COMPARISON OF RADIATION MODELS ON TURBULENT NON-PREMIXED FLAME DLR-A

Naveen Kumar*, Shesh N. Dhurandhar, Ankit Bansal, Atharva D. Ghadge, Sudhang Varshney

Indian Institute of Technology, Roorkee 247667, Uttrakhand, INDIA

ABSTRACT. In this work, numerical simulation of a Turbulent Non-premixed Flame (TNF) is carried out with and without consideration of radiation effects. An axi-symmetric TNF surrounded by air-coflow known as flame DLR-A [1] is considered. The models employed for the turbulence and combustion are standard $k-\varepsilon$ and the Eddy Dissipation Concept (EDC). The temperature along the centreline of the flame obtained from the simulation (without radiation) is compared to the experimental data [1]. This flame produces combustion gases, such as H$_2$O, CO$_2$, CO, CH, OH and others. The main participating gases for radiative heat transfer are CO$_2$ and H$_2$O. The radiative heat flux at the domain boundary will be calculated with the Spherical Harmonic Method ($P_1$) [2] and the Imaginary Plane Method (IPM). For the non-gray gas mixture, the weighted-sum-of-gray-gases (WSGG) model [3] and the $k$-distribution model [4] employed to calculate the properties of the gas. The figure 1 shows the variation of temperature along the central axis and found to be in good agreement with the experimental result.

Figure 1. Temperature along the central axis

REFERENCES


* Corresponding Author: 2008.naveen@gmail.com