

Experimental Study of LPG Diffusion Flame at Elevated Preheated Air Temperatures

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Abstract : This paper represents an experimental study of LPG diffusion flame at elevated air preheated temperatures. The flame is stabilized in a vertical water-cooled combustor by using air swirler. An experimental test rig was designed to investigate the different operating conditions. The burner head is designed so that the LPG fuel issued centrally and surrounded by the swirling air issues from an air swirler. There are three air swirlers having the same dimensions but having different blade angles to give different swirl numbers of 0.5, 0.87 and 1.5. The combustion air was heated electrically before entering the combustor up to a temperature about 500 K. Three air to fuel mass ratios of 30, 40 and 50 were also studied. The effect of air preheated temperature, swirl number and air to fuel mass ratios on the temperature maps, visible flame length, high temperature region (size) and exhaust species concentrations are studied. Some results show that as the air preheated temperature increases, the volume of high temperature region also increased but the flame length decreased. Increasing the air preheated temperature, EINO_x, EICO₂ and EIO₂ increased, while EICO decreased. Increasing the air preheated temperature from 300 to 500 K, for all air swirl numbers used, the highest increase in EINO_x, EICO₂ and EIO₂ are 141, 4 and 65%, respectively.

Keywords : air preheated temperature, air swirler, flame length, emission index

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