研究生: 李旺朝

研究生(英文姓名): Wang-Chao Lee

論文名稱: 電液動力(EHD)熱傳增強技術用於殼管式冷凝器性能提升之探討

英文論文名稱: Experimental Study of EHD Enhanced Technique for The performance Promotion o

指導教授: 黃博全

學位類別: 碩士

校院名稱: 國立臺北科技大學

系所名稱: 冷凍空調工程系所

學號: 91458520

學年度: 93

語文別: 中文

論文頁數: 80

關鍵詞: 電液動力 ; 熱傳增強 ; EHD冷凝器

英文關鍵詞: Electro-hydrodynamic ; Enhanced heat transfer ; EHD Condenser

被引用次數: 0

[摘要]

開發提升熱交換器熱傳遞效率之新技術，乃是當今環保與節能的重要課題。先進電液動力EHD (Electro-hydro-dyn
邊界層，使之產生較大擾動及液體擷取現象，達到熱傳增強的效果，但所造成的壓降卻很小，甚能符合環保節能的
本研究以實驗的方法，對EHD技術應用於冰水主機冷凝器熱傳增強性能之可行性進行研究探討。研究方式以R-22冷
EHD之熱傳增強電極，將EHD技術植入冰水主機之冷凝器中，建立具EHD冷凝器雛型機系統，再以實測評估EHD技
驗結果顯示，EHD冷凝器之冷卻能力會隨輸入電壓的增加而增加，其最佳冷卻能力爲未投入EHD電壓時的104.3%
之消耗電力僅97瓦。綜言之，本研究研製之EHD冷凝器雛型機，受有限經費及時間的限制，雖性能提升不十分明顯
可行的。

[英文摘要]

For both environmental protection and energy saving, the heat exchangers with high efficiency have become an
(EHD) technique applies in condensation, utilizes an electric field to destabilize the thermal boundary layer near t
and liquid extraction phenomenon, and leading to substantially higher heat transfer rate at the wall without signifi
In this study, the effect of applying EHD technique to condenser of commercial chiller was investigated by experi
condenser where the EHD enhanced heat transfer tubes were installed. The working fluid was R-22. The EHD e
energy-savings efficiency of the condenser was checked. The experimental result showed that the cooling capac
increased. Finally, a 1.043-fold enhancement of cooling capacity, with 1.0% consumptive energy increase and 9
uncharged electrodes. In summary, despite the increase in performance observed was not as obvious as predict
experimental results proved that the EHD technique is a feasible application in increasing condenser performanc

[論文目次]

[參考文獻]

[1] Velkoff, H. R., Miller, J.H., "Condensation of Vapor on a Vertical Plate with a Transverse Electrostatic Field” pp. 197-201.

[2] Choi, H. Y., ” Electrohydrodynamic Condensation Heat Transfer”, Journal of Heat Transfer, Transactions c

[3] Didkovsky, A. B., Bologa, M. K., “Vapor Film Condensation Heat Transfer and Hydrodynamics under the In Transfer , Vol. 24, No.5, 1981, pp. 811-819.

[4] Yabe, A., "Active Heat Transfer Enhancement by Applying Electric Fields”, ASME / JSME Thermal Enginee

[5] Sunada, K., Yabe, A., Taketani, T., and Yoshizawa, Y., “Experimental Study of EHD Pseudo-dropwise Con Thermal Engineering Conference, Vol. 3, 1991, pp. 47-53.

[6] Lovenguth, R. F., Hanesian, D., "Boiling-Heat Transfer in the Presence of Nonuniform Direct Current Electric 570-576.

[7] Kawahira, H., Kubo, Y., Yokoyama, T., Ogata, J., "The effect of an Electric Field on Boiling Heat Transfer of Applications, Vol. 26, No.2, 1990, pp. 359-365.

[8] Ohadi, M. M., Papar, R. A., Lag. T. L., Faani, M. A., Radermacher, R., "EHD enhancement of shell side boilir ASHRAE Transactions, Vol.98, Part2, 1992, pp. 427-434.

[9] Alien, P. H. G., Cooper, P., "The Potential of Electrically Enhanced Evaporators", 3"" Int. Symp. On the Large 221-229.

[10] Cooper P., "EHD Enhancement of Nucleate Boiling", J. Heat Transfer, Trans., ASME, Vol. 112, 1990, pp. 4

[11] Ohadi,M. M., Salehi, M., Dessiatoun, S., Singh, A.,” EHD-Enhanced Pool Boiling of R-123 in a Parallel Pla exchangers”, Proceedings of the ASME/JSME thermal engineering joint conference, 1995, pp. 225-232.

[12] Cooper, P., Allen, P. H. G., “The Potential of Electrically Enhanced Condensers”, Proc. 2nd Int. Symp. O

293-309.

[13] Yamashida, K., Kumagai, M.M. Sekita, S., Yabe, A., Taketani, T., and Kikuchi, K., “Heat Transfer Charact
Third ASME / JSME Joint Thermal Engineering Conference, Reno, Nevada, 1991, pp. 61-67.

[14] Yabe, A., Kikuchi, K., Taketani, T., Mori, Y., Hijikata, K., “Augmentation of Condensation Heat Transfer by
7th International Heat Transfer Conference, Vol. 5, 1982, pp. 189-194.

[15] Yabe, A., Taketani, T., Kikuchi, K., Mori, Y., Hijikata, K., “Augmentation of Condensation Heat Transfer Ar
Electrodes by Applying Non-uniform Electric Fields”, Heat Transfer Science and Technology, ed. B. Wang, 198

[16] Cheung, K., Ohada, M. M., Desssiatoum, S. V., “Boiling Heat Transfer Enhancement of R-134a in a Tube
Enhanced Heat Transfer, Vol. 3, No.4 , 1996a, pp. 301-309.

[17] Ogata, J., Iwafuji, Y., Shimada, Y., and Yamazaki. T., "Boiling Heat Transfer Enhancement in Tube-Bundle
Transactions, Vol. 98, Pan 2, 1992, pp. 435-444.

[18] 朱高照,” The Study of Electrohydrodynamic Technique for the Performance Promotion of Direct-Expansio
碩士論文，國立臺北科技大學冷凍與低溫科技研究所，台北，2002。

[19] Singh, A., Ohadi, M. M., Dessiatoun, S., “EHD Enhancement of In-Tube Condensation Heat Transfer of Al
Tubes.” ASHRAE Transactions Vol. 103, 1997, pp. 1-11.

[20] J. Trommelmans, and J. Berghmans, “Influence of Electric Fields on Condensation Heat Transfer of Nonc
International Heat Transfer Conference, San Francisco, C.A. U.S.A., vol. 6, 1986, pp. 2969-2972.