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FEM Simulation of Microcombustor based Thermoelectric Generator by using CFD fluent

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Abstract - *Electricity generation by using ecofriendly sources becoming vital day by day in last few decades. Thermoelectric generator is new alternative to the batteries. Thermoelectric generators converts thermal energy from the heat source into electricity directly. They are pollution free and free from noise. In this paper detail investigation has been done of microcombustor based TEG. Spreader effect is also included in this study. Steady state thermal and nonlinear behavior is analyzed for heat transfer and electric.*

Key Words: *CFD, Heat transfer, Microcombustor, Spreader, Thermoelectric*

1.INTRODUCTION

There is vast scope and motivation to form ignition primarily based convenient power producing frameworks within the previous decades due to the quick flip of events and execution of miniature mechanical device frameworks (MEMS) in several stages and tiny force necessity by these frameworks for its activity. The employment of standard chemical science batteries as a power supply is restricted in different military, aviation and freelance applications because of its intrinsic disservices, for example, long energizing time, low vitality thickness and antagonistic ecological effects [1]. Organic compound fuel-based force source with a amendment productivity of 5%, would induce multiple times higher force thickness than leading edge chemical science battery concepts Therefore, burning primarily based frameworks for power age are viewed as an acceptable possibility in distinction to ancient electrochemical batteries owing to their powerful thickness, light-weight weight and conservative size [2]. The power delivered by completely different traditional electrochemical batteries features a aslope unharness bend and it falls unendingly in the course of its release cycle as appeared in. This might provide ascent to different problems within the framework execution, particularly those requiring the same voltage graciously all through their activity. Hence, the burning based micropower generators could provides a superior option as they are equipped for giving a gentle force in the course of the operational time with least energize time [3]. Examination is completed on power age utilizing thermoelectrical modules around microcombustor. Aim was to created burning primarily based miniature force generator as another to the chemical science batteries. Results shows power ages for various lamb modules once introduced with external facet of microcombustor.The ability yield foursquare depends on temperature distinction among hot and cold side [4]. Model of micropower generator with incorporated microcombustor is dissected. The new model improved execution concerning temperatures and different important angles. A conservativeness of framework are going to be valuable for the transportable applications. A epic microcombustor utilized with 2 TEG modules within the framework [5].

1.1 THERMOELECTRCITY AND MATERIALS

Thermoelectric effect is defined because the direct conversion of temperature differences to electric voltage and the other way around. A thermoelectric device creates a voltage when there's a special temperature applied on either side. Conversely, when a voltage is applied to such a tool, it creates a temperature difference. At the atomic scale, an applied gradient causes charge carriers within the material to diffuse from the new side to the cold side, thus inducing a thermal current, which is comparable to a classical gas that expands when heated, leading a flux of the gas molecules. This effect are often accustomed generate electricity, measure temperature, or change the temperature of objects.

2. COMPUTATIONAL DETAILS

2.1 Velocity Propagation

Color contour shows Temperature distribution of flame propagation throughout Combustor which gives input data for Multiphysics simulation in term of heat flux, heat transfer coefficient and temperature in steady state / pressure base based condition. Figure 2.1.1 shows Color contour shows Velocity distribution after combustion.

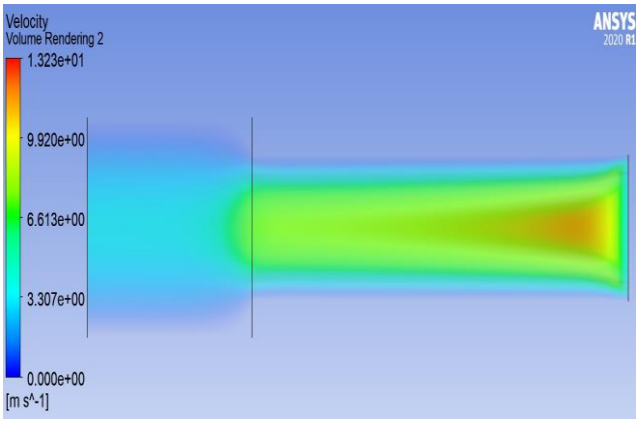

Fig- 2.1.1: Velocity Propagation

2.2 Current density and other Electrical Parameters

Current density plays important role in simulation. It is nothing but the amount of charge per unit time that flows through a unit area of a chosen cross section. Figure 2.2.1 shows total current density. Whereas Vector represent flow of current and their localized current density. The current density vector is a vector whose magnitude is the electric current per cross-sectional area at a given point in space, its direction being that of the motion of the positive charges at this point. Figure 2.2.2 shows density vector while voltage induced in TEG is shown in Figure 2.2.3 .The space around an electric charge in which its influence can be felt Electric field intensity as shown in figure 2.2.4

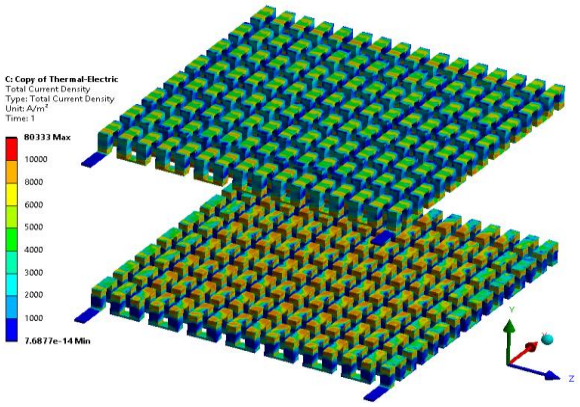

Fig- 2.2.1: Total Current Density

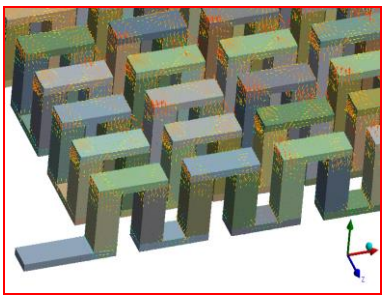

Fig- 2.2.2 Total current density vector distribution

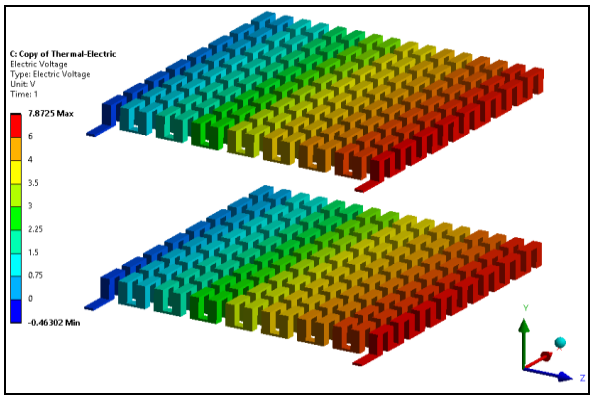

Fig- 2.2.3 Electric voltage induced in TEG

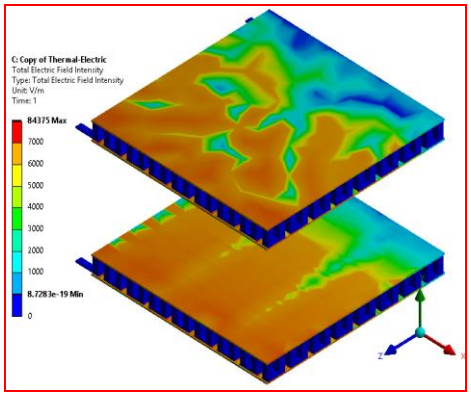

Fig-2.2.4: Electric field intensity

3. CONCLUSION

Detail FEM analysis of Microcombustor based Thermoelectric generator configuration using CFD FLUENT carried out in this paper. Also Simulation has been done using Ansys in order to obtain various results. The Voltage and various other parameter distribution are presented with the help of computational details. Electrically vital parameters are analyzed and presented with the values. The computational details gives total elaboration of Heat transfer process within the system.

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