International Journal of Current Engineering and Technology
E-ISSN 2277 - 4106, P-ISSN 2347 - 5161

Available at http://inpressco.com/category/ijcet

Research Article

Theory Comparison between Propane and Methane Combustion inside the Furnace

Dhafer A. Hamzah†*

†Al-Qadisiyah University, College of Engineering, Iraq

Accepted 01 July 2015, Available online 11 July 2015, **Vol.5, No.4 (Aug 2015)**

Abstract

This study used ANSYS FLUENT to model the transport, mixing, and reaction of chemical species. The reaction system was defined by using and modifying a mixture-material entry in the ANSYS FLUENT database. The study used propane C_3H_8 for simulation of hydrocarbon combustion and comparison the results with another study for methane CH_4combustion for find the difference in combustion temperature and effect of change in specific heat as a function of temperature. The study found that the maximum temperature for propane is less than methane for both states in constant and change of specific heat, and the reason for this attribute because of methane has octane number higher than propane and this effects on flame propagation speed and flame temperature also we note the distribution of maximum temperature is mostly near to wall and axis region as shown in the results . This distribution helps to know where will be the maximum temperature for varies applications. Also the NOx production in this study was dominated by the thermal NO mechanism. This mechanism is very sensitive to temperature. Every effort should be made to ensure that the temperature solution is not over predicted, since this will lead to unrealistically high predicted levels of NO. Because of all this the emission of NOx for methane is more than propane as result for high temperature for methane combustion

Keywords: *Propane, Methane Combustion etc.*

Background

Propane has been tested in fleet vehicles for a number of years. It's a good high octane number for SI engine fuel and produces less emission than gasoline about 60% less co, 30%less HC, and 20%less NOx **(Pulkrabek).**Propane stored as a liquid under pressure and delivered through a high pressure line to the engine. In this study, you will use the generalized eddy-dissipation model to analyze the methane-air combustion system. The combustion will be modeled using a global one step reaction mechanism, assuming complete conversion of the fuel to CO2 and H2O. The reaction equation is

$$C_3H8 + 5O2 \rightarrow 3CO2 + 4H2O \quad (1)$$

This reaction will be defined in terms of stoichiometric coefficients, formation enthalpies, and parameters that control the reaction rate. The reaction rate will be determined assuming that turbulent mixing is the rate-limiting process, with the turbulence-chemistry interaction modeled using the eddy-dissipation model.

*Corresponding author: **Dhafer A. Hamzah**

Problem Description

The cylindrical combustor considered in this study **(Ansys inc.)** is shown in **Figure 1**.

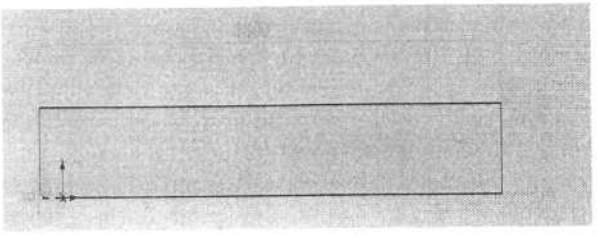

Figure 1 Problem description

The flame considered is a turbulent diffusion flame. A small nozzle in the center of the combustor introduces propane (C_3H_8) at 80 m/s. Ambient air enters the combustor coaxially at 0.5 m/s. The overall equivalence ratio is approximately 0.76 (approximately 28% excess air). The high-speed methane jet initially expands with little interference from the outer wall, and entrains and mixes with the low-speed air. The Reynolds number based on the methane jet diameter is approximately 5.7×10^3.