

## REFERENCES

- Ahmed, H. E., Mohammed, H. A., & Yusoff, M. Z. (2012). An overview on heat transfer augmentation using vortex generators and nanofluids: Approaches and applications. *Renewable & Sustainable Energy Reviews*, *16*(8), 5951-5993. doi: 10.1016/j.rser.2012.06.003
- Arora, A., Subbarao, P. M. V., & Agarwal, R. S. (2016). Development of parametric space for the vortex generator location for improving thermal compactness of an existing inline fin and tube heat exchanger. *Applied Thermal Engineering*, *98*, 727-742. doi: 10.1016/j.applthermaleng.2015.12.117
- Atkinsona, K., Drakulic, R., Heikal, M., & Cowell, T. (1998). Two-and three-dimensional numerical models of flow and heat transfer over louvred fin arrays in compact heat exchangers. *International Journal of Heat and Mass Transfer*, *41*(24), 4063-4080.
- Bahrami, S., Rahimian, M. H., Mohammadbeigi, H., & Hosseinimanesh, H. (2012). Thermal-Hydraulic Study of Multi-Louvered Fins in Compact Heat Exchangers and Recommendations for Improvement. *Journal of Enhanced Heat Transfer*, *19*(1), 53-61. doi: 10.1615/JEnhHeatTransf.2011002708.
- Bilirgen, H., Dunbar, S., & Levy, E. K. (2013). Numerical modeling of finned heat exchangers. *Applied Thermal Engineering*, *61*(2), 278-288.
- Blecich, P. (2015). Experimental investigation of the effects of airflow nonuniformity on performance of a fin-and-tube heat exchanger. *International Journal of Refrigeration*, *59*, 65-74.
- Box, G. (1951). WKB on the experimental attainment of optimum conditio. *Journal of the Royal Statistical Society: Series B (13)*, *1*, 20.
- Caliskan, S. (2014). Experimental investigation of heat transfer in a channel with new winglet-type vortex generators. *International Journal of Heat and Mass Transfer*, *78*, 604-614.

- Čarija, Z., Franković, B., Perčić, M., & Čavrak, M. (2014). Heat transfer analysis of fin-and-tube heat exchangers with flat and louvered fin geometries. *International Journal of Refrigeration*, 45, 160-167.
- Çengel, Y. A. (2008). *Introduction to thermodynamics and heat transfer*. Boston: Irwin/McGraw-Hill.
- Chang, Y.-J., & Wang, C.-C. (1996). Air side performance of brazed aluminum heat exchangers. *Journal of Enhanced Heat Transfer*, 3(1), 15-28. doi: 10.1615/JEnhHeatTransf.v3.i1.20
- Chang, Y.-J., & Wang, C.-C. (1997). A generalized heat transfer correlation for louver fin geometry. *International Journal of Heat and Mass Transfer*, 40(3), 533-544.
- Chen, H.-T., & Hsu, W.-L. (2007). Estimation of heat transfer coefficient on the fin of annular-finned tube heat exchangers in natural convection for various fin spacings. *International Journal of Heat and Mass Transfer*, 50(9), 1750-1761.
- Cho, H., Kim, T., Kim, J., Lee, C., & Choi, J. (2014). Simulation Results for the Effect of Fin Geometry on the Performance of a Concentric Heat Exchanger. *International Journal of Air-Conditioning and Refrigeration*, 22(04), 1450026.
- Dezan, D. J., Salviano, L. O., & Yanagihara, J. I. (2016). Heat transfer enhancement and optimization of flat-tube multilouvered fin compact heat exchangers with delta-winglet vortex generators. *Applied Thermal Engineering*, 101, 576-591. doi: 10.1016/j.applthermaleng.2015.12.107.
- Dong, J. Q., Chen, J. P., Chen, Z. J., Zhang, W. F., & Zhou, Y. M. (2007). Heat transfer and pressure drop correlations for the multi-louvered fin compact heat exchangers. *Energy Conversion and Management*, 48(5), 1506-1515. doi: 10.1016/j.enconman.2006.11.023.
- Du, X. Z., Feng, L. L., Li, L., Yang, L. J., & Yang, Y. P. (2014). Heat transfer enhancement of wavy finned flat tube by punched longitudinal vortex generators. *International Journal of Heat and Mass Transfer*, 75, 368-380. doi: 10.1016/j.ijheatmasstransfer.2014.03.081.

- Duan, F., Song, K. W., Li, H. R., Chang, L. M., Zhang, Y. H., & Wang, L. B. (2016). Numerical study of laminar flow and heat transfer characteristics in the fin side of the intermittent wavy finned flat tube heat exchanger. *Applied Thermal Engineering*, *103*, 112-127. doi: 10.1016/j.applthermaleng.2016.04.081.
- Firatligil-Durmus, E., & Evranuz, O. (2010). Response surface methodology for protein extraction optimization of red pepper seed (*Capsicum frutescens*). *LWT-Food Science and Technology*, *43*(2), 226-231.
- Gholami, A. A., Wahid, M. A., & Mohammed, H. A. (2014). Heat transfer enhancement and pressure drop for fin-and-tube compact heat exchangers with wavy rectangular winglet-type vortex generators. *International Communications in Heat and Mass Transfer*, *54*(0), 132-140. doi: <http://dx.doi.org/10.1016/j.icheatmasstransfer.2014.02.016>
- Gong, B., Wang, L.-B., & Lin, Z.-M. (2015). Heat transfer characteristics of a circular tube bank fin heat exchanger with fins punched curve rectangular vortex generators in the wake regions of the tubes. *Applied Thermal Engineering*, *75*, 224-238.
- Guide, F. U. s. (2014). Version 15, ANSYS. *Inc., April*.
- He, Y.-L., Chu, P., Tao, W.-Q., Zhang, Y.-W., & Xie, T. (2013). Analysis of heat transfer and pressure drop for fin-and-tube heat exchangers with rectangular winglet-type vortex generators. *Applied Thermal Engineering*, *61*(2), 770-783.
- He, Y., Han, H., Tao, W., & Zhang, Y. (2012). Numerical study of heat-transfer enhancement by punched winglet-type vortex generator arrays in fin-and-tube heat exchangers. *International Journal of Heat and Mass Transfer*, *55*(21), 5449-5458.
- Huisseune, H., T'Joel, C., De Jaeger, P., Ameel, B., De Schamphelire, S., & De Paepe, M. (2013a). Influence of the louver and delta winglet geometry on the thermal hydraulic performance of a compound heat exchanger. *International Journal of Heat and Mass Transfer*, *57*(1), 58-72.

- Huisseune, H., T'Joel, C., De Jaeger, P., Ameel, B., De Schampheleire, S., & De Paepe, M. (2013b). Performance enhancement of a louvered fin heat exchanger by using delta winglet vortex generators. *International Journal of Heat and Mass Transfer*, 56(1), 475-487.
- Huisseune, H., Tā, C., De Jaeger, P., Ameel, B., Demuynck, J., & De Paepe, M. (2012). Numerical study of flow deflection and horseshoe vortices in a louvered fin round tube heat exchanger. *Journal of Heat Transfer*, 134(9), 091801.
- Ibrahim, T. A., & Gomaa, A. (2009). Thermal performance criteria of elliptic tube bundle in crossflow. *International Journal of Thermal Sciences*, 48(11), 2148-2158.
- Instruments., N. (14 July 2015). What Is Data Acquisition?. Retrived from <http://www.ni.com/data-acquisition/what-is/.html>
- Jang, J.-Y., Wu, M.-C., & Chang, W.-J. (1996). Numerical and experimental studies of threedimensional plate-fin and tube heat exchangers. *International Journal of Heat and Mass Transfer*, 39(14), 3057-3066.
- Jeon, C. D., & Lee, J. (2001). Local heat transfer characteristics of louvered plate fin surfaces. *Transactions-American Society of Heating Refrigerating And Air Conditioning Engineers*, 107(1), 338-345.
- Joardar, A., & Jacobi, A. (2008). Heat transfer enhancement by winglet-type vortex generator arrays in compact plain-fin-and-tube heat exchangers. *International Journal of Refrigeration*, 31(1), 87-97.
- Joardar, H., Das, N., & Sutradhar, G. (2011). An experimental study of effect of process parameters in turning of LM6/SiC P metal matrix composite and its prediction using response surface methodology. *International Journal of Engineering, Science and Technology*, 3(8), 132-141.
- Junqi, D., Jiangping, C., Zhijiu, C., Yimin, Z., & Wenfeng, Z. (2007). Heat transfer and pressure drop correlations for the wavy fin and flat tube heat exchangers. *Applied Thermal Engineering*, 27(11), 2066-2073.

- Kakaç, S. (1981). *Heat exchangers: thermal-hydraulic fundamentals and design*: Misc-Sci/Eng.
- Karmo, D., Ajib, S., & Al Khateeb, A. (2013). New method for designing an effective finned heat exchanger. *Applied Thermal Engineering*, 51(1), 539-550.
- Khoshvaght Aliabadi, M., Gholam Samani, M., Hormozi, F., & Haghghi Asl, A. (2011). 3D-CFD simulation and neural network model for the j and f factors of the wavy fin-and-flat tube heat exchangers. *Brazilian Journal of Chemical Engineering*, 28(3), 505-520.
- Kim, Y., & Kim, Y. (2005). Heat transfer characteristics of flat plate finned-tube heat exchangers with large fin pitch. *International Journal of Refrigeration*, 28(6), 851-858.
- Kim, Y. H., Kim, Y. C., Kim, J. R., & Sin, D. S. (2004). Effects of fin and tube alignment on the heat transfer performance of finned-tube heat exchangers with large fin pitch.
- Kong, Y., Yang, L., Du, X., & Yang, Y. (2016). Impacts of geometric structures on thermo-flow performances of plate fin-tube bundles. *International Journal of Thermal Sciences*, 107, 161-178.
- Kong, Y. Q., Yang, L. J., Du, X. Z., & Yang, Y. P. (2016). Air-side flow and heat transfer characteristics of flat and slotted finned tube bundles with various tube pitches. *International Journal of Heat and Mass Transfer*, 99, 357-371. doi: <http://dx.doi.org/10.1016/j.ijheatmasstransfer.2016.04.002>
- Lauder, B., & Massey, T. (1978). The numerical prediction of viscous flow and heat transfer in tube banks. *Journal of Heat Transfer*, 100(4), 565-571.
- Leblay, P., Henry, J.-F., Caron, D., Leducq, D., Fournaison, L., & Bontemps, A. (2014). Characterisation of the hydraulic maldistribution in a heat exchanger by local measurement of convective heat transfer coefficients using infrared thermography. *International Journal of Refrigeration*, 45, 73-82.

- Lei, Y.-G., He, Y.-L., Tian, L.-T., Chu, P., & Tao, W.-Q. (2010). Hydrodynamics and heat transfer characteristics of a novel heat exchanger with delta-winglet vortex generators. *Chemical Engineering Science*, 65(5), 1551-1562.
- Li, L., Du, X., Zhang, Y., Yang, L., & Yang, Y. (2015). Numerical simulation on flow and heat transfer of fin-and-tube heat exchanger with longitudinal vortex generators. *International Journal of Thermal Sciences*, 92, 85-96.
- Lin, Z.-M., Liu, C.-P., Lin, M., & Wang, L.-B. (2015). Numerical study of flow and heat transfer enhancement of circular tube bank fin heat exchanger with curved delta-winglet vortex generators. *Applied Thermal Engineering*, 88, 198-210.
- Liu, X., Yu, J., & Yan, G. (2016). A numerical study on the air-side heat transfer of perforated finned-tube heat exchangers with large fin pitches. *International Journal of Heat and Mass Transfer*, 100, 199-207.
- Lotfi, B., Sundén, B., & Wang, Q. (2016). An investigation of the thermo-hydraulic performance of the smooth wavy fin-and-elliptical tube heat exchangers utilizing new type vortex generators. *Applied Energy*, 162, 1282-1302.
- Lotfi, B., Zeng, M., Sundén, B., & Wang, Q. (2014). 3D numerical investigation of flow and heat transfer characteristics in smooth wavy fin-and-elliptical tube heat exchangers using new type vortex generators. *Energy*, 73, 233-257.
- Lyman, A., Stephan, R., Thole, K., Zhang, L., & Memory, S. (2002). Scaling of heat transfer coefficients along louvered fins. *Experimental Thermal and Fluid Science*, 26(5), 547-563.
- Malapure, V., Mitra, S. K., & Bhattacharya, A. (2007). Numerical investigation of fluid flow and heat transfer over louvered fins in compact heat exchanger. *International Journal of Thermal Sciences*, 46(2), 199-211.
- Mamourian, M., Shirvan, K. M., & Mirzakhani, S. (2016). Two phase simulation and sensitivity analysis of effective parameters on turbulent combined heat transfer and pressure drop in a solar heat exchanger filled with nanofluid by Response Surface Methodology. *Energy*, 109, 49-61.

- Min, J. C., & Webb, R. L. (2004). Numerical analyses of effects of tube shape on performance of a finned tube heat exchanger. *Journal of Enhanced Heat Transfer*, 11(1), 61-73.
- Minitab, I. (2014). MINITAB release 17: statistical software for windows. *Minitab Inc, USA*.
- Mirkovic, Z. (1974). Heat transfer and flow resistance correlation for helically finned and staggered tube banks in crossflow. *Heat exchangers: design and theory source book*, 559-584.
- Nagarani, N., Mayilsamy, K., Murugesan, A., & Kumar, G. S. (2014). Review of utilization of extended surfaces in heat transfer problems. *Renewable and Sustainable Energy Reviews*, 29, 604-613.
- Peng, H., Liu, L., Ling, X., & Li, Y. (2016). Thermo-hydraulic performances of internally finned tube with a new type wave fin arrays. *Applied Thermal Engineering*, 98, 1174-1188. doi: 10.1016/j.applthermaleng.2015.12.115.
- Pongsoi, P., Pikulkajorn, S., & Wongwises, S. (2012). Effect of fin pitches on the optimum heat transfer performance of crimped spiral fin-and-tube heat exchangers. *International Journal of Heat and Mass Transfer*, 55(23), 6555-6566.
- Pongsoi, P., Pikulkajorn, S., & Wongwises, S. (2014). Heat transfer and flow characteristics of spiral fin-and-tube heat exchangers: A review. *International Journal of Heat and Mass Transfer*, 79, 417-431.
- Pongsoi, P., Promoppatum, P., Pikulkajorn, S., & Wongwises, S. (2013). Effect of fin pitches on the air-side performance of L-footed spiral fin-and-tube heat exchangers. *International Journal of Heat and Mass Transfer*, 59, 75-82. doi: 10.1016/j.ijheatmasstransfer.2012.11.071
- Rashidi, S., Bovand, M., & Esfahani, J. (2015). Heat transfer enhancement and pressure drop penalty in porous solar heat exchangers: A sensitivity analysis. *Energy Conversion and Management*, 103, 726-738.

- Salviano, L. O., Dezan, D. J., & Yanagihara, J. I. (2015). Optimization of winglet-type vortex generator positions and angles in plate-fin compact heat exchanger: response surface methodology and direct optimization. *International Journal of Heat and Mass Transfer*, 82, 373-387.
- Salviano, L. O., Dezan, D. J., & Yanagihara, J. I. (2016). Thermal-hydraulic performance optimization of inline and staggered fin-tube compact heat exchangers applying longitudinal vortex generators. *Applied Thermal Engineering*, 95, 311-329.
- Singh, S., Sørensen, K., & Condra, T. J. (2016). Influence of the degree of thermal contact in fin and tube heat exchanger: A numerical analysis. *Applied Thermal Engineering*, 107, 612-624.
- Tahseen, T. A., Rahman, M., & Ishak, M. (2015). Experimental Study on Heat Transfer and Friction Factor in Laminar Forced Convection over Flat Tube in Channel Flow. *Procedia Engineering*, 105, 46-55.
- Tao, Y., He, Y., Huang, J., Wu, Z., & Tao, W. (2007). Numerical study of local heat transfer coefficient and fin efficiency of wavy fin-and-tube heat exchangers. *International Journal of Thermal Sciences*, 46(8), 768-778.
- Tian, L., He, Y., Tao, Y., & Tao, W. (2009). A comparative study on the air-side performance of wavy fin-and-tube heat exchanger with punched delta winglets in staggered and in-line arrangements. *International Journal of Thermal Sciences*, 48(9), 1765-1776.
- Toolthaisong, S., & Kasayapanand, N. (2013). Effect of attack angles on air side thermal and pressure drop of the cross flow heat exchangers with staggered tube arrangement. *Energy Procedia*, 34, 417-429.
- Wang, C.-C., Chen, K.-Y., Liaw, J.-S., & Tseng, C.-Y. (2015). An experimental study of the air-side performance of fin-and-tube heat exchangers having plain, louver, and semi-dimple vortex generator configuration. *International Journal of Heat and Mass Transfer*, 80, 281-287.



- Wang, H., Liu, Y.-w., Yang, P., Wu, R.-j., & He, Y.-l. (2016). Parametric study and optimization of H-type finned tube heat exchangers using Taguchi method. *Applied Thermal Engineering*, *103*, 128-138.
- Wang, L.-B., Ke, F., Gao, S.-D., & Mei, Y. (2002). Local and average characteristics of heat/mass transfer over flat tube bank fin with four vortex generators per tube. *Journal of Heat Transfer*, *124*(3), 546-552.
- Wang, W., Bao, Y., & Wang, Y. (2015). Numerical investigation of a finned-tube heat exchanger with novel longitudinal vortex generators. *Applied Thermal Engineering*, *86*, 27-34.
- Wongwises, S., & Chokeman, Y. (2005). Effect of fin pitch and number of tube rows on the air side performance of herringbone wavy fin and tube heat exchangers. *Energy Conversion and Management*, *46*(13-14), 2216-2231. doi: <http://dx.doi.org/10.1016/j.enconman.2004.09.011>
- Wu, J., & Tao, W. (2007). Investigation on laminar convection heat transfer in fin-and-tube heat exchanger in aligned arrangement with longitudinal vortex generator from the viewpoint of field synergy principle. *Applied Thermal Engineering*, *27*(14), 2609-2617.
- Wu, J., Zhang, H., Yan, C., & Wang, Y. (2012). Experimental study on the performance of a novel fin-tube air heat exchanger with punched longitudinal vortex generator. *Energy Conversion and Management*, *57*, 42-48.
- Wu, X., Zhang, W., Gou, Q., Luo, Z., & Lu, Y. (2014). Numerical simulation of heat transfer and fluid flow characteristics of composite fin. *International Journal of Heat and Mass Transfer*, *75*, 414-424.
- Xiaoping, T., Huahe, L., & Xiangfei, L. (2010). CFD simulation and experimental study on air-side performance for MCHX. *International Refrigeration and Air Conditioning Conference*. doi: <http://docs.lib.purdue.edu/iracc/1023>.

- Xie, G., Wang, Q., & Sunden, B. (2009). Parametric study and multiple correlations on air-side heat transfer and friction characteristics of fin-and-tube heat exchangers with large number of large-diameter tube rows. *Applied Thermal Engineering*, 29(1), 1-16.
- Zdanski, P., Pauli, D., & Dauner, F. (2015). Effects of delta winglet vortex generators on flow of air over in-line tube bank: A new empirical correlation for heat transfer prediction. *International Communications in Heat and Mass Transfer*, 67, 89-96.
- Zhang, X., Wang, Y., Cang, P., & Wang, R. (2016). Experimental investigation of thermal hydraulic performance of heat exchangers with different Reynolds numbers on both air-side and water-side. *Applied Thermal Engineering*, 99, 1331-1339. doi: <http://dx.doi.org/10.1016/j.applthermaleng.2016.01.027>
- Zhao, Y., Qi, Z., Wang, Q., Chen, J., & Shen, J. (2012). Effect of corrosion on performance of fin-and-tube heat exchangers with different fin materials. *Experimental Thermal and Fluid Science*, 37, 98-103.
- Zukauskas, A. (1987). Heat transfer from tubes in cross-flow. *advances in heat transfer*, 18, 87.