Effects of the Different Injection Delay on the Combustion Characteristics for the Propagation Flame in a Tube

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A lean burn mode is a way to reduce throttling losses. The engines designed for lean-burning can employ higher compression ratios and thus provide better performance, efficient fuel use and low exhaust hydrocarbon emissions than those found in conventional gasoline engines. Ultra lean mixtures with very high air–fuel ratios can only be achieved by direct injection engines. In this research, it is accompanied by direct pipe injection method in a combustion tube, focusing on the combustion process of the lean-burn region. The primary disadvantage of lean-burn technology is the amount of NOx that is generated at this higher air to fuel ratio and that the combustion characteristics near the lean limit are instability and low heat release rate. In this experiment, we investigated the combustion improvement by using in a tube. To increase the flame area, we injected an air-fuel mixture to the flame surface to create a turbulent premixed combustion and make an increase in the flame propagation speed. In this study, we examine the combustion characteristics of the propagation flame in a combustion tube by changing the injection timing of the mixtures and achieve the purpose of combustion improvement.

The main conclusions are as follows: 1) The flame shape of turbulent premixed flame shows that the upper part of the flame is disturbed first, and the flame advances to the upper part as it is. There are also clear differences in the flame propagation velocity and measured values. 2) By focusing on the period during which the injection equivalence ratio and the flame propagation speed increase, it was observed that the injection timing at which the flame propagation speed increase effect appears is delayed as the injected pre- mixture shifts to lean. 3) When the injection equivalence ratio is less than the import equivalence ratio, comparing the influence of injection equivalence ratio and the mixtures injection timing it has been observed that the increase and decrease of the heat input does not greatly affect the maximum value of the flame propagation speed, but the pre-mixture injection timing has a significant effect.

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