11th. World Congress on Computational Mechanics (WCCM2014)
5th. European Conference on Computational Mechanics (ECCM V)
6th. European Conference on Computational Fluid Dynamics (ECFD VI)
July 20 - 25, 2014, Barcelona, Spain

CFD METHODS IN COMBUSTION AND EXHAUST AFTERTREATMENT OF INTERNAL COMBUSTION ENGINES

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Key words: Two-Phase Flow, Turbulent Mixing, Combustion, Pollutant Formation

ABSTRACT

Future emission legislation limits and the necessary reduction of greenhouse gases can only be achieved if the internal combustion engines burn fuel more efficiently and with less pollutant formation and/or if exhaust aftertreatment further reduces the raw emissions to the required limits.

Numerical methods are an integral part of nowadays research and development on internal combustion engines and exhaust aftertreatment systems. Computational Fluid Dynamics offers the possibility to study a number of processes happening during the engine cycle: turbulent flow in the combustion chamber and in exhaust pipes, fuel injection, mixture formation, ignition, flame propagation and pollutant formation.

Nowadays, alternative fuels and additional working fluids like urea-water solutions are more frequently used in automotive applications due to the high demands for the reduction of pollutant and greenhouse gas emissions. Therefore, this MS will invite experts to present the newest results in the field of the formulation of more elaborate fluid models like multi-component fuels to represent a realistic physical and chemical behaviour. Particularly, the application of these models to spray evaporation and wall film formation on the surfaces of the combustion chamber and the exhaust system, which is an important indicator for pollutant formations, pre-ignitions and deposits, will be discussed [1]. Additionally, the application of advanced turbulence models that describe the species transport and flame propagation as well as the fuel's impact on the auto-ignition of the mixture with respect to Diesel combustion process and the pre-ignition and knocking combustion in gasoline engines will be covered by this MS [2, 3, 4].

This symposium is a continuation of the MS at the ECCOMAS 2012 [5] and invites speakers from the industry and the academic world to publish their results and experiences with numerical methods in the field of combustion, pollutant formation and exhaust aftertreatment for internal combustion engines.

Progress in modelling of the following topics will be presented and discussed:

- Premixed and non-premixed combustion
- Modelling of the fuels and working fluids
- Irregular combustion (preignition, knocking)
- Pollutant formation
- Dosing and mixing of fuel and reducing agents in the exhaust
- Catalytic reactions and emission control

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