NOVEL APPROACH FOR PREDICTING KNOCKING COMBUSTION IN GASOLINE ENGINES

Frolov S. M., Ivanov V. S.
Department of Combustion and Explosion, Semenov Institute of Chemical Physics, Moscow, Russia
Basara B., Priesching P., Suffa M.
Advanced Simulation Technologies, AVL List GmbH, Graz, Austria





ABSTRACT
The objective of the research outlined in this article was to put forward a novel approach for predicting knocking combustion in gasoline engines based on the Flame Tracking – Particle (FTP) model available in AVL FIRE code. The novel approach is based on monitoring the local instantaneous temperature growth rates in the preflame zone and their statistical processing. This opportunity is provided by the Lagrangian Particle method (PM), a composite part of the FTP-model. At any time, each particle-in-cell representing one of multiple possible thermochemical states of turbulent reactive flow in a given computational cell has its own temperature growth rate due to multistage preflame reactions. One can readily use this information for identifying knock-critical conditions and knock probability using the formalism of particle-based probability density functions (PDF).

KEYWORDS: Gasoline engine, knocking combustion, 3D simulation, Flame Tracking – Particle model, Knock probability