

# New PI Formulation Provides Unsurpassed Fuel Economy and Performance

Today's fuels vary in quality and additive treat levels from the refinery. Although a certain level of detergent additive is required by law to be formulated into gasoline, cost restrictions cause refineries to use low quality additives in the lowest additive concentration (LAC), a level insufficient to prevent deposit accumulation. Deposits accumulate on fuel injectors, intake valves and combustion chambers within just a few thousand miles, disrupting spray patterns, affecting electronic sensors and causing a multitude of problems. Fuel system deposits result in the following:

- Lost fuel economy
- Lost power and poor throttle response
- Failed emission tests
- Poor drivability - surging, hesitation, stalling, rough idle
- Engine knocking (pinging) and rap
- Difficult starts



The newly formulated AMSOIL PI Performance Improver is the most potent gasoline additive available today. As a concentrated detergent, it is unsurpassed in cleaning combustion chamber deposits, intake valve deposits and port fuel injector deposits, eliminating the need for expensive fuel injector cleaning procedures. It is ideal for use prior to emissions inspections, and it helps maintain peak engine efficiency, fuel economy, power and drivability in newer low mileage engines. In engines with accumulated deposits, testing showed AMSOIL PI provided the following clean-up benefits after only one tank of gasoline:

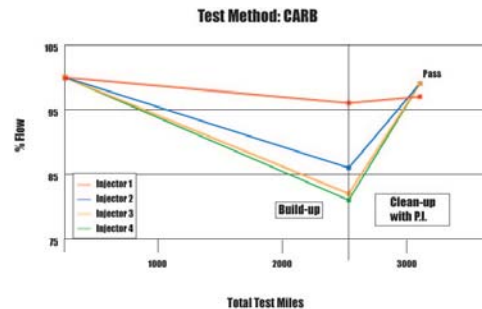
- Improves fuel mileage an average of 2.3% and up to 5.7%
- Reduced emissions
  - hydrocarbons (HC) up to 15%
  - carbon monoxide (CO) up to 26%
  - nitrous oxides (NOx) up to 17%
- Restored power and performance
- Reduced need for costly higher octane fuel
- Reduced noise from carbon rap and pre-ignition
- Better drivability
- Smoother operation

The new PI formulation offers greater potency than the old formulation and delivers extra benefits, including increased fuel economy improvements, improved intake valve and combustion chamber cleaning and lower emissions. Because it is recommended every 4,000 miles, rather than with every tank of gas, the new PI formulation is also more convenient to use. Its new smaller neck makes it easier to pour into the tank, and because the flip top has been eliminated, leakage is minimized.

## Unsurpassed Deposit Clean-Up

Port fuel injector deposits form after the engine has been shut down and there is no gasoline flowing through the

injectors. During this "hot soak" period the injectors heat up and the gasoline remaining in the injectors degrades and forms deposits. This can happen very quickly with the use of poor quality gasoline and short trip driving. Because the clearances within the injectors are extremely tight and injectors must deliver precise amounts of "atomized" fuel, even small amounts of deposits can cause injectors to malfunction. Fuel flow is reduced and spray patterns are disrupted, decreasing engine efficiency, power and fuel economy, while increasing exhaust emissions.



Two of the four dirty injectors tested were fouled >15% and another was fouled >10%. After one tank of operation on AMSOIL PI, all injectors returned to >95% flow.

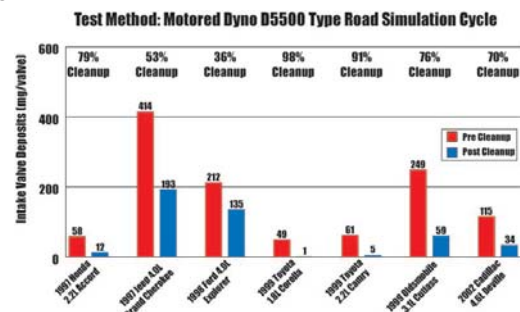


Injector spray pattern before PI treatment.



Injector spray pattern after PI treatment.

Intake valve deposits form on the intake side or back side of the valves. As deposits increase, they restrict airflow and alter airflow patterns in the cylinder. The deposits disrupt the balanced air/fuel ratio by momentarily absorbing and releasing fuel, and they can cause valve sticking by getting in the way of the valve stem and guide. Deposits also restrict proper seating, and the valves may be burned. Intake valve deposits cause lost engine power, increased emissions, poor engine efficiency and potential valve failure.



AMSOIL PI averaged 72% intake valve deposit cleanup across a wide range of engine types and sizes, with two cars cleaning up greater than 90%.

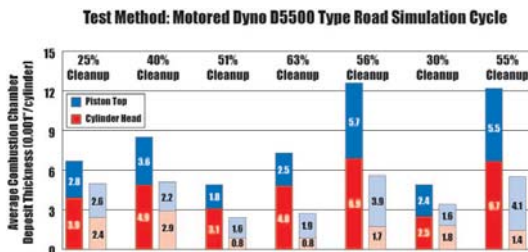


Intake valve before PI treatment.



Intake valve after PI treatment.

Combustion chamber deposits form on the top of the pistons and on the cylinder heads. They increase compression and absorb heat during combustion to later release it during the intake cycle. In some engines with tight squish domes, combustion chamber deposits cause the piston to hit the cylinder head. This is referred to as combustion chamber deposit interference or "carbon rap." Combustion chamber deposits also flake off as they get large, and these flakes can get trapped between the valves and valve seat, resulting in compression loss, difficult starting and rough idle.



AMSOIL PI averaged 46% combustion chamber deposit cleanup across a wide range of engine types and sizes, with four cars cleaning up greater than 50%.



Combustion chamber before PI treatment.

Combustion chamber after PI treatment.



Piston before PI treatment.

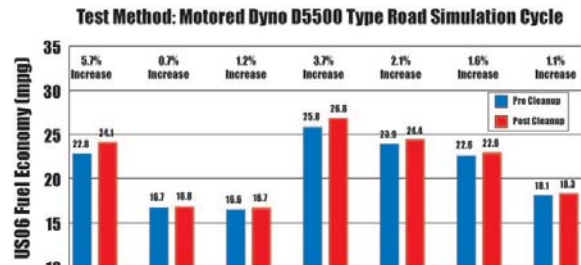
Piston after PI treatment.

Higher compression and stored heat cause increased intake fresh charge temperatures and the increased likelihood of pre-ignition "knock" or "pinging" when the fuel spontaneously combusts prior to spark ignition. This increases emissions and may cause engine damage. Many of today's cars have "knock" sensors that adjust spark timing to prevent knock. Although audible knock is controlled, power is lost from retarded timing. Higher octane fuels of 4-5 octane

numbers can be used to help prevent knock, an effect called "octane requirement increase." As a vehicle ages, more expensive higher octane fuel is needed to keep it operating at peak performance. By cleaning combustion chamber deposits, knock is controlled, power is restored, fuel economy increases and higher octane fuels are less necessary for peak performance.

### Maximum Fuel Economy

AMSOIL PI maximizes fuel efficiency by dissolving and removing fuel system deposits and other contaminants for improved power and overall performance.



AMSOIL PI provided an average fuel efficiency increase of 2.3%, with one car showing improved fuel efficiency of 5.7%.

Although the new PI formulation costs slightly more per bottle than the old formulation, its more powerful potency saves money in the long run. For example, in a vehicle with a 20-gallon tank receiving 20 miles per gallon, the new PI costs 15% less over the course of 4,000 miles. The old PI formulation treated fuel at a rate of one oz. per 10 gallons of gasoline. A vehicle receiving 20 mpg consumes 200 gallons of gas and 20 ounces of the old PI over 4,000 miles, equating to a \$9.81 suggested retail cost for the 20 ounces of PI necessary for 4,000 miles (\$7.85 suggested retail per 16-oz. bottle when purchased by the case). Similarly, only one 12-oz. bottle of new PI is recommended per 4,000 miles of driving, equating to a suggested retail cost of \$8.60 when purchased by the case. Additionally, old PI required an initial clean-up dose of six ounces per 10 gallons of gas, further increasing its cost. Owners of vehicles receiving less than 20 mpg save even more by using the new PI formulation.

### PI Product Improvements

- Unsurpassed combustion chamber clean-up
- Increased fuel economy improvement
- More powerful cleaning agents for better overall performance

### New Recommendations

Treat one full tank of gas every 4,000 miles or 100 hours of service. One bottle treats 20 gallons of gas. Do not treat and run more than 40 gallons of gas per treatment. PI helps pass emissions tests. Treat gas, run that tank and fill up again prior to test. Safe for use with catalytic converters, oxygen sensors, oxygenated gas and 10% ethanol blended gas. Ideally, PI should be poured into the tank prior to filling it up with gas, but it will mix thoroughly when added after fill-up through normal agitation from driving.