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	RIZAL MAHMUD
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論　文　題　目

Experimental Study on Heat Transfer of Flat-Wall-Impinging Diesel Spray Flame
（平板に衝突するディーゼル噴霧火炎の壁面熱伝達に関する実験的研究）

論文審査担当者

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〔論文審査の要旨〕

Despite increasing efficiency and improved fuel economy, heat loss still remains as a major factor, which contributes to substantial amount of energy loss in small size direct injection diesel engines. Therefore, heat loss reduction, which affects engine efficiency, has been of a challenging task. This heat loss occurs in various ways such as cooling loss, exhaust loss, and friction loss. Of the cooling loss, heat loss through the combustion chamber wall is the most significant one. Thus, a full understanding of the heat loss mechanism from combustion gas to cylinder wall would be needed to maximize thermal efficiency in the design of future engines.

The aim of this study was to better understand the mechanism of heat transfer from the spray flame to the impinging wall under the small Diesel engine–like condition. To present this work, the dissertation is organized as follows:

Chapter 1 is entitled as “Introduction”. A review of previous work such as heat transfer in engine combustion chamber, heat transfer correlation, heat transfer of wall impinging spray/flame and optical diagnostic technique for diesel spray were presented in this chapter.

Chapter 2 is entitled as “Experimental apparatus, measuring methods, and experimental conditions”. it described the experimental apparatus such as constant volume vessel, fuel injection system, and impingement wall test rig, including the TFTHF sensors. The observation by high-speed video camera, two-color method, heat flux measurement, and data acquisition are also introduced.

Chapter 3 is entitled as “Heat transfer under baseline condition”. It described the spray/flame behaviors and transient local heat flux characteristics under baseline conditions.

Chapter 4 is entitled as “Heat transfer under various impinging distances”. The effect of impingement distance on the heat flux on diesel spray flame was investigated under non-combustion and combustion conditions. The distribution of temperature near a wall and soot emission, respectively, by applying two-color techniques were also discussed in this chapter.

Chapter 5 is entitled as “Effect of injection pressure and nozzle hole diameter”. The spray flame behaviors of impinging spray and heat transfer characteristics under different injection pressures and nozzle hole diameters were studied. Furthermore, heat transfer coefficient under non-combustion and combustion conditions were discussed in this chapter.

Chapter 6 is entitled as “Effect of oxygen concentration on heat transfer”. The transient heat flux under different oxygen concentrations were discussed in detail in this chapter.

Chapter 7 is entitled as “Combined effect of impingement distance/injection pressure and oxygen concentration/injection pressure”. The combination effect on heat transfer and showed the optimum result to decreasing heat transfer on a diesel engine and a heat transfer correlation was expressed in this study.

Chapter 8 is entitled as “Conclusions”. General conclusions on spray flame behavior and transient local heat flux in diesel-like conditions and recommendations for future study were summarized in this chapter.

As mentioned above, As a result of the examination, this paper is judged to be of high value from academic and engineering viewpoints, so the author of this paper is considered to be sufficiently qualified to receive a doctoral (engineering) degree.

備考：審査の要旨は，1,500 字以内とする。