Methane hydrogen laminar burning velocity blending laws in horizontal open-ended flame tube rig

ABSTRACT

Different fuel properties and chemical kinetics of two different fuels would make it challenging to predict the combustion parameters of a binary fuel. Understanding the effect of blending methane and hydrogen gas is the main focus of this paper. Utilizing a horizontal tube combustion rig, methane-hydrogen fuel blends were created using blending laws from past literature, over a range of equivalence ratios from 0.6 – 1.2 were studied, while keeping one combustion parameter constant, the theoretical laminar burning velocity. The selected theoretical laminar burning velocity for all the mixtures tested were kept constant at 0.6 ms-1. Different factors affected the flame propagation across the tube, including acoustic pressure oscillations, heat loss from the rig, and obvious difference in hydrogen percentage in the fuel blends. The average experimental laminar burning velocity of all the flames was 0.368 ms-1, compared to the expected value of 0.6 ms-1. In an attempt to keep the theoretical laminar burning velocity constant for different mixtures, it was discovered that this did not promise the same flame propagation behaviour for the tested mixtures. Further experimentation and analysis are required in order to better understand the underlying interaction of the fuel blends.