Accepted Manuscript

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PII: S1743-9671(16)30488-3

DOI: 10.1016/j.joei.2016.10.004

Reference: JOEI 276

To appear in: *Journal of the Energy Institute*

Received Date: 22 August 2016

Revised Date: 18 October 2016

Accepted Date: 19 October 2016

Please cite this article as: M. İlbaş, M. Şahin, S. Karyeyen, 3D Numerical modelling of turbulent biogas combustion in a newly generated 10 kw burner, *Journal of the Energy Institute* (2016), doi: 10.1016/j.joei.2016.10.004.

3D NUMERICAL MODELLING OF TURBULENT BIOGAS COMBUSTION IN A NEWLY GENERATED 10 KW BURNER

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Abstract

This study concentrates on the 3D numerical modelling of combustion of different biogases in a generated burner and combustor. The main goal of this study is to investigate the combustion characteristics (such as temperature and emissions) of biogases through a combustor due to depletion of natural gas. Moreover, the effect of the preheated air on flame temperatures of biogases have been studied in the present study. Finally, the effect of H_2S amount in biogas on SO_2 emissions has been investigated within these predictions. The numerical modelling of turbulent diffusion flames has been performed by using the standard k–ε model of turbulent flow, the PDF/Mixture Fraction combustion model and P-1 radiation model in the combustor. A CFD code has been used for all predictions. Temperature gradients have been determined on axial and radial directions for better understanding combustion characteristics of biogases. Modelling has been studied for thermal power of 10 kW and excess air ratio of λ= 1.2 for each biogas combustion. The first finding is that combustion of biogases is possible via the newly generated burner. Moreover, the results show that the one of biogas is very close to methane in terms of temperature distributions in the combustor due to including high amount of methane compared to other biogases. It is also concluded that the flame temperatures of biogases increase with preheating the combustion air as expected. It is finally revealed that SO_2 emissions increase as amount of H_2S in biogas is increased through the combustor.

Keywords: Biogas, Burner, Combustion, Emission, CFD Modelling

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