

**RED LINE**

**SI-1**

**COMPLETE  
FUEL SYSTEM  
CLEANER**

**TECHNICAL  
MANUAL**

**RED LINE SI-1™ INJECTOR & VALVE DETERGENT** contains the most powerful high-temperature detergent available to clean gasoline fuel injectors, carburetors, and intake valves. SI-1 can clean injectors to nearly 100% efficiency with one application and SI-1 will typically provide a 90-99% reduction in intake valve deposits compared to detergent unleaded gasoline, improving performance and fuel economy considerably. Clean air regulations and the change from leaded fuel to unleaded has left refiners short of adequate octane capacity, which forces them to use cracking and oxygenates such as alcohols and MTBE (methyl tertiary butyl ether) to supplement octane. This has created a tremendous problem of coking of fuel injector tips and intake valve deposits which can cause problems within 1000 miles of driving. Alcohol-containing fuels have been demonstrated to cause between 3 to 5 times more deposits on valves than fuels without such oxygenates. Modern electronic engine technology has enabled auto manufacturers to provide performance while meeting emissions requirements by using computers which keep the engine operating at the lean limit of combustion. Unfortunately, fast burn/lean burn engines are much less tolerant of deposits than were older engines which operated at richer mixtures. Intake valve or fuel injector deposits can alter the air/fuel mixture in individual cylinders, causing a lean misfire. Since the electronic sensors sense an average signal in the exhaust, this causes a further leaning to the point of significant hesitation and stumbling, especially while accelerating. Many refiners are not willing to treat all their fuel with high temperature detergents to clean dirty injectors, but instead use larger doses of less costly carburetor detergents, which can partially clean simple cases, but the poor stability of these detergents cause another, equally serious problem - they break down and form deposits on valves, causing a restriction of intake air and poor driveability. Many other fuel additives try to achieve cleanup using solvents which can clean in a very concentrated form, but provide very little effectiveness when diluted in a fuel tank. Solvents have the potential drawback of causing swelling and degradation of seals and hoses in the fuel system. Red Line SI-1 uses surface active chemistry which cleans effectively and safely.

**SUMMARY**

- Cleans injectors and carbs to like-new efficiency
- Prevents fuel system rust
- Cleans intake valve deposits
- Lubricates upper cylinder and valves
- Reduces pre-ignition and run-on
- Cleans emission control systems
- Stabilizes gasoline and prevents carburetor icing
- Safe for all gasoline vehicles

**CLEANS INJECTORS AND CARBURETORS**

Powerful thermally-stable detergents contained in Red Line SI-1 are capable of cleaning fuel injectors and carburetors to nearly 100% efficiency. Red Line's detergents are so concentrated that this degree of cleanliness can be achieved with one treatment. Figure 1 shows the cleaning ability of SI-1's high temperature detergents. Injector plugging problems can be manifest as sluggishness, hesitation, poor idling, and poor fuel economy. Use SI-1 instead of taking the car in for a shop injector cleanup. SI-1 is just as effective as pressurized solvent treatments at a fraction of the cost and trouble. Red Line SI-1 is also very effective at cleaning carburetor deposits which can cause poor performance and run-on.

**SI-1 INJECTOR CLEANUP**

**AVERAGE 98.5% CLEAN**

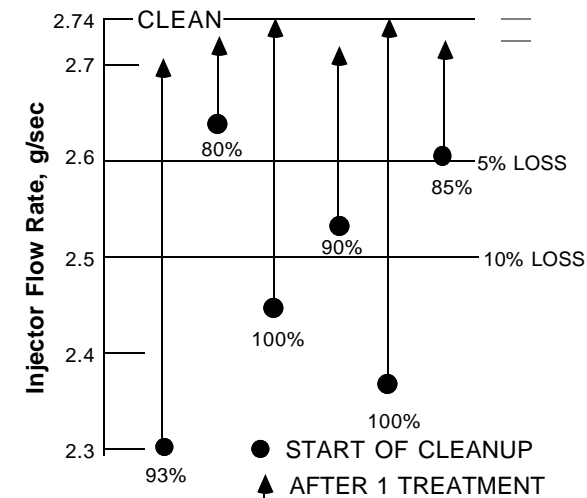


Figure 1: The use of one 15 oz. of SI-1 can clean fuel injectors to nearly 100% efficiency. GM 3.8L V-6.

**IMPROVES PERFORMANCE AND FUEL ECONOMY**

Fouled injector tips can provide poor fuel spray patterns, causing incomplete combustion which results in poor performance and fuel economy. Modern micro-processor-controlled feedback systems compound the problem by sensing an average rich condition, leaning out all cylinders to the point of lean misfire. Figure 2 shows how cleaning the fuel injectors in a 3.8L V-6 with Red Line SI-1 restored fuel economy - an increase of 19%. Regular use of SI-1 will keep optimum fuel economy and performance. Figure 2 shows how rapidly deposits can form and how Red Line SI-1 effectively cleans up deposits on fuel injectors, restoring performance, fuel economy, and emissions compliance. Figure 3 shows the significant effect fuel injector

**SI-1 Fuel Economy Improvement**

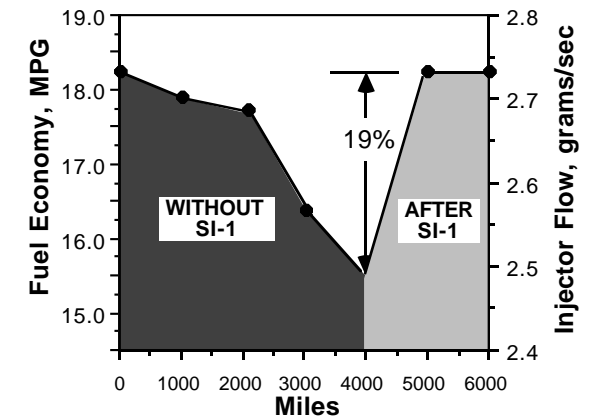


Figure 2: The deterioration of fuel economy and injector flow with subsequent restoration using one bottle of SI-1.

**Fuel Injector Deposits Reduce Wide Open Throttle Acceleration**

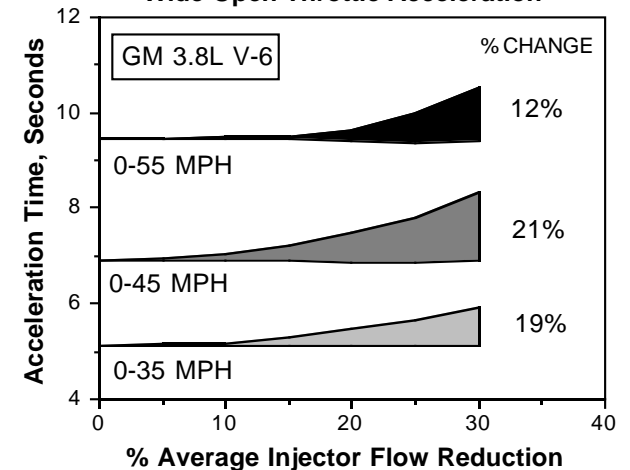


Figure 3: By reducing injector plugging, SI-1 can improve acceleration times as much as 20%.

deposits have on acceleration. Unequal plugging is indicated by the upper line of each set and the lower line indicates the effects if injectors are equally plugged. In a GM 3.8L V-6, 0 to 45 MPH acceleration times can increase by as much as 21% and fuel economy can be reduced as much as 20% when injectors become unequally plugged. Red Line SI-1 rapidly cleans these plugged injectors to like-new condition, restoring the power of the engine and eliminating hesitation and stumbling. SI-1 works equally well on the deposits created in higher temperature turbocharged engines.

### ENTIRE INTAKE SYSTEM CLEANLINESS

Unstable hydrocarbon mixtures present in today's fuels along with detergent additives added to gasoline by many refiners in order to claim the ability to clean fuel injectors has created an entirely new problem - intake system deposits. These fuel components and additives decompose readily at the higher temperatures of the intake valves. This results in sticky deposits which restrict the intake air and cause fuel to condense on their surface, making the mixture too lean to provide proper acceleration. Red Line SI-1 not only prevents these deposits, but the synthetic oils and detergents can actually wash these deposits away. Figure 4 shows a set of valves which have used low levels of SI-1 (15 oz/100 gal) on a regular basis compared to a set of valves from an engine operated on detergent unleaded. Figure 5 shows how intake deposits can significantly reduce power and performance in modern engines.

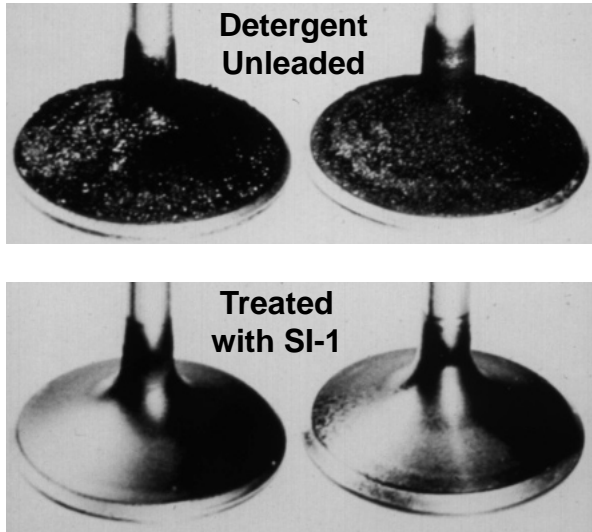


Figure 4

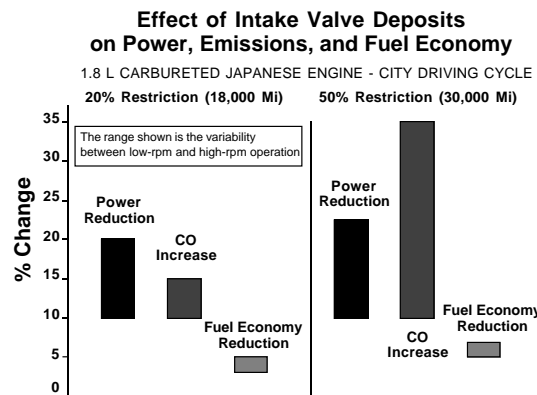


Figure 5

### CLEANS INTAKE VALVES

Red Line SI-1 is effective in a wide variety of fuels and engines. Figure 6 shows the reduction in intake valve deposits evaluated in many different engines, including turbocharged engines which see much higher intake temperatures. Figure 7 demonstrates how the detergents and synthetic oils in Red Line SI-1 can wash away existing intake valve deposits when used on a regular basis. This will allow the engine to breathe better, restoring power and eliminating hesitation.

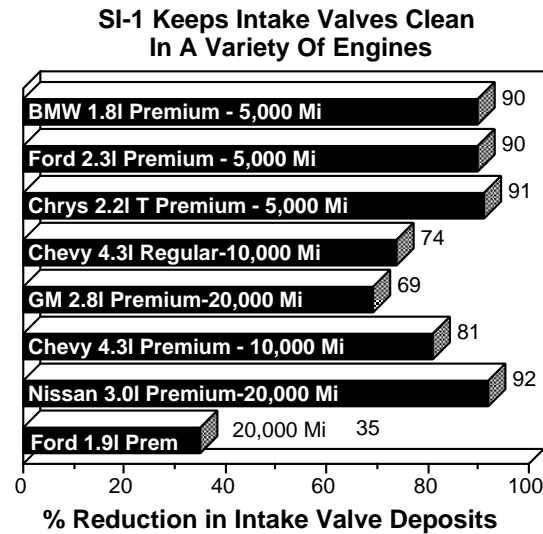


Figure 6: Demonstrates the effectiveness of SI-1 to provide intake valve cleanliness in a variety of engines.

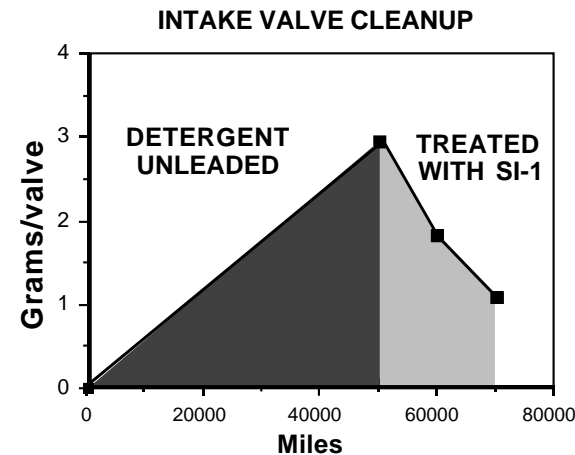


Figure 7: Shows the ability of SI-1 to cleanup existing deposits on intake valves.

### CLEANS EMISSION CONTROLS

Dirty injectors and carburetors can cause significantly greater exhaust emissions than allowed by state and federal requirements. Red Line SI-1 can help reduce these emissions by cleaning the carburetor, injectors and the emission control system. The graph below demonstrates the ability of Red Line SI-1 to reduce hydrocarbon emissions in a GM 3.8L V-6. Carbon Monoxide emissions experienced a similar reduction. Oxides of nitrogen were also reduced, but to a lesser extent. The detergents used survive the combustion process and clean the PCV valve and the EGR port as well as cleaning deposits in the combustion chamber.

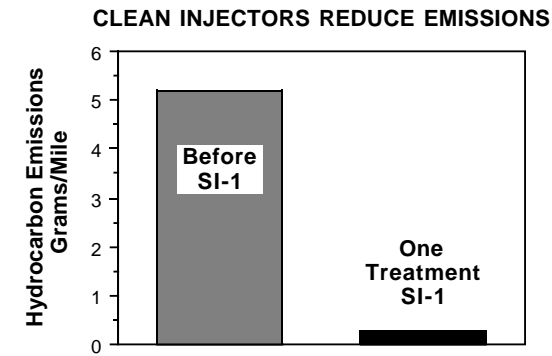
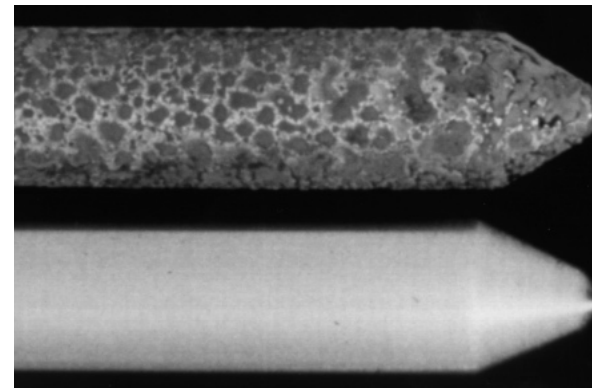


Figure 7: SI-1 can help reduce air pollutants by cleaning the intake system and emission control devices.

### PREVENTS RUST

The major problem with water in fuel is the rusting of the fuel system which will occur. Even the slightest rust on the injection metering valves can require a new metering system or injectors. Red Line SI-1 will disperse small amounts of water such as condensation water into the fuel. The rust inhibitors contained in SI-1 will prevent rust even in the presence of large amounts of water as demonstrated in Figure 8, a 24 hour rust test compared with untreated gasoline.



### USE DIRECTIONS

Initially use one bottle to a fuel tank and fill with fuel to achieve rapid cleanup. The treatment can be reduced on subsequent fillups to 1/3-1/6 oz per gallon (one bottle to 50-100 gallons) to provide continual injector and valve cleanliness. The detergents and antioxidants help prevent the formation of gum and varnish in gasoline, and the rust inhibitors prevent corrosion. Red Line SI-1 will not damage fuel system components and the combustion by-products do not cause corrosion of engine bearings as can many fuel additives. Red Line SI-1 is available in 15 ounce bottles, 5 gallon pails, and 55 gallon drums. Similar chemistry is available in a 6 ounce, less concentrated version called SI-2 Injector & Valve Detergent.

### DESIGNED FOR PERFORMANCE

Red Line Synthetic Oil Corporation is the leader in lubricant and fuel system chemistry. Red Line sets the standards for equipment durability and increased performance. Red Line manufactures a full line of automotive products which are designed to provide noticeable improvements in performance. Other Red Line products are:

- WaterWetter® SuperCoolant
- Diesel Fuel Catalyst
- 85 Plus Diesel Fuel Additive - with Cetane Booster
- Fuel System Antifreeze and Water Remover
- Lead Substitute
- SI-2 Injector & Valve Detergent
- Motor Oils - 5W20, 5W30, 10W30, 5W40, 10W40, 15W50, 20W50
- Diesel Engine Oil -15W40
- Race Oils - SAE 5, 10, 20, 30, 40, 50, 60, 70
- High-Performance Two-cycle Lubricants
- Gear Oils - LightWeight, 75W90, 75W140
- 75W90NS, 75W140NS, 80W140, ShockProof™
- MTL- Manual Transmission/Transaxle Lube, MT-90
- ATF - Synthetic Dexron II / Mercon , Racing ATF
- D4 ATF, C+ ATF for Chrysler/Jeep, High-Temp ATF
- CV-2 CV-Joint and Wheel Bearing Grease
- Assembly Lube
- Synthetic Compressor Lubricants

For further information please contact: