



Postdoc – Open position

Effect of the Cetane Improver on the combustion and the pollutant emission of a Diesel Compression Ignition Engine

Project description:

2-Ethyl-Hexyl Nitrate (2-EHN) is today, and for many years, the most widely used diesel additive to increase the Cetane number of a diesel fuel or others. It is used globally by the fuels companies to reach the regulatory Cetane levels. For some years the context of use of 2-EHN as an additive changes. Firstly, the emission standards (CO₂ and pollutants) of vehicles becoming increasingly demanding, the conditions of use of diesel in engines have changed considerably and few studies on Cetane additives have been carried out under modern conditions. Injection, calibration, EGR ... The impact of 2-EHN in these more recent conditions is little known and little studied. Secondly, 2-EHN users (refiners, cargo treaters, additive formulators) are beginning to have conditions in which the 2-EHN's change requires a better understanding of the mechanism causing the 2-EHN to reduce the ignition delay of the fuel in the combustion chamber.

The objective of the work is therefore:

- Investigate the influence of the 2-EHN on fuel consumption and emissions of a single cylinder research engine of standard Euro 5 / V or 6 / VI configuration and before exhaust emission control system using Diesel and Biodiesel fuels.
- Understand its operating chemical mechanism as an improvement on the Cetane Number.
- Understand the impact of Diesel chemical parameters on the effectiveness of the 2-EHN.

The work will focus on the following three points:

1. A bibliography study covering Cetanes Improvers, their performances, their mechanisms of operation is expected.
2. Tests on a single cylinder research engine and other devices (high pressure high temperature vessels):
 - Impact of Cetane Improver on fuel consumption and engine emissions (ignition delays, heat release, 6 gases analyzers and FTIR analyzers, soot characterization...)
 - Operating chemical mechanism for the improvement of the Cetane index by the addition of Cetane Improver.
3. Valorization of the work by publications and communications

Qualifications:

The candidate must have a PhD in mechanical engineering, chemical engineering, chemistry, or related discipline. Considerable knowledge of combustion fundamentals is required, as is demonstrated expertise using experimental devices to measure fundamental properties such as ignition delay, flame speed, fuel decomposition/oxidation intermediates and products, etc. Knowledge of internal combustion engines would be beneficial for this position. Good oral and written communication skills are required. The position requires good collaborative skills, including the ability to work well with our partner Eurenco / VeryOne.

Appointment period:

The initial appointment period is one year, with renewal possible up to three years total, subject to continued project funding and satisfactory performance. Gross salary evolves between 2400€ and 3400€ per month, depending on candidate experience.

Application:

Candidates will be required to provide: a detailed academic CV; list of publications, abstracts and significant presentations; two letters of recommendation. Direct all the inquiries to Pr. Fabrice FOUCHER (Fabrice.foucher@univ-orleans.fr).

Laboratory:

The research will be performed into the Energy, Combustion and Engine group of the PRISME laboratory. This group is composed of more than 35 researchers and students and is working on the chemical and physical understanding of the combustion process for the Internal Combustion Engine area on real engines, research engine with or without optical access and on high pressure and high temperatures vessels (laminar and turbulent vessel, sprays, auto ignition delays...)