FFI

MPG-CAPS™ Combustion Analysis

By Jerry Lang

Jerry Lang

Jerry Lang has more than 40 years of combustion experience and a strong background in refining processes. As the owner and operator of Jerry Lang Combustion Consulting, he is currently designing and overseeing combustion projects for four refineries, including efforts to lower emissions and improve efficiencies.

Mr. Lang has served as a combustion consultant to virtually all of the major oil companies and 95% of the refineries, including ChevronTexaco, Chevron Phillips, ARCO, Shell, Kraft, Exxon, Mobil, and Dow Chemical. At Exxon, Mr. Lang developed ways to improve efficiency by retrofitting the tankers of the company. He also served as the combustion auditor to Chevron on their Richmond Nitrous Oxide (Nox) Reduction Project, worth in excess of $300 million. In addition, Mr. Lang has completed projects in Norway and is currently contributing to an ongoing project in Qatar.

In 1967, Mr. Lang established his own business where he developed and patented several products related to combustion and incineration. He also served as Manager of Combustion Systems for Howe Baker Engineers where he helped develop ways to improve refining operations. Mr. Lang was also recruited by Dr. Edward Teller, the primary developer of the hydrogen bomb, for four years on an alternate fuels project doing combustion tests.

Mr. Lang has extensive experience designing equipment utilized in reducing emissions from stationary sources such as refineries, power plants, and industrial operations. He also contributed to the development of the equipment used during the clean up of the Alaska oil spill. Over the years he has also done work on systems to improve mileage in automobiles, such as installing a vaporizer in the exhaust to vaporize the gasoline prior to intake and working on steam injection in automobiles.

Mr. Lang holds 17 patents, including 13 combustion-related patents. Three of his patented emission reduction processes have been sold all around the world. He holds a B.S. in Mechanical Engineering.

Analysis

I became interested in the MPG-CAPS™ being marketed through FFI because of my past 40 years experience in the combustion and refining industry. One of my employees brought the product to me, and I was immediately skeptical because of my past experience with products making similar claims. I have seen and tested numerous fuel additives that claim to clean engines, increase performance, and increase fuel mileage. Many claim to lower emissions in burners. I have been a developer of combustion products for years and have patented several burner and combustion related technologies. My technologies are used extensively in the petrochemical, industrial, and commercial markets worldwide. I have personally tested several ideas with the specific intent of increasing efficiency in gasoline and diesel engines. My initial intent was to disprove the MPG-CAPS™ claims. I have emission tests and other equipment in my facility.

I was surprised when I first tested the vehicle of my employee who was using the MPG-CAPS™ and compared it to my identical vehicle without the MPG-CAPS™. I found a surprising reduction of emissions on the vehicle using the MPG-CAPS™. My employee wanted me to use the MPG-CAPS™ in my truck, but I decided to monitor my mileage and emissions to get a baseline first. After closely monitoring my mileage and emissions for about 1000 miles, I started using the MPG-CAPS™ as specified. At the conclusion of 1000 miles, my truck was getting 14% better mileage, and emissions were reduced by almost 75%. This result did get my attention, so I started an extensive research effort on the product. My conclusion based on my own testing, combusting experience, and research is that the product clearly does work and is scientifically and technically sound. The following is my explanation of the product from a combustion expert's viewpoint. I did sign a nondisclosure agreement with the manufacturer and owner of the technology in order to get information for this paper and cannot disclose any trade secrets. I will attempt to describe the product and process in a way that will help to reduce confusion and answer critics.

<u>What is it?</u>

The basic technology involves organometalic chemistry. Organometalic discoveries date back to the 1800's when an ethylene complex of platinum was prepared, and metal carbonyl, tetracarbony nickel was synthesized; however, the structure of such complexes was difficult to deduce using chemical methods of that day. With the 1950's development of NMR and single crystal x-ray diffraction, methods were then available to solve the structures of these complexes.

With the advent of computerization, a rapid growth in the study of organometallic compounds ensued. By the 1970's, organometallic compounds were being used as burn rate accelerators for solid fuel rockets. The Nobel Prize 1974 was awarded to Earnst Fisher and Geoffrey Wilkinson for their contribution to the field.

The development of these complexes for use in internal combustion engines has always been a scientific goal. As is found in any developing technology, you will find periods of success and times of less activity. The MPG-CAPS™ compound is the result of space-age continuation of a proven technology in its latest stage.

How Does it Work?

The MPG-CAPS™ compound uses the fuel (gas or diesel) as a carrier to deliver it into the engine combustion chamber where it actually does its work. The ingredients in the MPG-CAPS™ are used to treat the combustion chamber metal surfaces. A film is formed on all the surfaces. Technically, the film is thermally derived oxidation. The carboxylic metal creates an oxide residue on the hot surfaces at the time of combustion.

A simple similar example of this is the scorching of a pan when cooking. We are all familiar with how a residue from cooking will form a layer on a pan if the food is overheated. In most cooking cases, the amount of material oxidized is of sufficient quantity to form a heavy film. However, if you scrub the pan many times, the film will get so thin that all you see is discoloration with a film so thin it appears to be part of the pan impregnating the pours of the metal.

The high temperature in the cylinder of an engine combined with the small amount of material that will oxidize or carbon out produces a very thin layer very rapidly. This film coats the walls of the cylinder, the piston face, and the fire deck.

Once this film is deposited, it provides several benefits. First, it changes the surface heat absorption characteristics of metal. Note: The greatest loss in efficiency in an automobile engine is the loss of heat. Heat is energy released by the fuel, and air mixture as it burns producing a heat spike, which creates expansion used to drive the piston down. The cylinder walls and head are water cooled, and the piston is oil cooled. The film inhibits the transfer of radiant heat. This means higher combustion temperature, greater expansion, and more power. The second positive effect of the film is the provision of a surface to more evenly distribute the fuel. A polished surface tends to cause beading as a polished paint job. The micro film attracts the liquid fuel. More even fuel distribution better

shapes the charge yielding more power. The third work of the film is being a catalyst precursor to react with the catalyst component in the MPG-CAPS™. With the temperature in the cylinder and the presence of the catalyst, a catalytic reaction occurs to promote better disassociation of chemicals and better burn. The catalytic reaction is also exothermic and produces heat. The combination of all the above produces 30 to 40% more expansion in the cylinder with an equal amount of fuel.

Changes in the automotive industry in the last 15 years have increased fuel efficiency. The EPA has mandated rules to lower emissions. Fuel manufacturers have removed lead and added oxygenates to fuel. These changes have caused modern vehicles to build harmful deposits that tend to soak up the fuel and cause performance problems. The MPG-CAPS™ provide a micro-thin coating that inhibits build-up of harmful deposits.

An added benefit of using the MPG-CAPS™ is lower emissions. The catalytic process found in catalytic converters on exhaust systems is started in the firing cylinder, which reduces the formation of nitrous oxides (NO_x). The work required by the converter is reduced, and life of the converter is extended.

The film produced on the cylinder walls is a continuous process and is polished by the rings on the piston becoming a more durable surface than the original metal. Less wear will occur, and extended engine life should be the result.

In summary, I found many positive effects in using the MPG-CAPS™. I found no negative effects. Since most automobile engines burn fuel at over 99% efficiency, it is impossible to improve the combustion alone. However, by using more heat of combustion, shaping the burn, and using the catalytic process to start the reaction and disassociation of chemicals usually driven by heat, a more efficient burn is produced. A burn is produced that will provide more expansion in the cylinder, therefore requiring less fuel.

It is my opinion that the greatest positive effect is the fact that more heat produced by the combustion is being used. The extra heat causes greater expansion of gases, increasing power, and overall efficiency of the engine. Most fuel is burned to use the heat. In an automobile, the heat is basically wasted. In my past experiments and testing, I have proven heat recovery to be the only practical way to improve gas mileage on a modern engine. The process produced by the MPG-CAPS™ does use more of the heat generated, and the catalytic process produces additional heat. The use of FFI MPG-CAPS™ is a practical way to improve mileage, increase power, and extend engine life.

Jerry Lang Test Procedure

In order to eliminate variables the following procedure was used.

1. I established a baseline miles per gallon number for highway driving. I drove the 1998 Mercedes on highway trips only for 1313 miles.

2. I established a baseline miles per gallon for city or short trip driving. I drove the 1998 Mercedes in city and short trips for 1051 miles.

It was established that my baseline miles per gallon were 26.18 for highway and for city it was 18.72.

3. I conditioned the car for 1620 miles prior to testing.

4. I started my first test with a full tank of gas and drove 273 miles and recorded highway and city driving. (200 highway and 73 city). I added 10 gallons of gas at this point. I repeated this procedure three more times as shown in the chart. I then drove 261 miles as shown and filled the tank. My reason for following this procedure was to minimize the fill up errors.

During this test I drove a total of 1420 miles and used a total of 54.32 gallons of gas. That is an average of 26.14 miles per gallon. In order to compare this to my baseline mileage I used the following procedure.

980 miles of the 1420 were highway so 980 divided by 26.18, which was my baseline mileage for the highway, equals 37.43 gallons of gas. 440 miles of the 1420 were city type so 440 divided by 18.72, which was my baseline city mileage, equals 23.50. The total baseline gallons would have been 60.94 without the MPG-CAPS™. The average mileage without the MPG-CAPS™ would have been 23.30 miles per gallon.

The number 2 test was conducted in the same manner. The average miles per gallon was 23.63 but after you do the calculations you still see around 12% savings in fuel or miles per gallon.

98 Mercedes S-320 Baselines

Highway Baseline		
Route	**Miles**	**MPG**
HR-01	631	26.12
HR-02	196	26.51
HR-03	486	25.91
Total Miles	**1313**	
Hwy MPG Baseline		**26.18**

City Baseline		
Route	**Miles**	**MPG**
CR-01	467	18.64
CR-02	231	19.10
CR-03	353	18.42
Total Miles	**1051**	
City MPG Baseline		**18.72**

98 Mercedes S-320 Test-01

Test-01 Miles			
Hwy	**City**	**Combined**	**Gallons**
200	73	273	10
200	58	258	10
180	130	310	10
200	118	318	10
200	61	261	14.32
980	**440**	**1420**	**54.32**
37.43	**23.50**	**< Baseline Gallons Used**	

Total Gallons

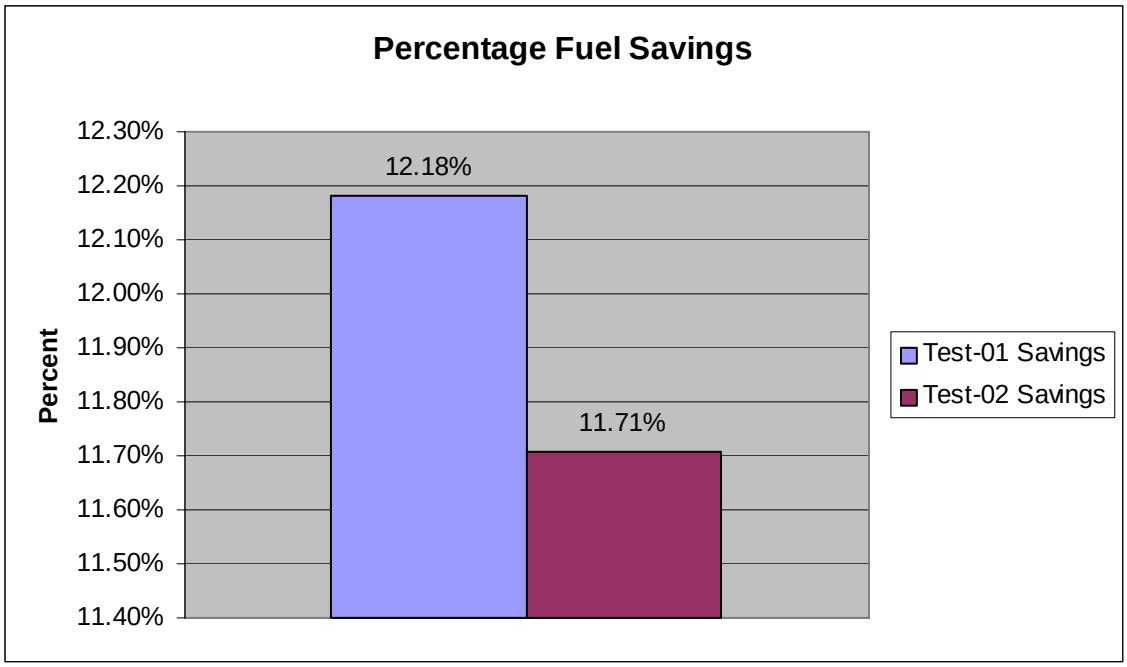
Gallon Comparison	
Without MPG-CAPS™	60.94
With MPG-CAPS™	54.32
Test-01 Savings	**12.18%**

98 Mercedes S-320 Test-02

Test-02 Miles			
Hwy	**City**	**Combined**	**Gallons**
68	212	280	10
54	186	240	10
20	210	230	10
200	64	264	10
189	111	300	15.6
531	**783**	**1314**	**55.6**
20.28	**41.83**	**< Baseline Gallons Used**	

Total Gallons

Gallon Comparison	
Without MPG-CAPS™	62.11
With MPG-CAPS™	55.60
Test-02 Savings	**11.71%**


Percentage Fuel Savings
12.30%
12.20%
12.10%
12.00%
11.90%
11.80%
11.70%
11.60%
11.50%
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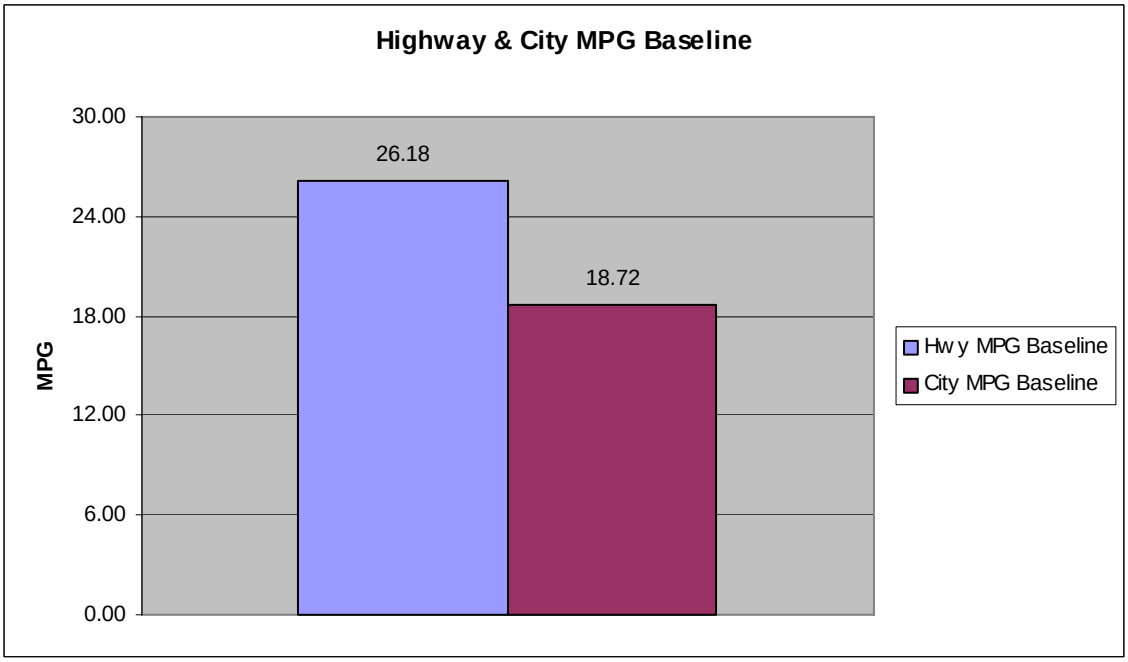
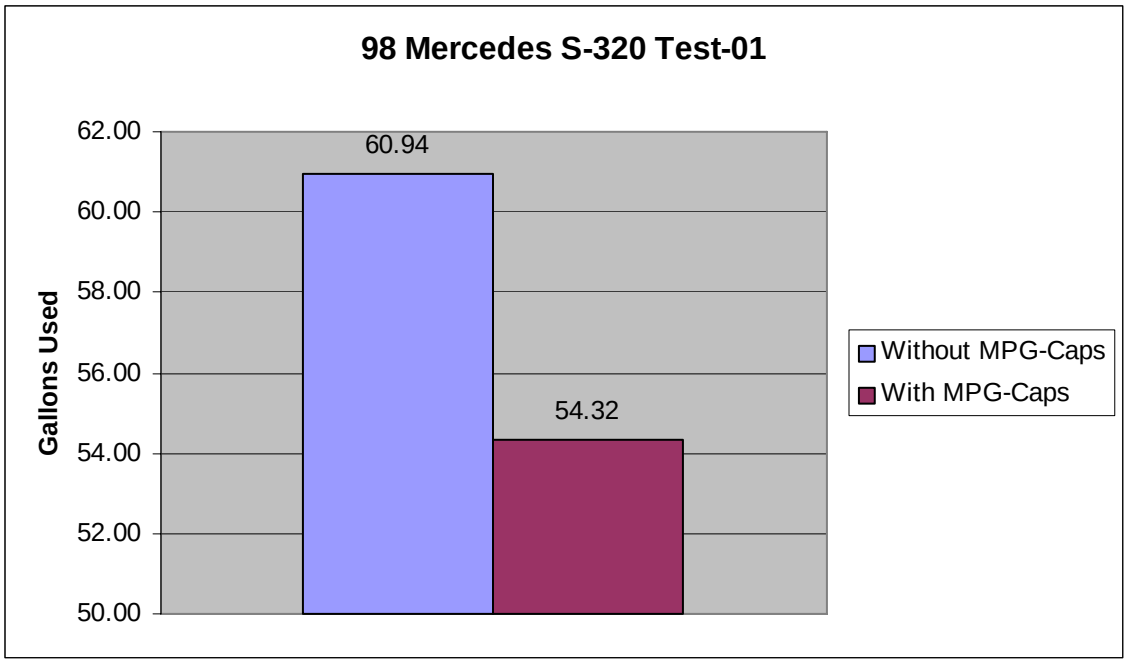
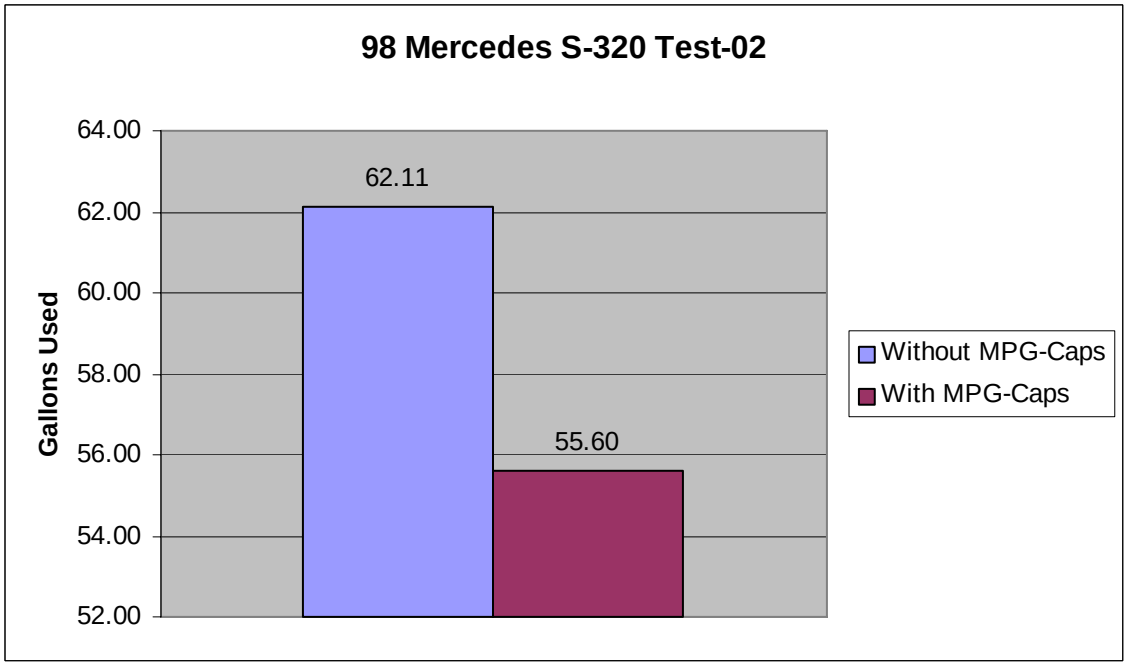
Percent
12.18%
11.71%
Test-01 Savings
Test-02 Savings


Highway & City MPG Baseline
30.00
24.00
18.00
12.00
6.00
0.00
MPG
26.18
18.72
Hwy MPG Baseline
City MPG Baseline


98 Mercedes S-320 Test-01
Gallons Used
62.00
60.00
58.00
56.00
54.00
52.00
50.00
60.94
54.32
Without MPG-Caps
With MPG-Caps


98 Mercedes S-320 Test-02
Gallons Used
64.00
62.00
60.00
58.00
56.00
54.00
52.00
62.11
55.60
Without MPG-Caps
With MPG-Caps