شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

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شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

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بعض الوثائق
الاصلية تالفة

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بالرسالة صفحات

لم ترد بالاصل

Mansoura University
Faculty Of Engineering
Mechanical Power Engineering Department

USING OF REFRIGERATING SYSTEMS FOR WATER CONDENSING OUT FROM MOIST AIR.

By

ENG. MOHAMED MAHMOUD ABD-EL RAOUF.

Thesis

Submitted in partial fulfillment of the requirements for the degree of master of science in mechanical engineering.

Under Supervision of

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Mansoura - Egypt.

1995

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TO THE
SPIRIT
OF MY
PARENTS

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ABSTRACT

The present study is dealing with the extraction of water from atmospheric moist air, in which a theoretical analysis is made to study the optimum values of condensate recovery (λ).

A mathematical model, based on the thermodynamics of simple vapour compression refrigeration cycle is used to serve all the cases studied in this work, using refrigerant (R12) to cool the atmospheric moist air in order to condensate the moisture from it.

The cases studied in this work are divided into three cases. In **Case I** the atmospheric moist air flows through the cold evaporator in which the temperature is reduced below air dew point, the condensation of moisture occurs and the outlet air drown to atmosphere, and/or the cooled outlet air flows from the evaporator to cool the condenser in **Case II** while in **Case III** this cooled air is used to cool the inlet atmospheric moist air without mixing them.

Many parameters have affected the process of condensation of moisture such as moist air state (dry bulb temperature (t_a), relative humidity (R.H.)), evaporator temperature (t_e), condenser temperature (t_c) and the design of the refrigeration system specially the evaporator and the condenser ***(i.e. temperature difference between refrigerant and air in both of them (Δt_{ar})).***

To make this study more useful for the MIDDLE EAST AREA and GULF COUNTRIES too, the range of moist air temperature (t_a) has been chosen between 20°C up to 50°C and the relative humidity (R.H.) between 10% up to 90%.

The calculated data is listed in tables and plotted in graphs as a relation between condensate recovery (λ) and its maximum value (λ_{max}) with the other parameters. It is seen from these results that (λ) increases with the decrease of evaporator temperature (t_e) up to a maximum value and then it decreases with further decrease of (t_e). The calculated results show also that (λ) along-with (λ_{max}) increase with (R.H.) and ambient temperature (t_a). It is shown also that the condensate recovery (λ) and its maximum value (λ_{max}) in **Case II** are higher than these in **Case I**, and (λ) & (λ_{max}) in **Case III** are the highest compared with **Case I** and **Case II** for the same conditions. The increase in (λ_{max}) in **Case II** over that in **Case I** is ranged between 8 : 10 % and the increase in **Case III** over that in **Case I** is in the range between 24 % to 50 %, also the condensate recovery (λ) as well as its maximum value (λ_{max}) are increased with the decrease of Δt_{ar} (terminal temperature difference) in case I only.

The correlations to calculate the maximum condensate recovery for the three cases ar found as follows.

$$\boldsymbol{\lambda_{max} = A.\ EXP(B.\ (R.H.) + C.\ \Delta t_{ar})}$$

where :

<u>In case I</u> :

$A = (5.8388\ t_a - 30.57).\ 10^{-6}$

$B = (0.07865 - 0.0013\ t_a + 1.557\ .\ 10^{-5} t_a^2)$

$C = - 0.073$

<u>In case II</u> :

$A = (-1210.57+58.34\ t_a - 0.5682 t_a^2).\ 10^{-6}$

$B = 0.0283 + 0.00106\ t_a - 1.2 \times 10^{-5}\ t_a^2$

$C = 0$

and :

<u>In case III</u> :

$$A = (-1894.7 + 91.0779\, t_a - 0.959\, t_a^2).\ 10^{-6}$$

$$B = 0.3229 - 0.01186\, t_a + 1.32 \times 10^{-4}\, t_a^2$$

$$C = 0$$

Finally it is found that for λ_{max} the ratio between the absolute value of evaporator temperature and moist air temperature (T_e / T_a) depends only on the relative humidity (R.H.), and a correlation between (T_e / T_a) and (R.H.) is found.

$$\boxed{T_a / T_e = 1.449\, (R.H.)^{-0.08}}$$

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