

Dramatic Improvements in Low-temperature Engine Combustion for Vehicles

Argonne engineers are developing an advanced vehicle combustion system that achieves high, diesel-like efficiency while producing ultra low emissions. In a dramatic breakthrough, the system uses low-cetane fuels (gasoline and naphtha blends that are easier for fuel companies to produce). The configuration drastically reduces or eliminates the need for exhaust after-treatment.

The Challenge

Developing a combustion system that operates with high efficiency and practical levels of power density while drastically reducing tailpipe emissions. Part of the additional challenge is to make advanced combustion systems robust enough for use in real-world vehicles.

The Solution

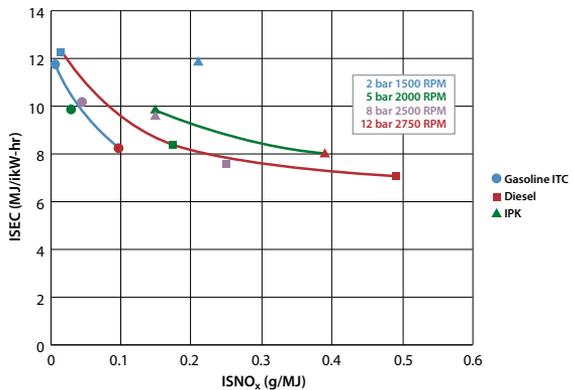
To research fuel spray and mixture preparations, ignition chemistry, turbulence modeling and reaction chemistry modeling in order to optimize this breakthrough combustion approach.

The Results

- ▶ Robust engine operation up to 3000 RPM at 16 bar BMEP (goal is 18-20 BMEP)
- ▶ Ultra-low NO_x emissions under driving cycle conditions
- ▶ Engine efficiencies of 30 to 40 percent over a range of driving cycle conditions



Argonne mechanical engineer Steve Ciatti works on the low-cetane fuel engine.



Gasoline low-temperature combustion shows diesel-like fuel efficiency with very low NO_x, especially at the higher speeds and loads.

“The advanced combustion breakthrough provides opportunity to achieve high efficiency, high power density engines while drastically reducing pollution,” stated Steve Ciatti, a principal mechanical engineer at Argonne.