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DATA BULLETIN

P.i. Performance Improver Concentrate

AMSOIL P.i. improved fuel economy by reducing fuel injector deposits, intake valve deposits and combustion chamber deposits in 100% of the vehicles tested. It is formulated for both gasoline direct injected (GDI) and port fuel injected engines.

Untreated Fuel Leads to Poor Engine Performance

A vehicle demonstrates its best efficiency and engine performance when it is new. As the engine ages, its performance suffers from gasoline-generated deposits that form on the fuel injectors, intake valves and combustion chamber. Additives are required to control deposit formation. Today's fuels, however, lack sufficient treatments of either enough additives or high-quality additives.

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

Treated Fuel Delivers Maximum Performance

AMSOIL P.i. ranks among the most potent gasoline additives. As a concentrated detergent, it is highly effective in cleaning combustion chamber deposits, intake valve deposits, port fuel injector deposits and gasoline direct injector deposits. AMSOIL P.i. helps maintain peak engine efficiency, fuel economy, power and drivability in newer low-mileage engines. In engines with accumulated deposits, testing shows AMSOIL P.i. provided the following clean-up benefits after only one tank of gasoline:

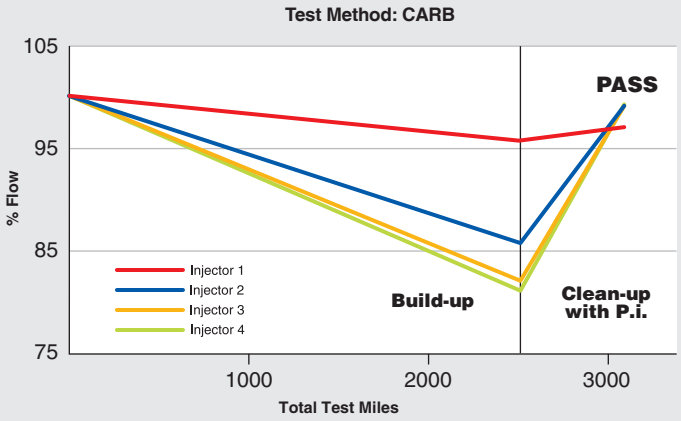
- Improved fuel mileage an average of 2.3% and up to 5.7%
- Reduced emissions
  - hydrocarbons (HC) up to 15%
  - carbon monoxide (CO) up to 26%
  - nitrous oxides (NOx) up to 17%
- Restored GDI injector flow to 99.1%
- Restored power and performance
- Reduced need for costly higher-octane fuel
- Reduced noise from carbon rap and pre-ignition
- Better drivability
- Smoother operation

AMSOIL P.i. works as an "emissions passer." It is ideal for use prior to emissions inspections.

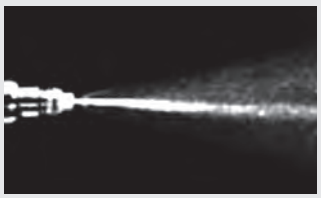
Maximum Deposit Clean-up



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. Being located in the combustion chamber, GDI injectors are also subjected to intense heat and pressure, making them even more susceptible to deposits. 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 P.i., all injectors returned to >95% flow.



Injector spray pattern before P.i. treatment.



Injector spray pattern after P.i. 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.

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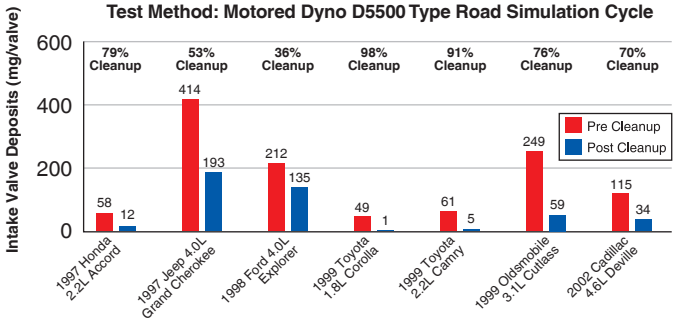
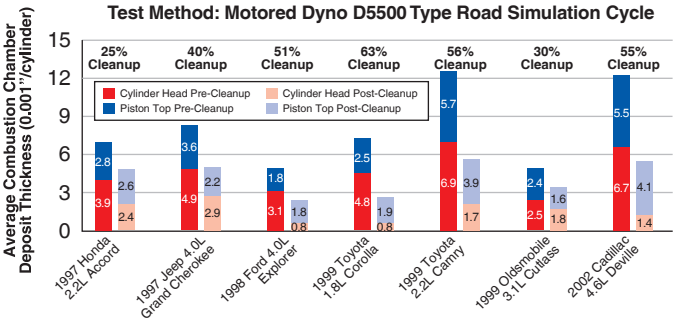


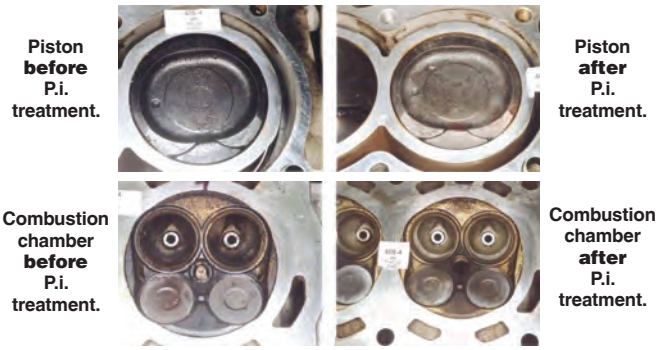
AMSOIL P.i. averaged 72% intake valve deposit cleanup across a wide range of engine types and sizes, with two cars cleaning up greater than 90%.

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

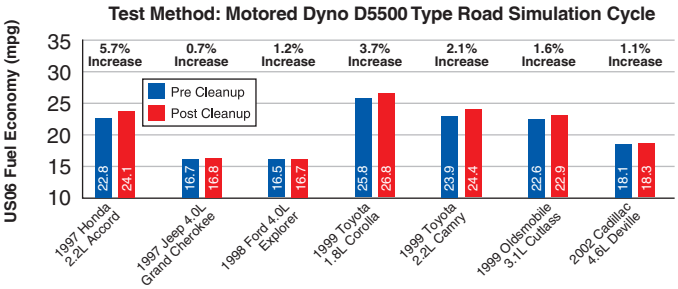
Higher compression and stored heat cause increased intake fresh charge temperatures and the increased likelihood of pre-ignition "knock" or "pinging" when the fuel spontaneously combusts prior to spark ignition. This increases emissions and may cause engine damage. Many of today's cars have "knock" sensors 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 P.i. maximizes fuel efficiency by dissolving and removing fuel system deposits and other contaminants for improved power and overall performance.



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

RECOMMENDATIONS

Treat one full tank of gas up to 20 gallons with one bottle of P.i. For very large gas tanks, partially fill to 40 gallons and treat with two bottles of P.i. Using more than two bottles per treatment is not recommended. Treat gas every 4,000 miles of service (or 100 hours for marine, stationary and off-road gasoline-powered engines). P.i. helps pass emission tests by running one tank of treated fuel through the engine prior to testing. Safe for use with catalytic converters, oxygen sensors, oxygenated gas and 10 percent ethanol blended gas. Not recommended for two-cycle engines.

DANGER: Combustible. Harmful or fatal if swallowed. Harmful if inhaled. Skin and eye irritant. Read precautions on container before use.

AMSOIL PRODUCT WARRANTY

AMSOIL products are backed by a Limited Liability Warranty. For complete information visit www.amsoil.com/warranty.aspx.

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