World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:10, No:01, 2016

Energy Efficient Refrigerator

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Abstract : In a world with constantly growing energy prices, and growing concerns about the global climate changes caused by increased energy consumption, it is becoming more and more essential to save energy wherever possible. Refrigeration systems are one of the major and bulk energy consuming systems now-a-days in industrial sectors, residential sectors and household environment. Refrigeration systems with considerable cooling requirements consume a large amount of electricity and thereby contribute greatly to the running costs. Therefore, a great deal of attention is being paid towards improvement of the performance of the refrigeration systems in this regard throughout the world. The Coefficient of Performance (COP) of a refrigeration system is used for determining the system's overall efficiency. The operating cost to the consumer and the overall environmental impact of a refrigeration system in turn depends on the COP or efficiency of the system. The COP of a refrigeration system should therefore be as high as possible. Slight modifications in the technical elements of the modern refrigeration systems have the potential to reduce the energy consumption, and improvements in simple operational practices with minimal expenses can have beneficial impact on COP of the system. Thus, the challenge is to determine the changes that can be made in a refrigeration system in order to improve its performance, reduce operating costs and power requirement, improve environmental outcomes, and achieve a higher COP. The opportunity here, and a better solution to this challenge, will be to incorporate modifications in conventional refrigeration systems for saving energy. Energy efficiency, in addition to improvement of COP, can deliver a range of savings such as reduced operation and maintenance costs, improved system reliability, improved safety, increased productivity, better matching of refrigeration load and equipment capacity, reduced resource consumption and greenhouse gas emissions, better working environment, and reduced energy costs. The present work aims at fabricating a working model of a refrigerator that will provide for effective heat recovery from superheated refrigerant with the help of an efficient de-superheater. The temperature of the refrigerant and water in the de-super heater at different intervals of time are measured to determine the quantity of waste heat recovered. It is found that the COP of the system improves by about 6% with the de-superheater and the power input to the compressor decreases by 4 % and also the refrigeration capacity increases by 4%.

Keywords : coefficiency of performance, de-superheater, refrigerant, refrigeration capacity, heat recovery
Conference Title : ICNIME 2016 : International Conference on Nanomechanical Interfaces and Mechanical Engineering
Conference Location : San Diego, United States
Conference Dates : January 21-22, 2016