

## Theoretical study in efficiency of modified Zeer refrigerator

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Zeel 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 Zeel 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 Zeel 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 Zeel 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 Zeel refrigerator. The results from theoretical model show that Zeel refrigerator will operate with high efficiency at high ambient temperature and low relative humidity. Modified Zeel refrigerator has greater efficiency compare to conventional Zeel refrigerator. The difference in efficiency becomes significant when the refrigerator is built in large scale. Therefore, modified Zeel refrigerator is possible to be built in large scale while having efficiency viable to preserve vegetable.

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