

# Advantages of Oxygenates Fuels over Gasoline in Direct Injection Spark Ignition Engines

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## Facts of Ethanol and Methanol

1. More environmentally friendly fuels than hydrocarbons (better carbon dioxide balance per unit fuel energy)
  2. Better knock resistance than gasoline (RON 129 and 133 vs. 95)
3. Larger latent heat of vaporization than gasoline (921 and 1177 vs. 349 KJ/Kg)

### Therefore

Fuel specific engines, preferably Turbo charged and with Direct Injection, may:

1. run higher compression ratios;
2. use higher boost pressures;
3. adopt spark timings closer to maximum brake torque;
4. more easily meet inlet temperature requirements of turbine.

Consequently delivering fuel conversion efficiencies and power outputs than gasoline engines.

### Example

A 1.6L Turbo, Direct Injection, Variable Valve Actuation Controlled Ethanol engine replacing a 4L Naturally Aspirated, Port Fuel Injected, Throttle Controlled Gasoline engine powering a full size passenger car.

The fuel energy efficiency over the New European Driving Cycle is improved from 16.3 to 27.3%.  
(The fuel energy efficiency of the same technology Gasoline engine is 21.6%).

### Keywords for high fuel efficiency vehicles

1. Engine Downsizing
2. Direct Injection
3. Turbo charging
4. Variable Valve Actuation
5. Exhaust Gas Recirculation
6. Variable Compression Ratio
7. Variable Stroke Ratio (Atkinson)
8. Power train with (Mechanical) Kinetic Energy Recovery System

