

学 位 論 文 概 要

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)

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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 entitled as “Introduction”. Current environmental and energy issues, along with a review of previous work are stated.

Chapter 2 is entitled as “Experimental setup and methods”. The experimental setup and methods of this study are illustrated.

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.

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.

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.

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