第５号様式

論文審査の要旨

博士の専攻分野の名称	博　士　（　工学　）	氏名	WU Qing
学位授与の要件	学位規則第４条第[1]・２項該当		

論　文　題　目

Droplet size and velocity characteristics of Diesel spray injected by common rail injection system

(コモンレール噴射系から噴射されたディーゼル噴霧の粒径と速度の特性)

論文審査担当者

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〔論文審査の要旨〕

When a Diesel spray is injected into the cylinder with high injection pressure, it will breakup and form small droplets after complete breakup. Droplet size distribution and its spatial distribution directly determine the droplet evaporation speed and spatial concentration difference, which will further influence the engine working and emission performances. The imaging-based technique is adopted in this study to capture the droplet images before and after the end of fuel injection. Droplet characteristic parameters, such as droplet velocity, droplet diameter and distance between droplets can hereafter be obtained through imaging processing method. In addition to the experimental analysis, simulation study of Diesel spray is also conducted.

Chapter 1 is the introduction of this dissertation paper and entitled as “Introduction”. Current environmental and energy issues, along with a review of previous work are stated. Meanwhile, the main objectives and scheme of this dissertation are also included.

Chapter 2 is entitled as “Experimental setup and methods”. The experimental setup and methods of this study are illustrated. Through comparison of different droplet size measurement techniques, imaging-based technique is selected. In addition, the settings of each experimental equipment are mentioned.

Chapter 3 is entitled as “Droplet size and velocity distributions within a short duration before and after the end of fuel injection”. In this chapter, variations of droplet size, droplet velocity and droplet We number in the spray tip and middle periphery regions within a short duration before and after the end of fuel injection under different injection pressures and ambient pressures are studied. The droplet Sauter

mean diameter in the spray tip region for all cases will firstly increases, then decreases.

Chapter 4 is entitled as “Droplet size and velocity distributions after the end of fuel injection”. In this chapter, the variation of droplet size distribution curves along spray axis under different injection and ambient pressures are studied. Different droplet size distribution functions are also used to fit the experimental results. In addition, few modifications are conducted on the empirical SMD function to better fit the experimental results. Compared with the influence of injection pressure, ambient pressure will do more effect on the droplet size distribution variation along spray axis.

Chapter 5 is entitled as “Simulation results and comparison with experiment”. The simulation of Diesel spray development is conducted and compared with the experimental results. Since the interaction between gas and droplets is based on the DDM scheme, making the simulation result disagree with experimental results well.

Chapter 6 is entitled as “Closure”. The main findings of this study and future plans are summarized in this chapter.

以上，審査の結果，本論文の著者は博士（工学）の学位を授与される十分な資格があるものと認められる。

備考：審査の要旨は，1,500 字以内とする。