

REFERENCES

- Abo M M E, Ragheb A M, Elsafty A F and Teamah M A, Experimental and numerical comparison between the performance of helical cone coil and ordinary helical coils used as dehumidifier for humidification dehumidification in desalination units, *International Journal of Applied Engineering Research*, Dindigul, 2(1),104-114, 2011.
- Akbaridoust F, Rakhsha M, Abbassi A and Avval M S, Experimental and numerical investigation of nanofluid heat transfer in helically coiled tubes at constant wall temperature using dispersion model, *International Journal of Heat and Mass Transfer*, 58, 480-491, 2013.
- Ali M E, Laminar natural convection from constant heat flux helical coiled tubes, *International Journal of Heat and Mass Transfer*, 41, 2175-2182, 1998.
- Ali M E, Natural convection heat transfer from vertical helical coils in oil, *Heat Transfer Engineering*, 27(3), 79-85, 2006.
- Amicis J D, Cammi A, Colombo L P M, Colombo M and Ricotti M E, Experimental and numerical study of the laminar flow in helically coiled pipes, *Progress in Nuclear Energy*, 76, 206-215, 2014.
- Aria H, Behabadi M A A and Shemirani F M, Experimental investigation on flow boiling heat transfer and pressure drop of HFC 134a inside a vertical helically coiled tube, *Heat Transfer Engineering*, 33(2), 79-87, 2012.
- Austen D S, and Soliman H M, Laminar flow and heat transfer in helically coiled tubes with substantial pitch, *Experimental Thermal and Fluid Science*, 183-194, 1988.
- Bahrami M and Jovanovich M M, Pressure drop of fully developed laminar flow in microchannels of arbitrary cross-section, *Journal of Fluids Engineering*, 128, 1036-1044, 2006.

- Bahrami M, Jovanovich M M and Culham J R, Pressure drop of fully developed laminar flow in rough microtubes, *Journal of Fluids Engineering*, 128, 632-637, 2006.
- Bayraktar T and Pidugu S B, Characterization of liquid flows in microfluidic systems, *International Journal of Heat and Mass Transfer*, 49, 815-824, 2006.
- Beigzadeh R and Rahimi M, Prediction of heat transfer and flow characteristics in helically coiled tubes using artificial neural network, *International Communication in Heat and Mass Transfer*, 39, 1279-1285, 2012.
- Berger S A, Talbot L and Yao L S, Flow in Curved Pipes, *Annual Review of Fluid Mechanics*, 15, 461-512, 1983.
- Bowring R W, A simple but accurate round tube uniform heat flux, dry-out correlation over the pressure range, 0.7-12 MN/m² (100-2500 psia), Br. Report, AEEW-R789, Atomic Energy Establishment of Winfrith, Winfrith, U K, 1972.
- Bozzoli F, Cattani L, Rainieri S and Pagliarini G, Estimation of local heat transfer coefficient in coiled tubes under inverse heat conduction problem approach, *Experimental Thermal and Fluid Science* (article in press), 2013.
- Caramello M, Bertani C, Salve M D and Panella B, Helical coil thermal hydraulic model, *Journal of Physics: Conference Series*, 547, 1-11, 2014.
- Cetin M, Design and experimental investigation of a microchannel heat exchanger, PhD thesis, Middle East Technical University, 2010.
- Chen C N, Han J T, Jen T C and Chen W W, Experimental study on critical heat flux characteristics of R134a flow boiling in horizontal helically coiled tubes, *International Journal of Thermal Science*, 50, 169-177, 2011.
- Cioncolini A and Santini L, An experimental investigation regarding the laminar to turbulent flow transition in helically coiled pipes, *Experimental Thermal and Fluid Science*, 30, 367-380, 2006.
- Dean W R, Note on the motion of fluid in a curved pipe, *Philosophical Magazine*, 20, 208-223, 1927a.

- Dean W R, The stream line motion of fluid in a curved pipe, *Philosophical Magazine*, 5(7), 208-223, 1927b.
- Dravid A N, Smith K A, Merrill E W and Brain P L T, Effect of secondary fluid on laminar flow heat transfer in helically coiled tubes, *American Institute of Chemical Engineers Journal*, 17, 1114-1122, 1971.
- Elsayed A M, Dadah R A, Mahmoud S and Rezk A, Investiagtion of flow boiling heat transfer inside small diameter helically coiled tubes, *International Journal of Refrigeration*, 35, 2179-2187, 2012.
- Freng Y M, Lin W C and Chieng C C, Numerically investigated effects of different Dean number and pitch size on flow and heat transfer characteristics in a helically coiled tube heat exchanger, *Applied Thermal Engineering*, 36, 378-385, 2012.
- Garimella S, Richards D E and Christensen R N, Experimental investigation of heat transfer in coiled annular ducts, *Journal of Heat Transfer*, 110, 329-336, 1988.
- Ghorbani N, Taherian H, Gorji M and Mirgolbabaie H, Experimental study of mixed convection heat transfer in vertical helically coiled tube heat exchangers, *Experimental Thermal and Fluid Science*, 34, 900-905, 2010.
- Guo L, Feng Z and Chen X, An experimental investigation of frictional pressure drop of steam water two phase flow in helical coils, *International Journal of Heat and Mass Transfer*, 44, 2601-2610, 2001.
- Gupta R, Wanchoo R K and Ali T R M J, Laminar flow in helical coils a parametric study, *Industrial and Engineering Chemistry Research*, 50, 1150-1157, 2011.
- Haruki N and Horibe A, Flow and heat transfer characteristics of ice slurries in a helically-coiled pipe, *International Journal of Refrigeration*, 36, 1285-1293, 2013.
- Hashemi S M, and Behabadi M A A, An empirical study on heat transfer and pressure drop characteristics of CuO- base oil nanofluid flow in a horizontal helically coiled tube under constant heat flux, *International Communication in Heat and Mass Transfer*, 39, 144-151, 2012.

- Hwang K W, Kim D E, Yan K H, Kim J M, Kim M H and Park H S, Experimental study of flow boiling heat transfer and dryout characteristics at low mass flux in helically coiled tubes, *Nuclear Engineering and Design*, 273, 529-541, 2014.
- Ito H, Laminar flow in curved pipes, *Journal of Applied Mathematics and Mechanics*, 49 (11), 653–663, 1969.
- Jamshidi N, Farhadi, M, Ganji, D D and Sedighi K, Experimental analysis of heat transfer enhancement in shell and tube helical tube heat exchangers, *Applied Thermal Engineering*, 51, 644-652, 2013.
- Janssen L A M and Hoogendoorn C J, Laminar convective heat transfer in helical coiled tubes, *International Journal of Heat and Mass Transfer*, 21, 1197-1206, 1978.
- Kahani M, Zeinali, S H and Mousavi S M, Effects of curvature ratio and coil pitch spacing on heat transfer performance of Al₂O₃/Water nanofluid laminar flow through helical coils, *Journal of Dispersion Science and Technology*, 34, 1704–1712, 2013.
- Kalb C E, and Seader J D, Fully developed viscous-flow heat transfer in curved circular tubes with uniform wall temperature, *American Institute of Chemical Engineers Journal*, 20(2), 340-346, 1974.
- Kannadasan N, Ramanathan K and Suresh S, Comparison of heat transfer and pressure drop in horizontal and vertical helically coiled heat exchanger with CuO/water based nanofluids, *Experimental Thermal and Fluid Science*, 42, 64-70, 2012.
- Khairul M A, Saidur R, Rahman M M, Alim M A, Hossain A and Abdin Z, Heat transfer and thermodynamic analysis of helically coiled heat exchanger using different types of nanofluids, *International Journal of Heat and Mass Transfer*, 67, 398-403, 2013.
- Khandlikar S G and Grande W J, Evolution of microchannel flow passages thermo hydraulic performance and fabrication technology, *Heat Transfer Engineering*, 24, 3-17, 2003.

- Kharat R, Bhardwaj N and Jha R S, Development of heat transfer coefficient correlation for concentric helical coil heat exchanger, *International Journal of Thermal Sciences*, 48, 2300-2308, 2009.
- Kim J W, Im Y B and Kim J S, A study on performance analysis of helically coiled evaporator with circular mini channels, *Journal of Mechanical Science and Technology*, 20(7), 1059-1067, 2006.
- Kim S K, Ha M Y, Son C and Jeong J H, An experimental study on the pressure drop and heat transfer through straight and curved small diameter tubes, *Journal of Mechanical Science and Technology*, 28 (2), 797-809, 2014.
- Kline S J and McClintock F A, Describing uncertainties in single sample experiments, *American Society of Mechanical Engineering*, 75(1), 3-8, 1953.
- Ko T H, Numerical investigation of laminar forced convection and entropy generation in a helical coil with constant wall heat flux, *Numerical Heat Transfer Part A*, 49, 257-278, 2006.
- Kumar V, Saini S, Sharma M and Nigam K D P, Pressure drop and heat transfer study in tube in tube helical heat exchanger, *Chemical Engineering Science*, 61, 4403-4416, 2006.
- Li Z, He Y L, Tang G H and Tao W Q, Experimental and numerical studies of liquid flow and heat transfer in microtubes, *International Journal of Heat and Mass Transfer*, 50, 3447-3460, 2007.
- Liu S and Sakr M, A comprehensive review on passive heat transfer enhancements in pipe exchangers, *Renewable and Sustainable Energy Reviews*, 19, 64-81, 2013.
- Mehendale S S, Jacobi A M and Shah R K, Fluid flow and heat transfer at micro- and meso-scales with application to heat exchanger design, *Applied Mechanics Reviews*, 53, 175-193, 2000.
- Mishra P and Gupta S N, Momentum transfer in curved pipes. 1. Newtonian fluids, *Industrial and Engineering Chemistry Process Design and Development*, 18 (1), 131-136, 1979.

-
- Moawed M, Experimental study of forced convection from helical coiled tubes with different parameters, *Energy Conversion and Management*, 52, 1150–1156, 2011.
- Mohammed H A and Narrein K, Thermal and hydraulic characteristics of nanofluid flow in a helically coiled tube exchanger, *International Communication in Heat and Mass Transfer*, 39, 1375-1383, 2012.
- Mohammed H N, Experimental study of free convection in coiled tube heat exchanger with vertical orientation, *Tikrit Journal of Engineering Sciences*, 18(4), 80-87, 2011.
- Mori Y and Nakayama W, Study on forced convective heat transfer in curved pipes, *International Journal of Heat Mass Transfer*, 8, 67-82, 1965.
- Mori Y. and Nakayama W, Study on forced convection heat transfer in curved pipes, *International Journal of Heat and Mass Transfer*, 10, 681–94, 1967.
- Naphon P and Wongwises S, A Review of flow and heat transfer characteristics in curved tubes, *Renewable and Sustainable Energy Review*, 10, 463-490, 2006.
- Obot N T, Toward a better understanding of friction and heat/mass transfer in microchannels – A literature review, *Microscale Thermophysical Engineering*, 6, 155-173, 2003.
- Pakdaman M F, Behabadi M A A and Razi P, A empirical study on the pressure drop characteristics of nanofluid flow inside helically coiled tubes, *International Journal of Thermal Science*, 65, 206-213, 2013.
- Pan C, Zhoua Y and Wanga J, CFD study of heat transfer for oscillating flow in helically coiled tube heat exchanger, *Computers and Chemical Engineering*, 69, 59-65, 2014.
- Patankar S. V., Pratap V. S. and Spalding D. B., (1974), Prediction of laminar flow and heat transfer in helically coiled pipes, *Journal of Fluid Mechanics*, 62: 539-551.

- Pawar S S, Sunnapwar V K and Mujawar B A, A critical review of heat transfer through helical coils of circular cross section, *Journal of Scientific and Industrial Research*, 70, 835-843, 2011.
- Prabhanjan D G, Raghavan G S V and Rennie T J, Comparison of heat transfer rates between a straight tube heat exchanger and a helically coiled heat exchanger, *International Communication in Heat and Mass Transfer*, 29, 185-191, 2002.
- Prabhanjan D G, Rennie T J and Raghavan G S V, Natural convection heat transfer from helical coiled tubes, *International Journal of Thermal Sciences*, 43(4), 359-365, 2004.
- Purandare P S, Lele M M and Gupta R, Parametric analysis of helical coil heat exchanger, *International Journal of Engineering and Research Technology*, 1(8), 2012.
- Raj R T K, Kumar M S, Mathew A C, and Elango T, Numerical analysis of helically coiled heat exchanger using CFD technique, *ARPN Journal of Engineering and Applied Sciences*, 9 (3), 300-307, 2014.
- Reddy M C S and Rao V V, Experimental investigation of heat transfer coefficient and friction factor of ethylene glycol and water based TiO₂ nanofluid in double pipe heat exchanger with and without helical coil insert, *International Communication in Heat and Mass Transfer*, 50, 68-76, 2014.
- Rennie T J, Numerical and experimental studies of a double pipe helical heat exchanger, PhD thesis, McGill University, Montreal, 2004.
- Rindt C C M, Sillekens J J M and Steenhoven A A V, The influence of the wall temperature on the development of heat transfer and secondary flow in a coiled heat exchanger, *International Communication in Heat and Mass Transfer*, 26(2), 187-198, 1999.
- Seara J F, Pontevedra C P and Dopazo J A, On the performance of a vertical helical coil heat exchanger numerical model and experimental validation, *Applied Thermal Engineering*, 62, 680-689, 2014.

- Shah M M, Improved general correlation for critical heat flux during up flow in uniformly heated vertical tubes, *International Journal of Heat and Fluid Flow*, 8, 325-335, 1987.
- Shah R K and Joshi S D, Convective Heat Transfer in Curved Ducts, *Handbook of Single-Phase Convective Heat Transfer*, (Chapter 3), S. Kakac, R. K. Shah, and W. Hung (eds.), Wiley Interscience, New York, 1987.
- Shokouhmand H and Salimpour M R, Optimal Reynolds number of laminar forced convection in a helical tube subjected to uniform wall temperature, *International Communications in Heat and Mass Transfer*, 34, 753–761, 2007.
- Srinivasan P S, Nandapurkar S S and Holland F A, Pressure drop and heat transfer in coils, *Chemical Engineering (London)*, 218, 113-9, 1968.
- Steele W G and Coleman H W, *Experimental an uncertainty analysis for engineers*, 1st Edition, Wiley, New York, 1989.
- Suresh S, Chandrasekar M and Selvakumar P, Experimental studies on heat transfer and friction factor characteristics of CuO/water nanofluid under laminar flow in a helically dimpled tube, *Heat and Mass Transfer*, 48, 683-694, 2012.
- White C M, Streamline flow through curved pipes, *Proceeding Royal Society London*, 123A-645, 1929.
- Wongwises S and Polsongkram M, Evaporation heat transfer and pressure drop of HFC-134a in a helically coiled concentric tube in tube heat exchanger, *International Journal of Heat and Mass Transfer*, 49, 658-670, 2006.
- Xin R C and Ebadian M AX, The effects of Prandtl numbers on local and average convective heat transfer characteristics in helical pipes, *Journal of Heat Transfer*, 119 (3), 467-473, 2006.
- Xin R C, Awwad A, Dong Z F, Ebadian M A and Sliman H M, An investigation and comparative study of the pressure drop in air water two phase flow in vertical helicoidal pipes, *International Journal of Heat and Mass Transfer*, 39(4), 735-743, 1996.

- Yang G, Dong F and Ebdian M A, Laminar forced convection in a helicoidal pipe with finite pitch, *International Journal of Heat and Mass Transfer*, 38, 853-862, 1995.
- Yang R and Chiang F P, An experimental heat transfer study for periodically varying-curvature curve-pipe, *International Journal of Heat and Mass Transfer*, 45, 3199–204, 2002.
- Zachar A, Analysis of coiled tube heat exchangers to improve heat transfer rate with spirally corrugated wall, *International Journal of Heat and Mass Transfer*, 53, 3928-3939, 2010.
- Zheng B, Lin C X and Ebdian M A, Combined laminar forced convection and thermal radiation in helical pipe, *International Journal of Heat and Mass Transfer*, 43, 1067-1078, 2000.