

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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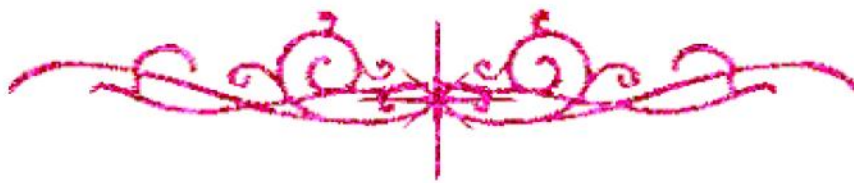
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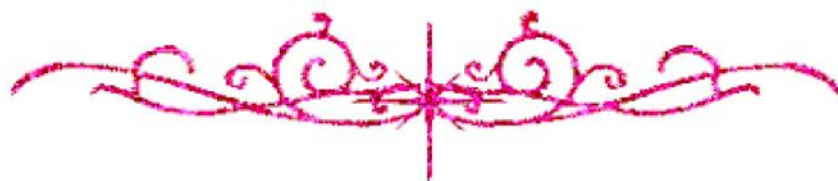


بعض الوثائق الأصلية تالفة





بالرسالة صفحات
لم ترد بالأصل





AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

**Effect of Fins Material on the Performance of
Stratified Chambers Gas to Gas Heat Exchanger
with Porous Medium**

A Thesis Submitted in Partial Fulfillment of the
Requirement of the Degree of Master of Science in
Mechanical Engineering

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STATEMENT

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The author carried out the work included in this thesis, and no part of it has been submitted for a degree or qualification at any other scientific entity.

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Thesis Summary

An experimental study was carried out to investigate the effect of fin material on the performance of stratified chambers gas to gas heat exchanger with and without porous media. The target of these experiments was to study the change of the rate of heat transfer under different hot and cold air stream rates, different porous material thicknesses and different hot air inlet temperatures. Using two different fin materials facilitate the investigation of the heat exchanger performance when using steel and aluminum fins. In addition to the heat exchanger performance in the absence of porous material and its presence is obtained. The determination of the optimum operating parameters to achieve maximum total heat recovery ratio is also investigated.

The test rig used in these experiments consists of the air supply system, flow and temperature measurement instruments, heating system with its control system and five heat exchanger chambers, each chamber provided with corrugated fins. The experimental study showed that using aluminum fins instead of steel fins had much improvement on the performance of the heat transfer rate. While adding the porous material to the heat exchanger chambers leads to improvement of the heat transfer rate on the expense of an increase in pressure drop.

In case of aluminum fins, the porous material thickness is 70 mm and the hot air stream inlet temperature is 400°C, the heat recovery ratio increased to 0.822, at 0.5 m³/min volume flow rate of the cold and hot air streams. While in case of steel fins with the same conditions of the hot air inlet temperature, porous material thicknesses and the volume flow rates of the cold and hot air

streams, the heat recovery ratio was 0.537. It is concluded that in aluminum fins case the heat recovery ratio increases by approximately 53% of the case of the steel fins.

Keywords:

Heat exchanger, aluminum fins, steel fins, porous material, heat transfer.

Nomenclature

\dot{m}	Air mass flow rate.....	kg/se c.
$c_{p,c}$	Cold air specific heat capacity at constant pressure.....	J/kg. K
$c_{p,h}$	Hot air specific heat capacity at constant pressure.....	J/kg. K
$T_{c,i}$	Cold air inlet temperature.....	°C
$T_{c,o}$	Cold air outlet temperature.....	°C
\bar{T}_c	Average cold air temperature.....	°C
$T_{h,i}$	Hot air inlet temperature.....	°C
$T_{h,o}$	Hot air outlet temperature.....	°C
\bar{T}_h	Average hot air temperature.....	°C
H_R	Heat recovery ratio.....	--
Q_h	Rejected heat rate by the hot air.....	Watt
Q_c	Heat recovery rate. Heat gained by the cold air.....	Watt
Q_{hc}	Rate of heat transfer from the hot air to the cold air.....	Watt
$\%Q_{loss}$	Percentage of heat loss.....	%

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