SUMMARY

Beryl Cholif Arrachman, Mechanical Engineering Department, Faculty of Engineering, Brawijaya University, December 2017, Heating System Efficiency Analysis of Bunsen Burner using LPG Fuel with CO_2 Addition. Adviser Lecturer: Agung Sugeng Widodo, Fikrul Akbar Alamsyah.

In the world of energy conversion, combustion phenomenon has become a frequently discussed topic, where the definition of burning itself is a rapid oxidation reaction between fuel and air or oxygen that generates heat and light. Bunsen burner is a tool used to examine premixed flames where the fire is produced out of the burner nozzle.

In this research, effects of CO_2 addition in the combustion process towards the heating system efficiency and flame characteristics using LPG as a fuel is examined. The combustion that resulted from using a bunsen burner is a premixed combustion, where premixed combustion is a combustion where the fuel and oxidants (oxygen or air) mix completely and then burn in the reaction zone, then the normal speed of the premixed reactant that flows into the fire zone may also be examined. The aforementioned combustion process will be used to heat water contained in a vessel, which then the thermal efficiency of the heating system may be examined. During this research, effects of CO_2 addition is also analyzed, where during combustion in general, CO_2 will act as an inhibitor and would then disrupt the reaction process, but it is also found that during the combustion process of a biogas, which is a mixture of methane (CH_4) and carbon dioxide, the composition of CO_2 does not fully give negative effects to the whole combustion process, therefore more researches would be needed to further study the effects of CO_2 addition in a combustion process.

On the tests that are carried out in this research, the CO_2 flow will be varied to the fuel and air flow, which is 10%,8%,6%,4%, and 2%. During the thermal efficiency sistem test an equivalence ratio of 1,03 is used which is acquired from the whole reactants mixture. For flame visualization, air and CO_2 flow is varied with a constant fuel flow. The fuel flow used will be at 0,2 NL/min. The resulting equivalence ratio from the mixture of reactants are 0,88 ; 0,95 ; 1,03 ; 1,12 ; 1,23 then the visual data is taken by means of a camera. The visual image is further processed using an autocad 2016 apllication.

The results show that as the amount of CO_2 increases, thermal efficiency would rise. The varied equivalence ratio would cause alterations on the flame visualization where at equivalence ratio 0,95 the observed flame gives off the highest laminar flame speed and temperature, but the resulting flame height is lowest, this shows that optimum combustion occurs at such condition. The increasing amount of CO_2 causes flame height to increase, but flame temperature and laminar flame speed to decrease.

Keywords: *Bunsen burner*,CO_2, LPG, Efficiency, Flame Characteristics