

Reduction of production of nitrogen oxides and soot in Non-Permixed combustion chamber of methane/air using water injection

Saeid Reihanpour^{1,*}, Ali Ershadi²

¹ Department of Mechanical Engineering, Dezful Branch, Islamic Azad University, Dezful, Iran

² Department of Mechanical Engineering, Dezful Branch, Islamic Azad University, Dezful, Iran

Abstract

The main objective of the present paper is to reduce the pollutants of nitrogen oxides and soot in the combustion chamber by using a water inlet air inlet (relative humidity) to the compartment. In this regard, is taken from reference laboratory research a non-Permixed axisymmetric combustion chamber with gas fuel (methane). Have been used for turbulence of flow, the model of two equations $k-\epsilon$ in standard and realizable methods, and for the reaction rate, two combustion models of eddy dissipation model (EDM) and probability density function (PDF). The results of modeling showed that is the most accurate model for the turbulence $k-\epsilon$, realizable and for combustion, PDF. In objective to reduce of pollutants, was considered the relative humidity of the inlet air in six different amounts from zero to 100 percent. The results showed that are observed by increasing the relative humidity of the inlet air, a slight decrease in temperature and consequently a big decrease in pollutants such as nitrogen oxide and soot in the chamber. The reason for reducing NO and soot can be, a decrease in maximum temperature of the chamber due to the evaporation of water injected, as well as the reduction of carbon contained in the chamber, respectively. The amount of temperature reduction due to air humidity (from 0 to 100%) was 1%, while for NO and soot it was 67.5% and 71.8%, respectively. The lack of thermal efficiency and the big reduction of NO and soot show useful of the above method to reduce pollutants.

*Corresponding author: s.reihanpour@gmail.com

Keywords: Non-Permixed combustion, Relative humidity, Reduction pollutants, NO_x, Soot.

Please cite this article as:

S. Reihanpour, A. Ershadi, Reduction of production of nitrogen oxides and soot in Non-Permixed combustion chamber of methane/air using water injection, Journal of Energy Conversion, 2(3,4), 1-10 [In Persian]