I-CHEST: IMPLEMENTATION AND VALIDATION OF A HPC COMBUSTION AND EMISSIONS MODEL FOR THE ANALYSIS OF SUSTAINABLE

Description

Liquid fuel combustion applications are the main energy consumers within our current transport system, with a consequent impact on resource utilization, global warming and pollutant emissions. Society is pushing to decarbonize the transportation sector with replacementfuels that have lower impact and allow to a carbon-neutral growth for the near term. The implementation of such fuels in real combustion systems demands for advanced spray and combustion models, as their physical and chemical properties are expected to be significantly different from those of conventional transportation fuels. The interaction of complex physical and chemical phenomena such as high pressure liquid fuel injection, atomization, vaporization, fuel/air mixing and combustion is still not well understood and plays a major role inthe overall performance of practical powertrains.

The CHEST project focuses on the development of an avanced spray combustion and emissions model and its application to identify the suitable physical and chemical characteristics of alternative liquid fuels for future automotive and aviation power plants. The effort isdevoted to evaluate the fuel interchange ability and the final gains in pollutant and CO2 emissions. Improvement of the fidelity andpredictability of simulation tools for spray combustion is mandatory to move towards more sustainable and greener transportation systems. The use of advanced CFD tools will enable faster and more efficient design of new combustion systems, both in terms of performance and pollutant emission. The CHEST project is a coordinated effort by two institutions CMT and BSC to take advantage of their evident synergies. CMT will define the target applications, conduct the related experiments and the corresponding numerical simulations, while BSC will be in charge of themodel developments and validation in realistic conditions. These two actions have been divided into two subprojects, where I-CHEST isfocused on the mathematical, physical and numerical aspects of the tool and its integration into the parallel multiphysics HPC code Alya. ICHEST is the activity led by BSC and is dedicated to develop the physical and numerical framework for high-fidelity LES within CHEST.

Barcelona Supercomputing Center - Centro Nacional de Supercomputación