

# Low-Temperature Combustion Knocks out the NO<sub>x</sub>

*Did you know...*

Diesel engines require less maintenance, generate power more efficiently, and produce less carbon dioxide emissions than traditional gasoline engines. However, they still emit relatively high levels of nitrogen oxide (NO<sub>x</sub>) and particulate matter (PM), which are considered harmful to humans and the environment.

## Opportunity

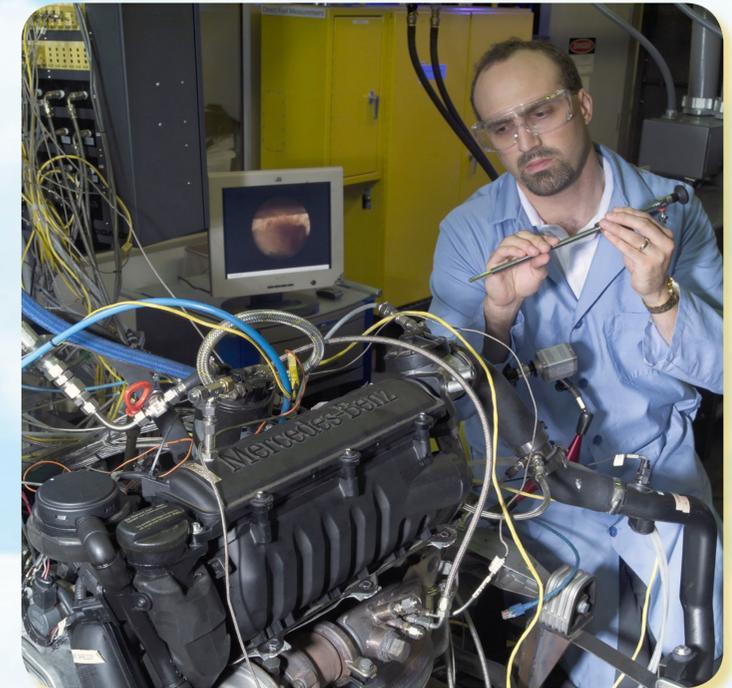
With stringent U.S. Environmental Protection Agency (EPA) regulations in place for diesel engines, automakers are interested in solutions that reduce emissions and the cost of aftertreatment devices. One way to achieve this is by lowering combustion temperatures. However, most current approaches to low-temperature combustion (LTC) have problems with engine performance.

## Argonne's Solution

To optimize LTC, detailed combustion information is needed. Argonne researchers are using endoscopes, advanced cameras, and fiber-optic tools to obtain information on fuel spray characteristics and combustion reactions and temperatures. The ultimate goal is to define conditions that will enable high engine efficiency and reduced emissions.



Using an endoscope, researchers can peer inside an engine as it operates. This image shows the fuel spray zone in a traditional diesel engine.



Argonne engineer Steve Ciatti readies an endoscope to capture images from inside a diesel engine.

## Potential Benefits

Low combustion temperatures can result in very low outputs of NO<sub>x</sub> and PM. The reduced emissions will allow for much smaller and less expensive aftertreatment devices. LTC systems could also potentially increase fuel efficiency by as much as 25 to 50 percent.

## Industry Partnerships

Argonne is working with General Motors, BP, the University of Illinois at Chicago, and the U.S. Air Force to develop LTC technology into a usable system for automobiles.

Visit [www.transportation.anl.gov](http://www.transportation.anl.gov) to learn more!



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