Baumgarten

Mixture Formation in Internal Combustion Engines



A systematic control of mixture formation with modern high-pressure injection systems enables us to achieve considerable improvements of the combustion pr- ess in terms of reduced fuel consumption and engine-out raw emissions. However, because of the growing number of free parameters due to more flexible injection systems, variable valve trains, the application of different combustion concepts within different regions of the engine map, etc., the prediction of spray and m- ture formation becomes increasingly complex. For this reason, the optimization of the in-cylinder processes using 3D computational fluid dynamics (CFD) becomes increasingly important. In these CFD codes, the detailed modeling of spray and mixture formation is a prerequisite for the correct calculation of the subsequent processes like ignition, combustion and formation of emissions. Although such simulation tools can be viewed as standard tools today, the predictive quality of the sub-models is c- stantly enhanced by a more accurate and detailed modeling of the relevant pr- esses, and by the inclusion of new important mechanisms and effects that come along with the development of new injection systems and have not been cons- ered so far. In this book the most widely used mathematical models for the simulation of spray and mixture formation in 3D CFD calculations are described and discussed. In order to give the reader an introduction into the complex processes, the book starts with a description of the fundamental mechanisms and categories of fuel - jection, spray break-up, and mixture formation in internal combustion engines.

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