

Do Diesel Additives Have a Role?

Pros and Cons

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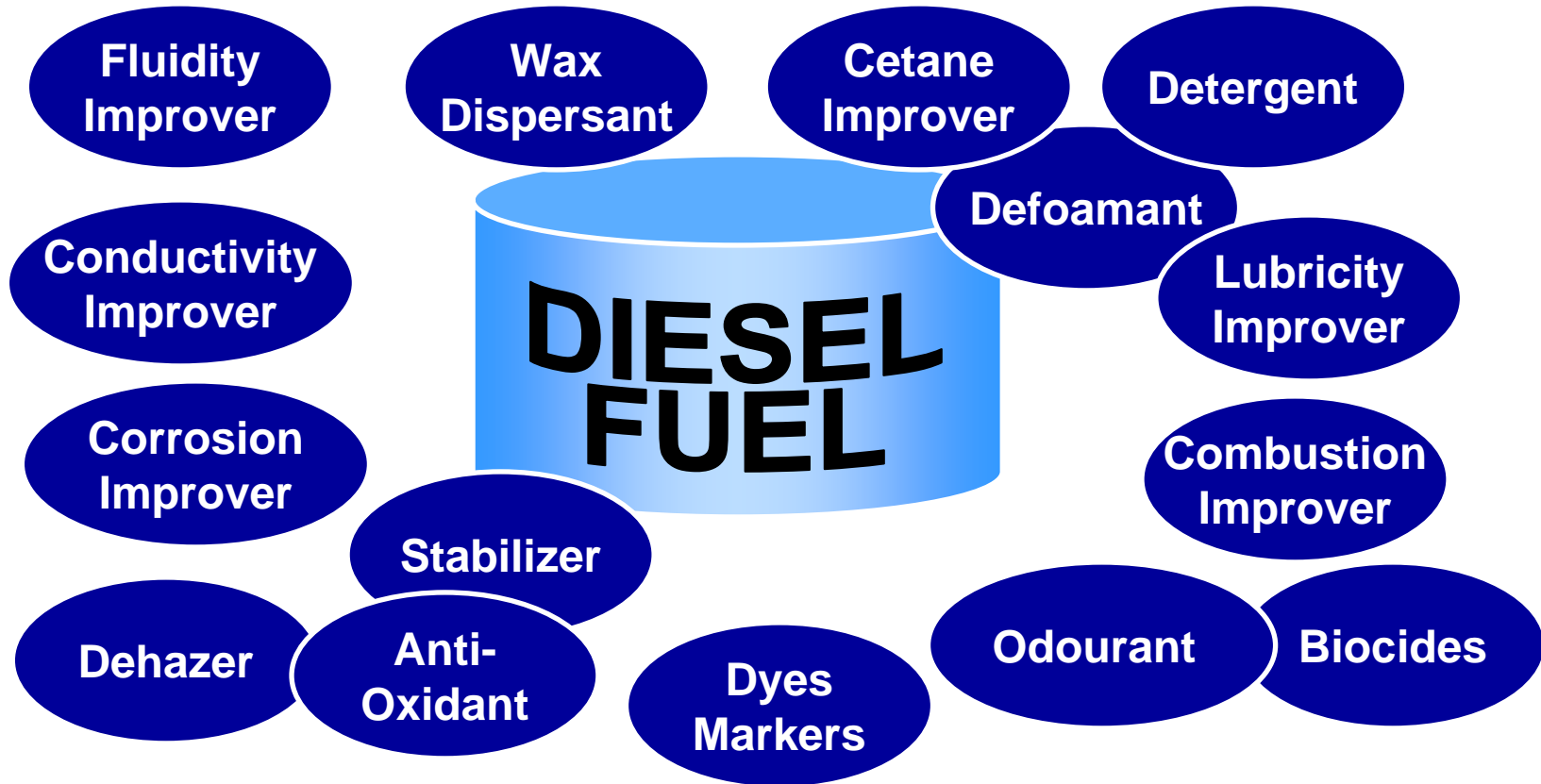
Outline

- **Diesel Additives**
- **Performance Aspects**
- **Selection Criteria**
- **Summary**

Selection Principles

- **Beneficial Effects: Proof of Performance**
 - Laboratory / Engine Tests
 - Correlation with Field Performance
- **Side Effect Testing**
- **Compatibility Between Components**
 - Neat Package
 - Other Components in Fuels and Lubricants
- **Optimization for Best Performance**

Many Different Functions Available



Diesel Cold Flow

- Fuel Filter Plugging at Low Ambient Temperature

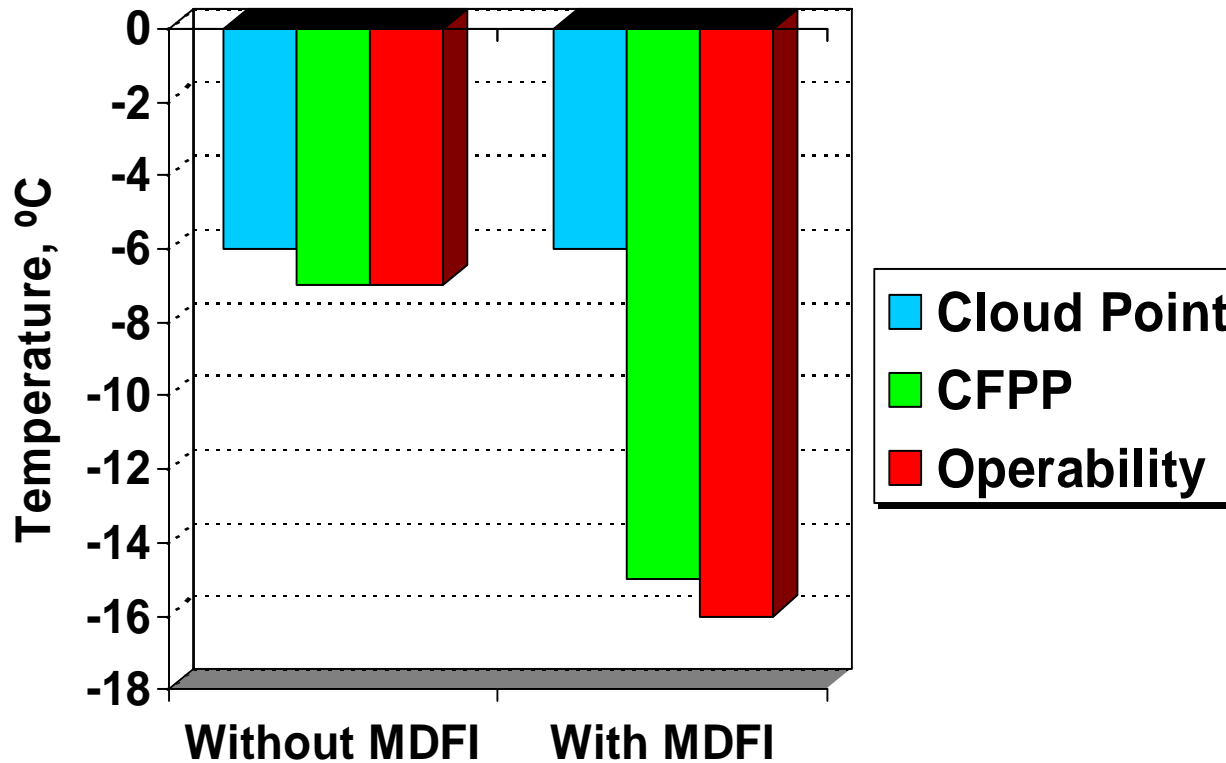
Diesel Cold Flow

- Fuel Filter Plugging



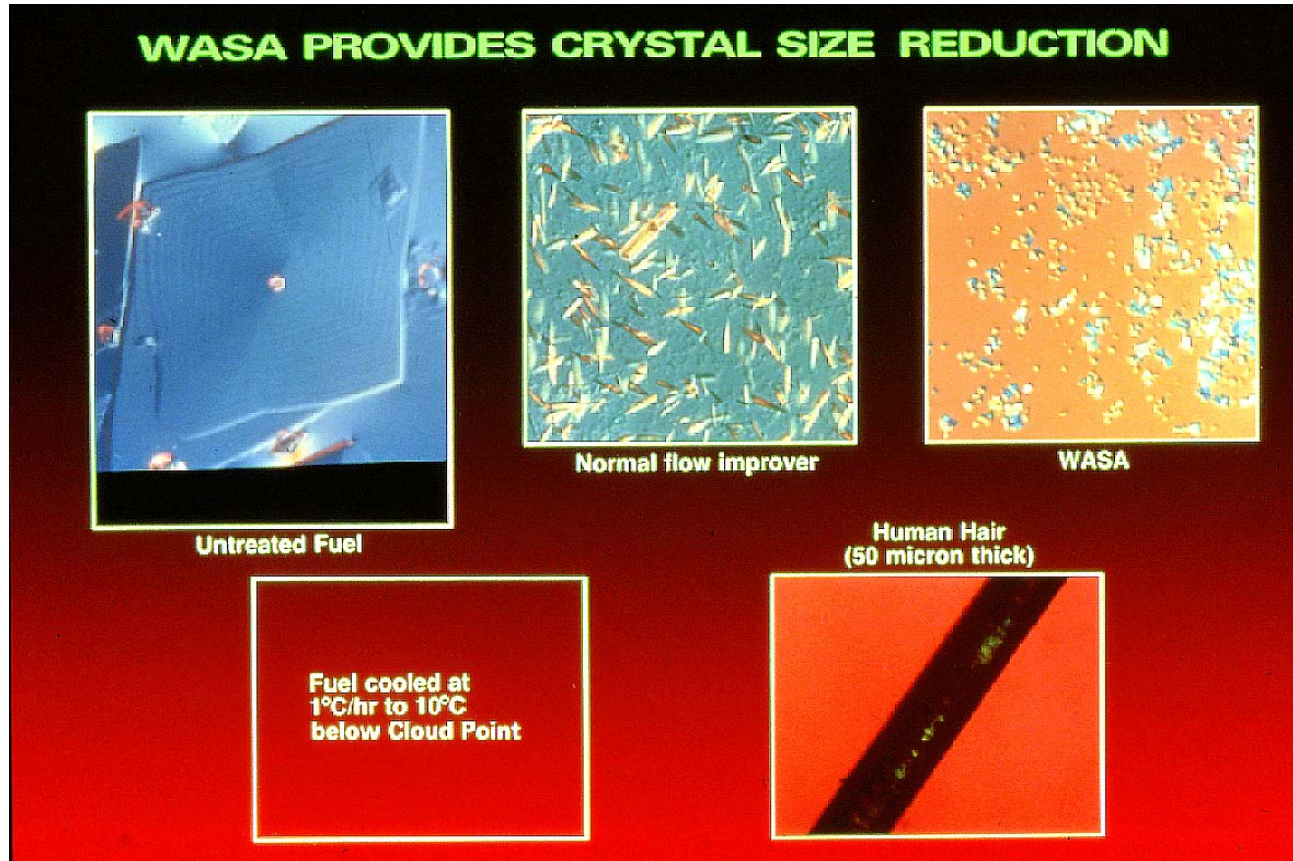
Diesel Cold Flow

- Vehicle Operability Affected by MDFI



Modifying Paraffin Crystals

- Smaller and More Compact Paraffin Wax Crystals



Cold Flow Additives

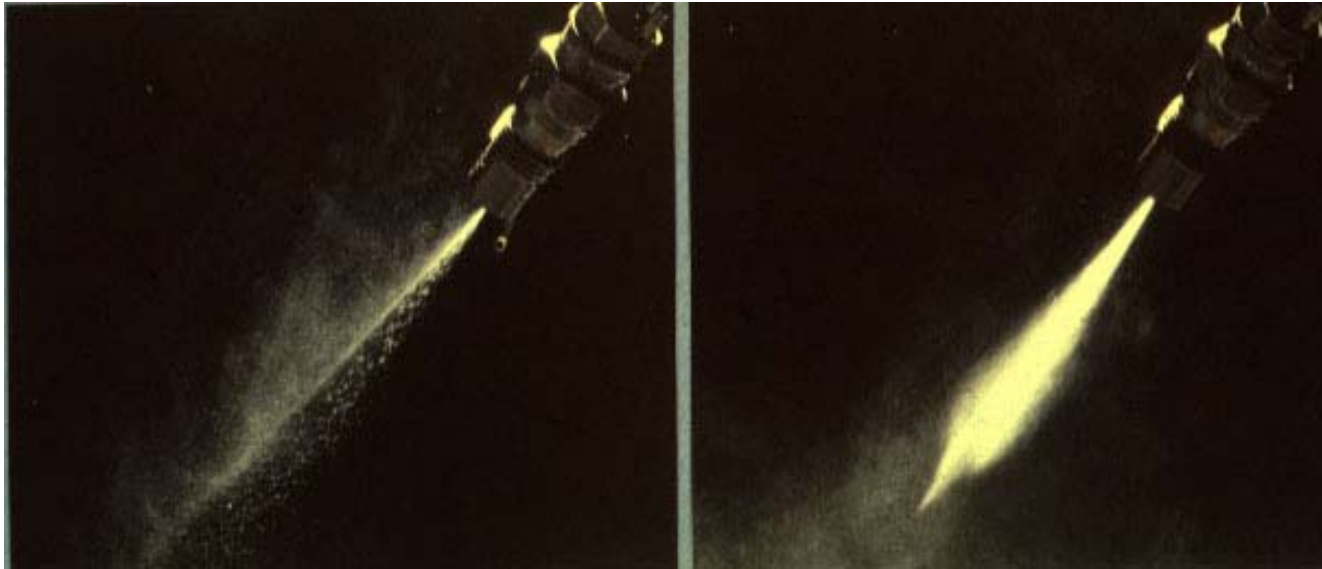
- **Middle Distillate Fluidity Improvers / Wax Anti-settling Additives**
 - Modify Wax Crystal Size / Shape, Do Not Reduce Amount of Wax
 - Reduce Clumping of Wax Crystals
 - Slow Rate of Wax Settling
 - Increase “Porosity” of Wax Layer
- **Blend Optimisation**
 - Distillation Cut Points
 - Must Be Blended into Fuel Above Cloud Point
- **Side Effect Testing**

Diesel Detergents

- **Diesel Injector Nozzle Coking**
 - Restricting Fuel Flow During Start / Pilot Injection
 - Effect on Spray Pattern

Diesel Detergents

- Diesel Injector Spray



**Poor Spray Pattern
Base Fuel**

**Good Spray Pattern
Base Fuel
Plus Additive**

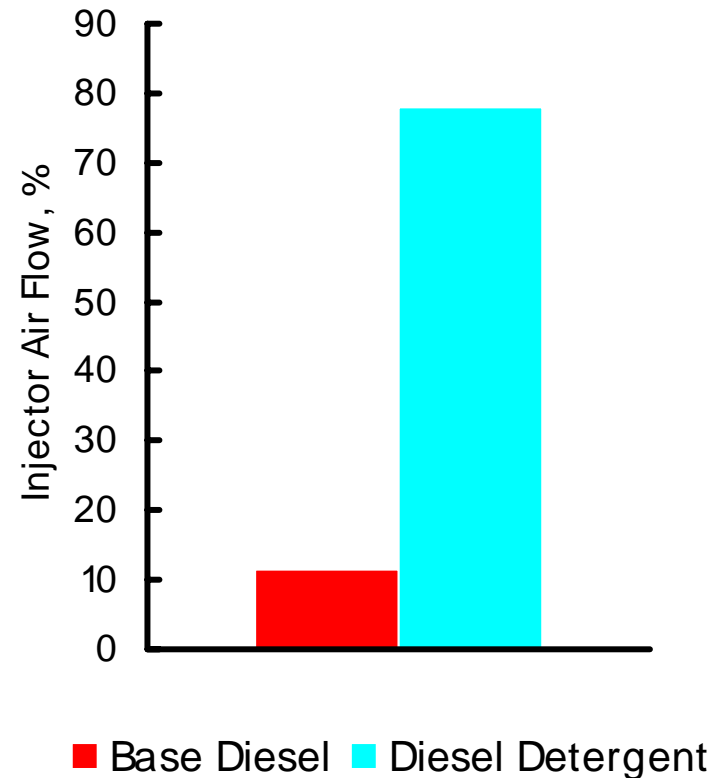
Diesel Detergents

- **Diesel Injector Nozzle Coking**
 - Restricting Fuel Flow During Start / Pilot Injection
 - Effect on Spray Pattern
- **Too Much Coking Affects**
 - Higher Engine Noise
 - Rough Idle Quality
 - Poorer Driveability and Acceleration Performance
 - Increased Fuel Consumption
 - Increased Exhaust Emissions

Diesel Detergent Additives

Detergency Performance in Nissan LD-28 Engine Test

- Diesel Detergent Provides Keep Clean / Clean-up Performance for the Diesel Engine Fuel Injection System
- Maintains Optimum Fuel Economy and Exhaust Emissions

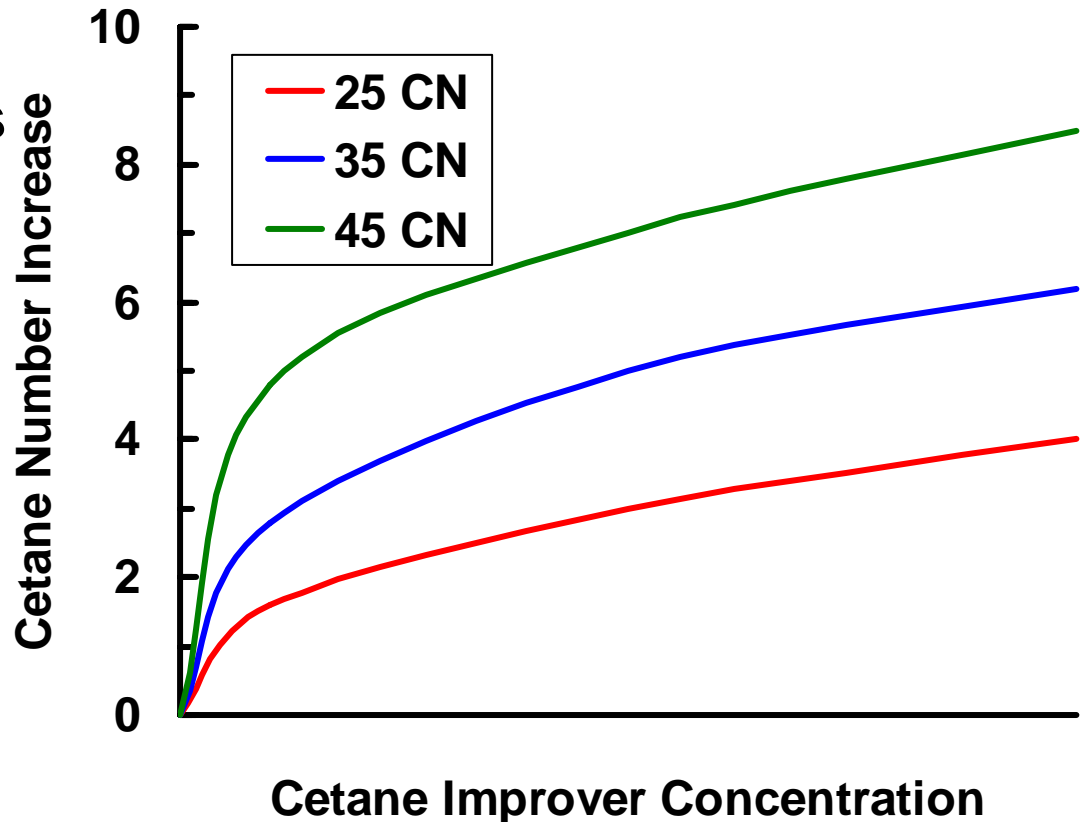


Diesel Cetane Quality

- **Ignition Quality Determined in**
 - **Cetane Engine: Cetane Number**
 - **From Correlation with Density and Distillation: Cetane Index**
 - **Calculation Not Applicable to Fuels Containing Cetane Improvers**
- **Cetane Improvers**
 - **2-Ethyl hexyl nitrate**
 - **Work Best in High Cetane Fuels**

Cetane Improvers

- Cetane Lift from Cetane Improver is Dependent on Base Fuel CN and Treat Rate
- Best Response from High Cetane Base Fuel



Combustion Improvers

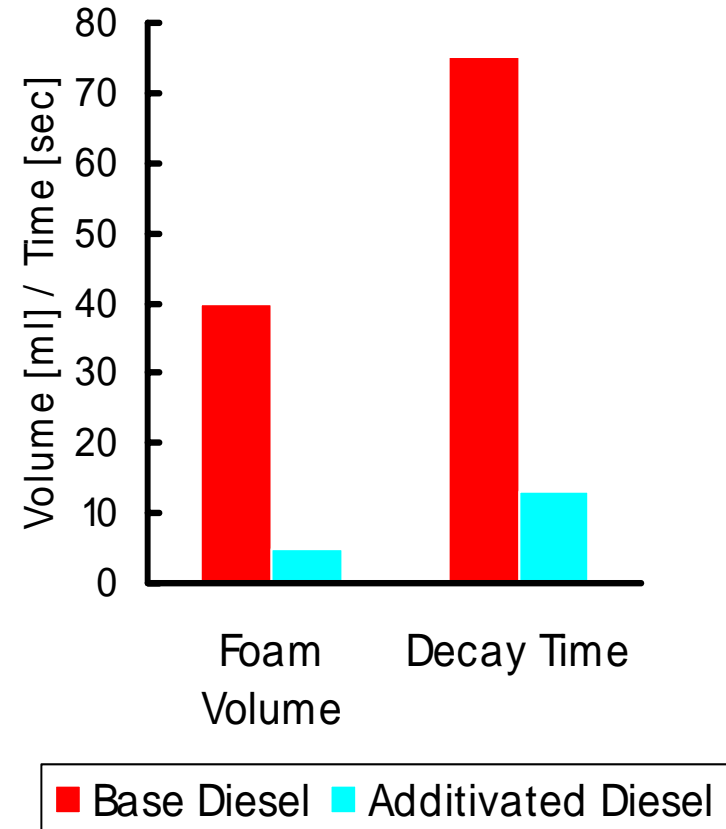
- **Catalyze Burn-off of Carbon / Soot**
 - Reduce Ignition Temperature of Carbon
 - Soot Particles Continue to Burn at Lower Temperatures
 - Main Effect on Black Smoke and Particulate Matter
- **Particulate Traps**
 - Controlled Addition
 - Enable Reliable Regeneration of Particulate Traps

Lubricity of Low Sulphur Diesel

- **Moves to Reduce Sulphur in Diesel Fuel**
- **Desulphurisation Removes Other Polar Compounds**
 - Natural Lubricants: Rotary Pump Wear
 - Lubricity Additives Help
- **HFRR Test to Control Lubricity**
- **Lubricity Additives Enable Use of Low Sulphur Diesel**
- **Desulphurisation May Also Change Composition**
 - Lower Aromatics Content: Leaking Fuel System Seals
 - Requires Seal Replacement

Defoamant Additives

- **A 75% Reduction in Foam Collapse Time Was Obtained With Diesel Containing Defoamant Compared to Base Diesel**
- **Allows Cleaner, Faster and More Complete Refuelling Without Spillage**



Summary

- **Diesel Additives Play an Integral Part in Enhanced Fuel Performance**
- **Different Functions Can Be Enhanced**
- **Maintain Engine Performance at Design Level**
- **Enable Use of Cleaner Diesel Fuels in Existing Fleet**

- **Optimisation of Components**
- **Unwanted Side Effects**

Diesel Additives

- **Mandatory Use of Additives?**
- **Performance Requirements Instead of Prescription of Additives**
- **Testing Protocol**
- **Minimum Quality Level**

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