



## PRODUCT INFORMATION SHEET

### WYNN'S SPITFIRE DIESEL FUEL TREATMENT

Product Number: 35301 24 x 350 ml

WYNN'S SPITFIRE DIESEL FUEL TREATMENT is a premium diesel fuel injector cleaner that provides additional benefits and unique features for light-duty and heavy duty diesel engines

Wynn's Spitfire Diesel Fuel Treatment also is formulated to reduce exhaust emissions, to improve fuel economy and power, and to provide low sulphur diesel fuel lubricity.

#### Introduction

In order for a vehicle to perform at its optimal capacity, it is essential that fuel system parts remain clean and free of build-up. This is of particular importance in diesel engines where the deposits on intake valves, port fuel injector and combustion chamber are likely to accumulate rapidly. Such build-ups directly affect the power output, the fuel consumption, the emissions and the general performance of the vehicle. While it is important to introduce a 'clean' fuel to the vehicle, it is also necessary to condition the injector system to ensure that cleanliness is maintained. The introduction of a diesel fuel treatment has a dual purpose: It will help remove deposits already in existence and it will protect the fuel system against future build-up and consequent problems.

There are clear and measurable advantages to incorporating a multifunctional diesel fuel additive into diesel fuel. The end user of the treated fuel will appreciate the difference in terms of improved drivability, reduced combustion noise, more efficient fuel consumption, longer component life and reduced operation costs. With this in mind Wynn's has developed a diesel fuel treatment which helps remove injector deposits to restore the optimum performance of the vehicle. Engine test data as well as field test results give a clear indication as to the suitability of this product for improving the overall performance of vehicles running on diesel fuel.

#### Advantages

Wynn's Spitfire Diesel Fuel Treatment offers a large number of performance benefits. The additive technology has been extensively tested giving outstanding results.

The Cummins L10 Depositing Test is a very good indicator of the ability of a product to provide injector cleanliness.

Cummins had a fuel problem that occurred in some fleets. Certain engines developed injector deposits that led to a noticeable decrease in power. Cummins analysed the driving patterns of the effected fleets and a laboratory test method was developed to simulate these deposits. The test can be used to discriminate fuel/fuel additive quality. (Reference SAE paper No. 912331).

The addition of Wynn's Spitfire Diesel Fuel Treatment to a variety of fuels, resulted in outstanding performance in the Cummins L10 test, which is based on CRC piston and ring rating system as described in CRC manual 18.

The CRC ratings for treated and untreated fuel with regards to injector cleanliness was plotted. A significant improvement was noted when Wynn's Spitfire Diesel Fuel Treatment was used, suggesting that this product is suited to removal of injector build-up.

In addition, Wynn's Spitfire Diesel Fuel Treatment core technology has been subjected to the Peugeot XUD-9 Nozzle Coking test.

This test is a recognised industry evaluation of deposits in an indirect injected passenger car diesel engine. It was developed in Europe by Group PF26 of the CEC.

New nozzles are flowed with air and measurements are taken at lift points of 0.1, 0.2, 0.3 and 0.4mm. The nozzles are then reassembled in the engine. The engine is warmed up to test conditions and the run for 6 hours. Nozzles are then reflowed and compared to the initial flow rate.

The original procedure was developed by Group PF26, but they specified no pass/fail limits. A French OEM group, CSCA, has developed a pass/fail criteria: a pass is greater than 15% remaining injector flow as compared to original flow at 0.1mm of pintle lift.

Wynn's Spitfire Diesel Fuel Treatment exhibited remarkable performance in this test, further confirming the ability of this product to provide injector cleanliness.

Combined with the excellent Cummins L10 results, this demonstrates Wynn's Spitfire Diesel Fuel Treatment's performance versatility for direct fuel injection (DI) and indirect diesel fuel injection (IDI) engines.

One of the most important features of Wynn's Spitfire Diesel Fuel Treatment is the fuel economy benefits it provides.

In a fleet test, a significant increase of 4.6% and 4.1% in fuel economy was achieved for Cummins at Detroit Diesel engines respectively. The cost savings due to lower fuel consumption as a result of using Wynn's Spitfire Diesel Fuel Treatment are notable.

The benefits in reduction of exhaust emissions were also demonstrated by the use of Wynn's Spitfire Diesel Fuel Treatment. It was noted that there was a considerable reduction in the level of hydrocarbon and carbon monoxide emissions. Particulates and NOx were also reduced significantly. Wynn's Spitfire Diesel Fuel Treatment improves the quality of emissions so that they are less harmful to the environment.

## Benefits

Wynn's Spitfire Diesel Fuel Treatment has been formulated to provide the following benefits:-

- Cleans injectors and keeps them clean.
- Provides superior Cummins L10 Depositing Test rating level of injector cleanliness.
- Exceeds CSCA requirement for Peugeot XUD-9 injector cleanliness.
- Provides low sulphur diesel fuel lubricity.
- Reduces exhaust emissions.
- Improves diesel engine performance.
- Reduces smoke and engine deposits.
- Improves fuel economy and power.
- Reduces water entrainment and prevents stable emulsion formulation.

The extensive engine and field testing conducted on Wynn's Spitfire Diesel Fuel Treatment core technology is a clear demonstration of the outstanding performance of this product, which proved to be very effective in providing injector clean-up, which in turn results in improved fuel economy and reduced emissions. The use of Wynn's Spitfire Diesel Fuel Treatment contributes significantly to the smooth running of a vehicle.

## Applications

Add entire contents of 350ml bottle of Wynn's Spitfire Diesel Fuel Treatment to diesel fuel tank. Use every second tank fill of diesel fuel to maintain injector cleanliness, or every tank fill to provide injector pump lubricity.

For larger diesel fuel tanks, and above ground or underground storage tanks, use Wynn's Enviro Diesel Treatment and Biocide, which is available in bulk containers.

### Typical Characteristics

Appearance	Clean Thin Liquid
Colour (Visual)	Amber
Colour (ASTM D 1500)	3.0
Density @ 15°C	0.868 (ASTM D 4052)
Flash Point (°C) PMCC	84 (ASTM D 93)
Boiling Range (°C)	149 – 207

### Performance Tests

- **FLEET TEST – USED VEHICLES**

Minimum 70,000 km accumulated  
1 x 1993 Daihatsu Hilina (Jeep) 2.8 litre  
1 x 1995 Mitsubishi L300 (Minibus) 2.2 litre

Japanese IDI Engines, naturally aspirated (swirl type combustion chamber and throttle type injectors).

Test Duration: 4 months  
Total Distance: 80,000km  
Average Service: 20,000km

Objective: To demonstrate the “clean-up” effectiveness of Wynn’s Spitfire Diesel Fuel Treatment in Japanese engines.

Test: Vehicles did 10,000km build up on base fuel followed by 10,000km on treated fuel. Road fuel consumption was measured every day. Chassis dynamometer measurements were taken at the beginning and at the 5,000km intervals.

Results: Average Improvement

- 1) Road Fuel Economy 13.6%
- 2) Brake Specific Fuel Consumption 11.6%
- 3) Exhaust Emission Opacity 42%
- 4) Engine Noise Reduction 2.5 dB
- 5) Remaining Injector Air Flow 42%

• **FLEET TEST – NEW VEHICLES**

1 x 1996 Daihatsu Hilina (Jeep) 2.8 litre  
1 x 1996 Mitsubishi L300 (Minibus) 2.5 litre  
2 x 1996 Isuzu Panther (Minibus) 2.2 litre  
Japanese IDI Engines, naturally aspirated (swirl type combustion chamber and throttle type injectors).

Test Duration: 6 months  
Total Distance: 180,000km  
Average Service: 30,000km

Objective: To demonstrate the “keep-clean” effectiveness of Wynn’s Spitfire Diesel Fuel Treatment in Japanese engines.

Test: Vehicles were operated in pairs through two phases (15,000 km/phase). In Phase 1, Group 1 vehicles were operated on base fuel and Group 2 on treated fuel. In Phase 2, the fuels were interchanged. Road fuel consumption was measured every day. Chassis dynamometer measurements were taken at the beginning and at 5,000km intervals.

Results: Net Average Improvement

- 1) Road Fuel Economy 7.5%
- 2) Brake Specific Fuel Consumption 7.3%
- 3) Exhaust Emission Opacity 33%
- 4) Engine Noise Reduction 2.7 dB
- 5) Remaining Injector Air Flow 49%
- 6) Intake and Exhaust Valve Deposit Rating (CEC/MO2-T-70) 2.4%
- 7) Combustion Chamber Deposit Rating (CEC/MO2-T-70) 2.3%

● **CUMMINS L10 DEPOSITING TEST**

CRC Ratings for untreated fuels and the same fuels treated with Wynn's Spitfire Diesel Fuel Treatment.

- Test:
- Two L-10 Cummins Engines in tandem.
  - 2300 RPM, 50-60 HP.
  - 15 second cycle – one engine driving, the other being driven. The roles are reversed for each subsequent 15 second cycle.
  - 125 hours duration.
  - CRC visual rating of plunger deposits.

Results: CRC Visual Ratings

<b>Fuel</b>	<b>Base Fuel</b>	<b>Treated Fuel</b>	<b>% Improvement</b>
A	17.2	5.6	67
B	21.3	10.6	50
C	27.6	7.6	72
D	22.2	7.2	68
E	24.8	7.8	69
F	30.4	10.6	65

● **PEUGEOT XUD-9 NOZZLE COKING TEST**

Injector Nozzle Flow Rates for untreated fuel and fuel treated with Wynn's Spitfire Diesel Fuel Treatment.

- Test:
- Peugeot XUD-9 Engine
  - 4 Cylinders, 1.9 Litres
  - 3,000 RPM
  - 58 Nm Load
  - 6 Hours duration

Results: % Flow Remaining

<b>Pintle Lift (mm)</b>	<b>Base Fuel</b>	<b>Treated Fuel</b>	<b>% Improvement</b>
0.1	9.7	15.6	61
0.2	11.3	18.6	65
0.6	16.5	25.5	55
0.4	25.2	40.6	61
Average Residual Flow	15.7	25.4	60

● **FLEET TEST – FUEL ECONOMY**

A fleet of 59 haulage trucks with Cummins L10 and Detroit Diesel Series 60 engines was chosen to monitor long term additive effects including injector cleanliness over a variety of well maintained engines. Test duration was 18 months. Overall, the fleet data showed that Wynn's Spitfire Diesel Fuel Treatment was successful in keeping injectors clean and cleaning up dirty injectors. In addition, the treated Cummins and Detroit Diesel engines had a fuel economy improvement.

Results: % Change in Fuel Economy

<b>Engines</b>	<b>Base Fuel</b>	<b>Treated Fuel</b>	<b>% Improvement</b>
Cummins	4.67	9.29	4.6
Detroit Diesel	-3.65	0.41	4.1

● **EMISSION TESTING**

A Cummins L10 Injector Depositing test was run with base fuel and fuel treated with Wynn's Spitfire Diesel Fuel Treatment.

At the conclusion of the test, the injectors were removed and placed in another L10 engine, which was run on the transient emission cycle for the highway certification of trucks.

Emissions, fuel consumption and power were measured and all significantly improved with the treated fuel.

Results: Composite FTP Emissions (g/KW-Hr)

<b>Emission</b>	<b>Base Fuel</b>	<b>Treated Fuel</b>	<b>% Improvement</b>
NOx	3.588	3.529	1.7
CO	3.096	2.484	19.8
Hydrocarbons	0.358	0.298	16.7
Particulates	0.316	0.281	11.1