

Theoretical study in efficiency of modified Zeer refrigerator

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Zeer refrigerator is an evaporative cooling system which use evaporation of water to lower temperature inside the refrigerator. Its rate of evaporation which affects rate of heat loss depends on surface area of the refrigerator. Conventional Zeer refrigerator can't be built in large scale because its efficiency and terminal temperature difference between inside refrigerator and ambient environment drops as the rate of heat loss per volume decreases to the point where its efficiency isn't suitable for vegetable preservation. We interest in developing Zeer refrigerator with greater efficiency by increasing the surface area to volume ratio of the refrigerator. We develop theoretical model which is used to study the effect of the dimension of Zeer refrigerator, ambient temperature and relative humidity on the temperature difference of the refrigerator. The results from theoretical model are matched with results from experiments performed on prototype of Zeer refrigerator. The results from theoretical model show that Zeer refrigerator will operate with high efficiency at high ambient temperature and low relative humidity. Modified Zeer refrigerator has greater efficiency compare to conventional Zeer refrigerator. The difference in efficiency becomes significant when the refrigerator is built in large scale. Therefore, modified Zeer refrigerator is possible to be built in large scale while having efficiency viable to preserve vegetable.

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