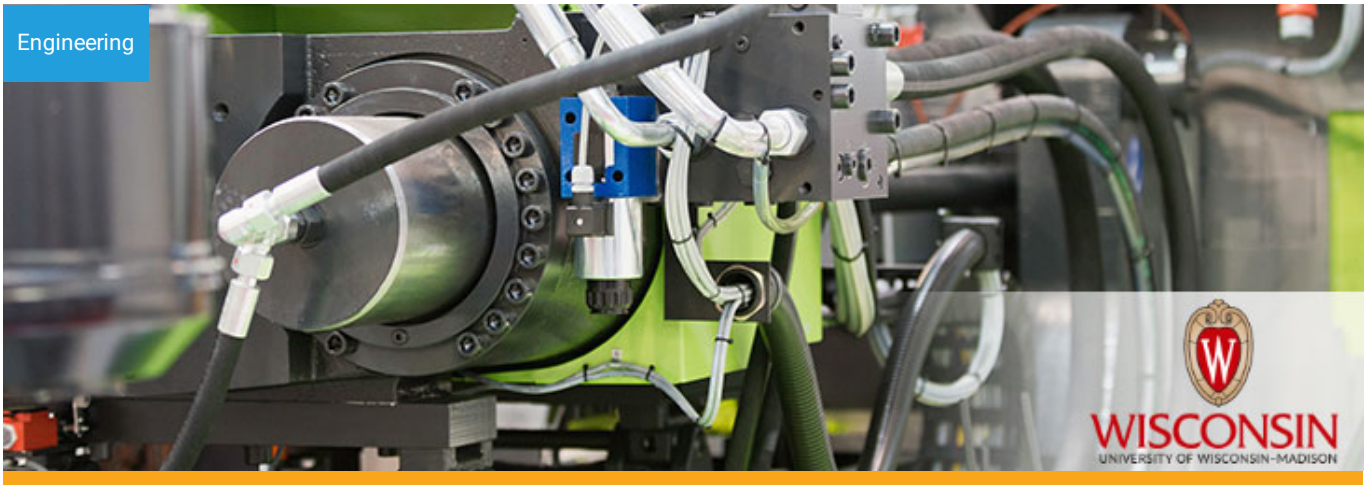
Engineering




# Adaptive Fuel Injection Method Cuts Diesel Engine Emissions

View U.S. Patent No. 7,464,690 in PDF format.

**WARF: P07342US**

Inventors: Rolf Reitz, Yong Sun

**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a technique for simultaneously reducing both nitrogen oxide and particulate emissions from diesel engines.**

## Overview

Nitrogen oxides (NOx) and soot are two common pollutants that result from the burning of fuel in diesel engines. Cooler engine conditions tend to reduce NOx emissions but increase soot. Due to this "nitrogen oxide-soot tradeoff," reducing both types of emissions at once has proven difficult.

UW–Madison researchers previously developed a method for reducing engine emissions using multiple, increasingly pressurized fuel injections during an engine cycle (see WARF reference number P01108US). The method cuts emissions by providing better fuel-air mixing and more controlled heat release from the injected fuel (thus, lower peak temperatures and NOx production).

Despite these advances, additional improvements are needed, particularly in light of the ever-increasing need for cleaner engines.

## The Invention

UW–Madison researchers have developed a new adaptive injection technique to reduce NOx and soot emissions from diesel engines.

For low engine loads, one or more fuel injections take place between the intake and compression strokes. Each injection has increasing pressure, making the fuel highly premixed with air in the combustion chamber.

For greater engine loads, the process has two steps. First, injections of increasing pressure take place between the intake and compression strokes. Then, subsequent injections occur between the compression and expansion strokes. These subsequent injections have variable pressure. Such variation in injection pressure helps the fuel penetrate within the combustion chamber. At the same time, the pressure is modified so that fuel does not impinge on the walls of the chamber, which would worsen fuel economy and emissions. The technology can readily be implemented using an engine equipped with two fuel injectors per cylinder (each operated with different injection pressures), or with a single injector featuring variable injection pressure, as described in WARF reference number P01108US.

## Applications

- Reduction of emissions from internal combustions engines

## Key Benefits

- Avoids the temperature extremes that give rise to NOx
- Avoids the soot that accompanies uneven fuel-air distribution
- No rapid and potentially damaging increases in chamber pressure

- Could help diesel engines meet tough emission standards
- Implementable in all diesel engines

## Additional Information

**Related Technologies**

- WARF reference number P01108US describes the researcher's original multiple fuel injection scheme.

**Tech Fields**

- Engineering : Engine technologies

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867