ABSTRACT

Refrigeration process is a process of heat transfer from an object or a room into surrounding environment so that the room or object temperature is lower than the temperature of its surrounding. In our daily lives vapor compression refrigeration system which potentially causes the destruction of ozone layer is widely used. This final project designs and implements a cooling system which is environmentally friendly by using thermoelectric cooler modul (TEC), a device that converts electrical voltage into a temperature differences between the two sides of the thermoelectrics. In this final project, the cooling system consists of a styrofoam box with a size of 11 x 11 x 14 cm , a TEC , a heat sink, an external fan, and an internal fan. The cooling process in side the box is generated by the cold side of the TEC while the heat distribution in the hot side of TEC occurs via conduction and convection process. Furthermore, the effect of electric input to the cooling process is tested by a voltage variation of 2 V – 12 V for 30 minutes. It is observed that the voltage of 12 V is able to decrease the temperature down to 10.7° C. The system is modeled using COMSOL to describe the temperature distribution in the system. It is found that the steady state has an average temperature of 11° C which is achieved within 1800 seconds. The cooling process can be more effective if a better heat distribution to the environment is created. The simulaion shows that an average temperature of 0° C is achieved if the hot side of the TEC is set to 30° C.

Keywords: Refrigeration, thermoelectric, COMSOL®