine oil, which is considered an environmental hazard as it can contain toxic substances such as benzene, lead, zinc, and cadmium. Disposing these filters in household waste is almost uniformly prohibited in the US due to potential hazards to drinking water. With a recycling rate around 50%, used oil filters represent a significant threat to the environment. Most states require recycling of used oil filters to reduce the overall potential environmental hazard from used oil. Used filters can be drained to reclaim and can be used to recover raw materials and provide fuel for industrial boilers. Additional facts are provided in Appendix A-2.

Although it is beneficial to recover these resources and protect the environment, it does not come without an associated cost. To achieve one ton of recycled filters, approximately 7500 used filters must be recovered. Service garages and quick-lube companies are responsible for working with recyclers and the cost of the recycling is embedded in price charged to the consumer. For private DIY oil and filter changers, state and local governments pay recycling firms around \$300 per ton for removal and processing. In California alone there are 2,600 State-certified collection centers and 70 curbside collection programs. Some States even offer financial incentives to encourage oil filter recycling.

### ***Preventative Maintenance Costs***

The cost of an oil change has been increasing and will become more expensive as the cost of engine lubricants rises. In 1999 average retail price for engine oil was \$1.38 per quart and increased to \$3.09 per quart in 2007. Most engine oil is a by-product of refining crude oil. The cost of crude oil has increased sharply over the past several years, rising from an average of \$32 per barrel in 2001 to over \$100 per barrel at current

prices and is projected to remain at elevated prices for an extended period of time. This rise in oil cost has translated into a parallel increase in cost of engine oil. Some engine oils are synthetic (non-petroleum), which typically are more expensive than conventional motor oil, although recent crude oil price increases have erased some of the disparity. In either case, the direct cost of engine maintenance is increasing. More information is provided in Appendix A-3.

**Table 1 – Estimated Direct Annual Oil Change Costs**

	DIY Cars	DIFM	Medium-Duty
Replacement Filter	\$20		\$60
Oil	\$70		\$180
Labor/Service	\$0	\$180	\$180

These estimates do not take into account the indirect cost of engine wear, which over time may require an engine overhaul or replacement. The costs also do not include the downtime and inconvenience of oil and filter maintenance, as well as fuel economy losses due to lack of operating efficiency of the engine.

### **Engine Wear**

Technical studies by the Society of Automotive Engineers (SAE) have focused on the effect of small particles in engine oil. These studies demonstrate that particles in engine oil in the 3-10 micron range contribute significantly to abrasive wear, friction and oil breakdown, as well as loss of fuel economy and engine power. The 3-10 micron range particle size is important, as they are equivalent to the typical oil film thickness that coats the surfaces of the key moving components in the engines such as the piston, piston rings, and piston shafts. Therefore, particles in that size range can get between the moving parts and cause friction and abrasion. The studies concluded that engines wear six times faster when these small particles are not removed.

### **The microGreen™ Oil Filter**



SOMS' Chief Technology Officer, Norbert Assion, developed the microGreen™ vehicle engine oil filter. The filter is based on the patented technology for the Spin-On Microfilter System™ (SOMS™), and addresses all of the needs listed above. It is a hybrid design combining two distinct filter elements within the confines of the conventional spin-on oil-filter design. The SOMS filter is based on pairing a conventional oil filter media with uniquely designed internal flows and an advanced material microfilter element, as detailed below. The standard filter media captures the larger particles in the engine oil, while the microGreen filter captures additional particles down to 2 microns in size.

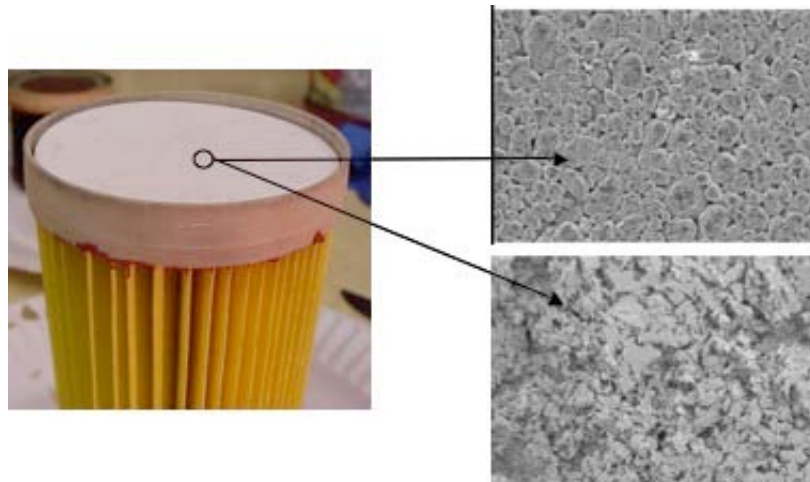
The microGreen filter is unique in that it is rare for a product to enter into the automotive market with a technological advancement that is very easy to adopt. It is similar to developments in spark plugs and radiator coolant fluid. Those products used to be

changed quite often, requiring maintenance several times per year. The conventional thinking developed around spark plugs and radiator fluid was that frequent changes were required for efficient operation. Nevertheless, end-users desired less maintenance and technology was finally developed to match their demands. Now spark plugs are changed at around 50,000 miles and radiator fluid can be used 3 years or longer. Similarly, the microGreen filter is in a position to leverage the demands of end-users and make a positive change in vehicle lubricant maintenance practices.

### ***Design and Function***

The microGreen design places a microfilter made from sintered polytetrafluoroethylene (PTFE) in a specially designed chamber on the top of the full-flow oil filter media within the filter canister housing (Figure 1). PTFE, commonly known as Teflon™, is a specialized polymeric material that is highly resistant to heat and chemicals, has an extremely low coefficient of friction, and is used as a coating on cookware, gaskets, seals, and hoses. The microfilter is seated in a special housing with an overhead spring to hold the unit in place and enable the oil flow through the microfilter. The architecture of the microfilter is a porous design having a high pore volume with 2-5 micron pore openings. This design enables the capture of large amount of these small particles without clogging the filter.

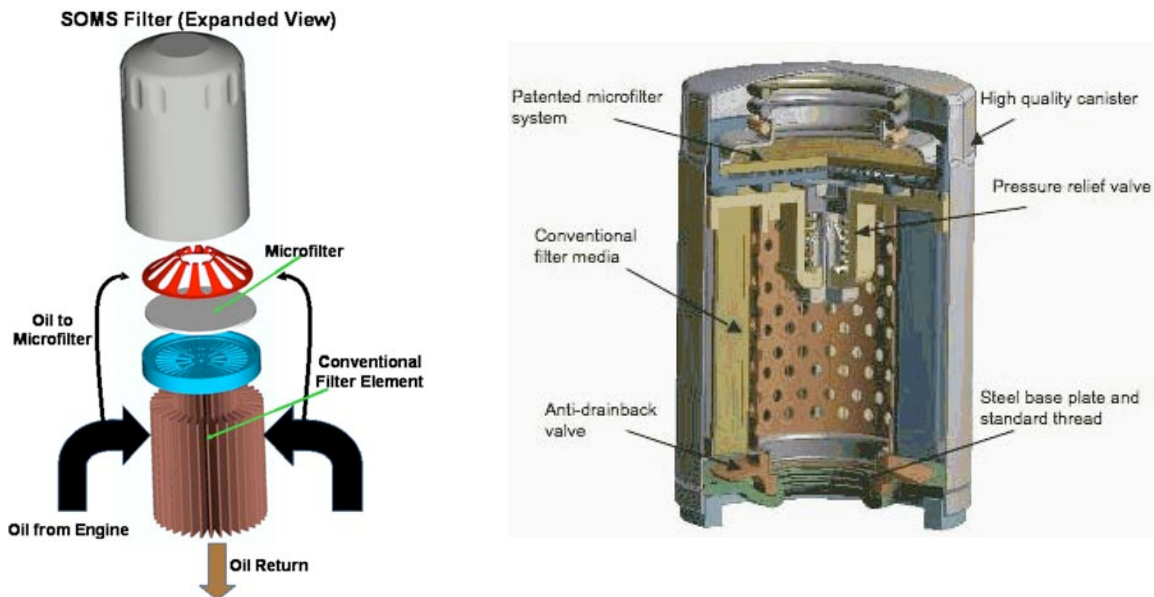
**Figure 1 – Microfilter Material**



Photomicrographs at different levels of magnification of the microfilter system used in the microGreen oil filter showing the surface of the specialized PTFE filter material.

In a conventional oil filter, oil enters the filter cartridge under pressure through a series of inlet holes in the filter base-plate. The oil flows around the exterior of the filter media and through the media towards the center of the filter. The oil collects in center of the filter and returns to the engine through the larger center drain hole in the base plate.

**Figure 2 – microGreen Filter Design and Function**



The hybrid design of the microGreen filter leverages the core conventional oil filter design (Figure 2). As the oil enters the filter cartridge, most of the oil takes its usual path through the standard filter media. However, a small portion of the oil is diverted to the top of the filter and processed through the microfilter. The microfilter is not designed to capture all of the oil in a single pass in order to avoid disruption of oil flow or adversely affect oil pressure. By continuously filtering a small portion of the engine oil the microGreen filter achieves its effect over time and accumulated mileage. Nevertheless, the mileage necessary to demonstrate effectiveness is relatively low, as improvements in oil quality and particulate count can be achieved in as little as 100 miles of driving after installing a microGreen filter.

The microGreen oil filter is unique as it replaces a conventional oil filter assembly without making or requiring any modifications to the engine or the filter housing. The microGreen filter has the same specifications as a traditional spin-on oil filter: steel base plate, standard attachment threads, standard filter sizes, internal pressure relief valve, anti-drainback valve, and high quality pleated filter media. Therefore, it is installed and removed like a conventional filter, requiring no change in installation technique. The design utilizes off-the-shelf conventional filter parts and adds a few proprietary components, requiring only a minor modification to the conventional oil filter. The microGreen filter is readily mass-produced because it represents only minor, patent-protected changes to oil filter manufacture and assembly.

### ***Installation and Use***

The use of the microGreen filter is simple and makes engine oil maintenance much easier and less expensive. When the vehicle is serviced, the oil is changed and the microGreen filter is installed. At every other oil change interval, the microGreen filter is changed but the oil remains in the engine and is simply 'topped-up' if necessary. Thus, for vehicles with a 3,000 mile oil change interval, a new microGreen filter is installed

every 6,000 miles but the oil is not changed until 24,000 miles (Table 2). For vehicles with a suggested change interval of 5,000 miles or higher, the microGreen filter is changed every 10,000 miles and the oil can be used up to 30,000 miles.

**Table 2 - microGreen Filter Change Intervals**

Current Change Interval	microGreen Filter Change	Oil is Used to:
<3,000 mi	Interval x 2	Interval x 8
3,000 – 5,000 mi	6,000mi	24,000mi
5,000+	10,000mi	30,000mi

**Operating Cost Savings**

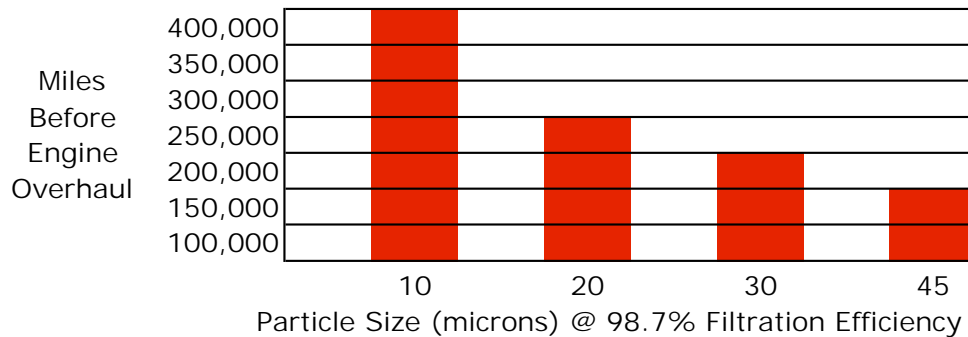
The microGreen filter improves engine maintenance by extending the use of the engine oil. Table 3 indicates the potential direct savings that can be achieved by installing the microGreen filter. They are significant based on estimated direct maintenance costs over 24,000 miles:

**Table 3 - Estimated Direct Savings Using the microGreen Filter:**

Costs	DIY Light-Duty	DIFM Light-Duty	Medium Duty
Oil & Filter Change	\$180.00	\$360.00	\$1040.00
microGreen filter	(\$59.80)	(\$109.80)	(\$236.80)
<b>ESTIMATED SAVINGS</b>	<b>\$120.20</b>	<b>\$250.20</b>	<b>\$803.20</b>
Customer ROI	2X	2.3X	3.4x

These direct savings do not take into account the decreased downtime of vehicles due to reduced maintenance time. Furthermore, engine life is directly impacted by the quality and efficiency of the oil filter. Increased capture of small particles reduces engine wear and therefore maintenance associated with wear, providing additional indirect savings potential. Figure 3 shows that by improving filtration efficiency to capture 98.7% of smaller micron size particles, the average mileage before an engine overhaul is required can be extended.

**Figure 3 – Mileage to Engine Overhaul Based on Oil Filtration Efficiency**



**Potential Additional Savings from Increased Fuel Efficiency**

Changing engine oil helps an engine to maximize fuel efficiency. Oil that is free of particles is best at reducing friction in the engine, improving engine operating efficiency and therefore fuel efficiency. This improvement can be upwards of 5%. Based on average fuel efficiency for passenger cars, light-trucks and medium-duty trucks, and

current fuel prices, even just 3% savings could be considerable (Table 4). Additional details are also provided in Appendix A-4. Fuel efficiency improvement assumptions are based on SAE papers and SOMS has not yet been able to conduct tests to independently confirm fuel savings from use of the microGreen filter.

**Table 4 - Estimated Potential Fuel Efficiency Savings**

	Passenger Car	Light Truck	Medium Duty
1%	\$26.18	\$33.49	\$47.15
3%	\$78.55	\$100.47	\$141.46
5%	\$130.91	\$167.44	\$235.76

### **Reduced Use of Oil and Filters**

The resulting environmental benefits of the microGreen filter are significant. Decreasing frequency of oil changes and filter replacements has the potential to remove a significant amount of hazardous waste from the waste stream. This can translate to taxpayer savings from more efficient and proper disposal of used oil filters (Table 5).

**Table 5 - Estimated Reduction in Use of Oil and Filters**

Vehicle	Light Duty	Medium Duty
Reduction in Use of Oil	31.5 quarts	206.5 quarts
Reduction in Use of Filters	4	4

### **Net Savings**

The microGreen filter can achieve direct oil and filter change cost savings of over 65% and reduce use of oil by 70% for an average vehicle. By analyzing the materials, labor and potential fuel savings, the benefits achievable using the microGreen filter over 24,000 miles (Table 6) for a 200 vehicle fleet may be estimated.

**Table 6 – Net Savings for a 200 Vehicle Fleet**

	Light Duty	Medium Duty
Materials & Labor	\$27,440	\$112,640
Fuel (3%)*	\$20,093	\$28,292
<b>TOTAL</b>	<b>\$47,440</b>	<b>\$140,932.00</b>
Reduced Oil Use (Qts)	6,300	41,300
Reduced Filter Use	800	800

\* Estimated potential savings based on SAE 881825 and 881827.

### **Technical Validation**

The microGreen filter has already undergone extensive testing and has completed validation. In summary, the microGreen filter has demonstrated the ability to clean soiled engine oil by removing small particulates to a level comparable to ‘virgin’ engine oil and maintain oil quality over extended periods of use.

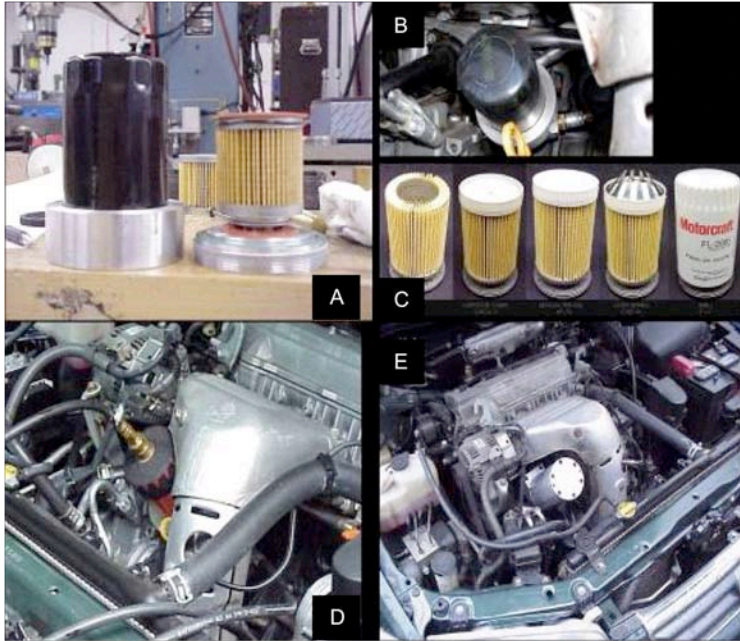
The microGreen filter includes a standard filter media that demonstrated excellent performance under standard SAE testing. To demonstrate the effectiveness of the filter beyond the SAE analysis, the microGreen filter was subjected to both laboratory testing and on-road validation. In both cases, periodic oil analysis at an independent testing laboratory was utilized to evaluate the technology’s effectiveness. In all cases, new,

clean oil was used as the reference point.

To boost its validation and catalogue expansion activities the Company has entered into a \$504,000 shared research agreement with the New York State Energy Research and Development Authority (NYSERDA). The contract with NYSERDA confirms the value and credibility of the microGreen filter and opens the way for additional relationships and customers in New York. The NYSERDA contract will enable advanced laboratory testing to further elucidate the function of the microGreen filter as well as make design improvements. The contract also provides financial support for additional on-road testing in medium and heavy-duty vehicles to be conducted with medium-duty school buses at the Shenendehowah Central School District, Saratoga County, NY and medium duty work trucks at the Town of Bethlehem, Albany County, NY. These tests were initiated in March 2008. Recent discussions with the Department of Energy (DoE) may lead to further evaluation of the microGreen filter as well as access to DoE vehicles.

The Company has also published an article regarding its filtration technology in *Practicing Oil Analysis*, a leading industry trade journal. Based on the research conducted with NYSERDA it is anticipated that additional technical papers will be produced.

### Laboratory Testing



microGreen filter validation testing: (A) Customized testing mount; (B) Mounted microGreen filter; (C) microGreen filter parts assembly; and, (D) (E) microGreen filter in use.

Laboratory testing included an assessment of both oil flow rates and oil pressure. A variety of conditions were simulated, including low engine revolutions per minute (RPM's), high RPM's and variable RPM's. The tests concluded that the microGreen filter does not impede engine performance and the flow of lubrication to the engine. The pressure gradients and flow rates are comparable to conventional oil filters. In fact, the SOMS Filter does not demonstrate any of the degradation of the standard filter media due to loosening of the fibers and binding resin from exposure to small particles.

The Company is currently working on a series of advanced analyses on the filter with Rensselaer Polytechnic Institute (RPI) that is supported by NYSERDA. RPI will employ Particle Image Velocimetry, Particle Tracking Velocimetry, and Shadowgraphy to assist in visualizing oil and particle flows within the filter and among the filter elements. Using these expensive and advanced techniques is unique in the oil filter industry. The

analysis will examine the filter operation over extended periods of use to simulate over 25,000 miles of driving. Results will enable a detailed understanding of the operation of the filter and support potential design modifications to improve the filter design.

The Company has also subjected the filters to burst pressure testing under ISO protocol SAE HS-806. This test ensures the quality and integrity of the filter canister and its resistance to leaking and splitting under extreme pressures. Burst pressure testing was conducted by the filter manufacturer and was repeated at Bonnavista Laboratories, an independent ISO 9001 certified laboratory. The results clearly exceeded the necessary tolerances and demonstrate the high quality of the filter assembly and manufacture.

Analyses have also been conducted to understand the quality of the oil film using the microGreen filter even after extended use of the lubricating oil. The oil film is the thin coating of lubrication on the surface of the moving parts within the engine. By using a 'Pin-on-Disc' test, ASTM G99, conducted at Herguth Laboratories, the lubricity and protective properties of the oil can be assessed. After analyzing new oil, oil filtered by the microGreen filter for 25,000 miles, oil filtered by the microGreen filter for 72,000 miles and oil filtered by a conventional filter.

Analyses were also conducted SouthWest Research Institute to determine the filtration efficiency of the filter. A standard ISO 4548 multi-pass test was conducted. This test is conducted over approximately 30 minutes and introduces predetermined amounts and sizes of particulates at a rapid rate into a circulated oil flow that passes through the filter. Particle counts are taken upstream and downstream of the filter. The result is a beta ratio that is a projection of filtration efficiency. The microGreen filter achieved excellent results. Nevertheless, the standard multi-pass test is not reflective of extended period of engine use and, therefore, is not reflective of the efficiency of the microfilter. The Company has developed an extended mileage test protocol based on ISO 4548 and will be using it under the shared research contract with NYSERDA.

### ***On-Road Testing***

The focus of validation activities has been on testing in actual vehicles and driving conditions. This is the most accurate reflection of the performance of the microGreen filter. This testing consists of installing the microGreen filter on various vehicles. Oil samples are taken directly from the engine and sent to Wearcheck International (Cary, NC), an independent oil analysis laboratory. Oil analysis is common for heavy-duty trucks where the cost of the test is less expensive than the cost of changing the oil. The oil is analyzed for particulate contamination, wear metals, viscosity and overall chemistry. Particulates are the leading oil quality indicator as oil cleanliness is directly related to changes in viscosity, wear metal levels, and chemical changes.

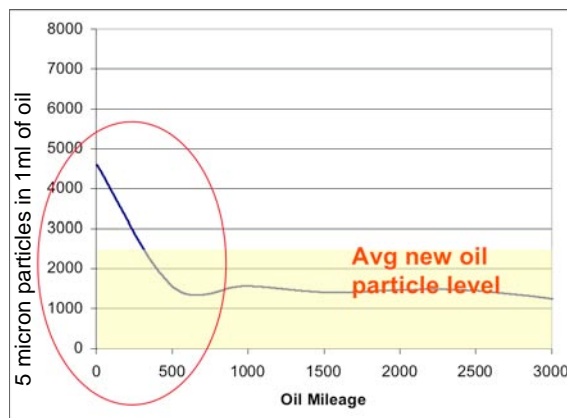
Validation under various actual driving conditions has also been performed. Firstly, using used, dirty engine oil in a passenger automobile, 14 name-brand conventional filters were tested. The assessment was designed to determine the capability of each type of filter to reduce particle count and whether the reductions could be maintained. After 40 miles of travel, the new conventional filters reduced the 5 micron particle count to an average of 10,000 particles/ml. Using an adapter, these conventional filters were complemented with the SOMS technology. After an additional 40 miles of travel, the microGreen filter actually achieved a reduction from 10,000 particles/ml to an average range under 1000 particles/ml – one order of magnitude below the conventional filter

performance. It is important to note that conventional filters lose effectiveness during use as the small particles degrade the filter. Over time, the microGreen filter demonstrates that it maintains the low level of particulates.

The microGreen filter has been installed in over 35 passenger cars and light trucks of varying ages, mileages and driving styles (with pending installations in several more vehicles). Several of these vehicles have passed 25,000 driving miles using the microGreen filter and several more vehicles will cross that threshold in the near future (Figure 4). All the cars had been using conventional engine oil filters from various manufacturers. The baseline for comparison was the particulate count in the oil at the time the microGreen filter was installed. This presented the greatest challenge to the microGreen filter as the oil was not changed when the microGreen filter was installed (Figure 4a). The vehicles continued to operate for additional intervals (Figure 4b). One car using the microGreen filter traveled over 72,000 miles without an oil change and demonstrated excellent results throughout.

### Figure 4 – Analysis of Particle Levels Using the microGreen Filter

Figure 4a



Vehicles were analyzed with used oil and oil samples were taken at end of the standard oil change interval (approx. 3,000 mi). The microGreen filter installed without an oil change. The microGreen filter was able to clean the used oil to a particle count level below that of new oil within a short amount of mileage.