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FORCED SWIRL COMBUSTION CHAMBER IN DIESEL ENGINE: NUMERICAL SIMULATION AND EXPERIMENTAL RESEARCH

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Abstract

Fuel injection system, intake system and the geometric shape of combustion chamber are the three key factors to the fuel-air mixture and combustion process for diesel engine. long with the need of high power density in diesel engine, the pressure of intake is higher increasingly. Together with the effect of high pressure fuel injection, the fuel-air mixture and combustion process is hard to spread as usual. In this circumstance, the performance of power, heat efficiency and emission in diesel engine become worse. So it is necessary to design a new concept of combustion chamber to speed up the air-fuel mixture and combustion process.

Based on this idea, forced swirl combustion chamber has been put forward. In this paper, ω type, double swirl, partial swirl and side swirl combustion chamber which of the latter three belong to the range of forced swirl combustion chamber have been calculated by CFD code AVL FIRE. From the calculative result, compared with ω type combustion chamber, air-fuel mixture and combustion process is faster in forced swirl combustion chamber. And because of the special structure in forced swirl combustion chamber, on the instantaneous heat release rate curve there are two peaks during the main combustion duration. Contrasting ω type combustion chamber, fuel consumption on double swirl combustion chamber is 7.5 percent lower, and indicated heat efficiency is 7.1 percent higher on the experimental platform. The accuracy of combustion calculation on double swirl combustion chamber is also validated by the experiment.

Key words: CFD calculation, experimental research, forced swirl combustion chamber

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