STUDY THE PERFORMANCE OF CYCLONE SEPARATOR AND GRAVITY SETTLING CHAMBER ON ICE PLANT

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ABSTRACT

Liquid particles entrainment in gas flow can cause substantial problems in process plant operations which use vapour compression refrigeration systems if not properly separated from the gas stream. The conventional gravity settling chamber has the advantages of simple construction, low initial cost, low maintenance cost, and low pressure drop. However, they are large, heavy and expensive to purchase and operate. On the other hand, the cyclone separator is a simple, compact, low weight, low cost and high efficiency separator. This research demonstrates that the implementation of cyclone separators improves the liquid separation process from the gas stream in vapor compression refrigeration system, compared to the conventional gravity settling chambers. Therefore, it is gaining in popularity as an attractive economical alternative to the conventional separator. Models of the gravity separator and the cyclone separator are proposed and then used for a parametric study of the performance under different conditions. The comparison of the two separators is made by running several design and operational data using MATLAB. The results have shown a better performance in the cyclone separator with the variation of particle diameter and the gas-liquid mixture inlet velocity more than the gravity settling chamber.

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CHAPTER 5
CONCLUSIONS AND FUTURE WORK

This research consists of fundamental study of Gas-Liquid cyclone separator for evaporator entrainment in vapor compression refrigeration cycles at different suction pressures and different particles diameter. The study measurements of these efficiencies were obtained at pressure ratios varying from P = 0.5 to 1.4 bar and particles diameter of 60 - 100μm.

From the results obtained, the following are the main conclusions:

1- It is verified that the cyclone separator is better in performance than the gravity separation method.
2- As the inlet velocity increases, the settling velocity of gravity settling chamber decreases and an increase is noted in the settling velocity of the cyclone separator.
3- The increase in inlet velocity results in a better collection efficiency for the cyclone separator than the gravity settling chamber.
4- Cut point diameter decrease has a positive effect on settling velocity and the collection efficiency of the cyclone separator.
5- Formation of bigger particles results in better performance for both separators.

5.1 Suggestions for further Work

The gas-liquid separator models characteristics proposed in this research are analyzed using MATLAB software, which need to be validated through experimental analysis. To further validate these characteristics; experiments involving different operational conditions should therefore be performed.

Further studies and experiments on the flow characteristics inside the two type gas-liquid separators should be performed.