

Heat and Technology, 36(1): 319-324.
<https://doi.org/10.18280/ijht.360142>

- [15] Camaraza-Medina, Y., Hernandez-Guerrero, A., Luviano-Ortiz, J.L., Mortensen-Carlson, K., Cruz-Fonticiella, O.M., García-Morales, O.F. (2019). New model for heat transfer calculation during film condensation inside pipes. *International Journal of Heat Mass Transfer*, 128: 344-353. <https://doi.org/10.1016/j.ijheatmasstransfer.2018.09.012>
- [16] Ali, H.M., Qasim, M.Z., Ali, M. (2016). Free convection condensation heat transfer of steam on horizontal square wire wrapped tube. *International Journal of Heat and Mass Transfer*, 98: 350-358. <https://doi.org/10.1016/j.ijheatmasstransfer.2016.03.053>
- [17] Akers, W.W., Deans, H.A., Crosser, O.K. (1959). Condensing heat transfer within horizontal tubes. *Chemical Engineering Progress Symposium Series*, 55(29): 171-176.
- [18] O'Neill, L., Balasubramaniam, R., Nahra, H.K., Hasan, M.M., Mudawar, I. (2019). Flow condensation heat transfer in a smooth tube at different orientations: Experimental results and predictive models. *International Journal of Heat and Mass Transfer*, 140: 533-563. <https://doi.org/10.1016/j.ijheatmasstransfer.2019.05.103>
- [19] Camaraza-Medina, Y., Cruz-Fonticiella, O.M., García-Morales, O.F. (2019). New model for heat transfer calculation during fluid flow in single phase inside pipes. *Thermal Science and Engineering Progress*, 11: 162-166. <https://doi.org/10.1016/j.tsep.2019.03.014>
- [20] Camaraza-Medina, Y., Khandy, N.H., Carlson, K.M., Cruz-Fonticiella, O.M., García-Morales, O.F., Reyes-Cabrera, D. (2018). Evaluation of condensation heat transfer in air-cooled condenser by dominant flow criteria. *Mathematical Modelling of Engineering Problems*, 5(2): 76-82. <https://doi.org/10.18280/mmep.050204>
- [21] Camaraza-Medina, Y., Hernandez-Guerrero, A., Luviano-Ortiz, J.L., Cruz-Fonticiella, O.M., García-Morales, O.F. (2019). Mathematical deduction of a new model for calculation of heat transfer by condensation inside pipes. *International Journal of Heat Mass Transfer*, 141: 180-190. <https://doi.org/10.1016/j.ijheatmasstransfer.2019.06.076>
- [22] Camaraza-Medina, Y., Mortensen-Carlson, K., Guha, P., Rubio-Gonzales, A.M., Cruz-Fonticiella, O.M., García-Morales, O.F. (2019). Suggested model for heat transfer calculation during fluid flow in single phase inside pipes (II). *International Journal of Heat and Technology*, 37: 257-266. <https://doi.org/10.18280/ijht.370131>
- [23] Camaraza-Medina, Y., Cruz Fonticiella, O.M., García-Morales, O.F. (2018). Predicción de la presión de salida de una turbina acoplada a un condensador de vapor refrigerado por aire. *Centro Azúcar*, 45(1): 50-61.

NOMENCLATURE

| | |
|------------|---|
| a | Thermal diffusivity, $\text{m}^2\cdot\text{s}^{-1}$ |
| C_p | Specific heat, $\text{J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$ |
| d | Equivalent inner tube diameter, m |
| G | Mass flux, $\text{kg}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ |
| g | Gravitational acceleration, $\text{m}\cdot\text{s}^{-2}$ |
| h_{fg} | Latent heat of vaporization, $\text{J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$ |
| h | Single-phase heat transfer coefficient, $\text{kg}\cdot\text{m}^{-1}\cdot\text{K}^{-1}\cdot\text{s}^{-1}$ |
| h_T | Two-phase heat transfer coefficient, $\text{kg}\cdot\text{m}^{-2}\cdot\text{s}^{-3}\cdot\text{K}^{-1}$ |
| h_C | Single-phase heat transfer coefficient, $\text{kg}\cdot\text{m}^{-2}\cdot\text{s}^{-3}\cdot\text{K}^{-1}$ |
| h_{med} | Experimental measured value, $\text{kg}\cdot\text{m}^{-2}\cdot\text{s}^{-3}\cdot\text{K}^{-1}$ |
| J_g | Dimensionless velocity |
| k | Fluid thermal conductivity, $\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ |
| k_L | Fluid thermal conductivity for single-phase, $\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ |
| Pr_L | Prandtl number for single-phase |
| p_R | Reduced pressure |
| Re_L | Liquid Reynolds number |
| Re_V | Vapor Reynolds number |
| T | Mean fluid temperature, $^{\circ}\text{C}$ |
| ΔT | Temperature difference across the condensate film |
| T_{sat} | Saturation temperature, $^{\circ}\text{C}$ |
| T_P | Wall temperature, $^{\circ}\text{C}$ |
| V | Velocity profile, $\text{m}\cdot\text{s}^{-1}$ |
| V_{Max} | Maximum velocity, $\text{m}\cdot\text{s}^{-1}$ |
| V_x | Velocity component in x axis, $\text{m}\cdot\text{s}^{-1}$ |
| V_y | Velocity component in y axis, $\text{m}\cdot\text{s}^{-1}$ |
| V_z | Velocity component in z axis, $\text{m}\cdot\text{s}^{-1}$ |
| x | Thermodynamic vapor quality |
| Z | Dimensionless Shah parameter |

Greek symbols

| | |
|----------------|--|
| β | Thermal expansion coefficient, K^{-1} |
| μ | Dynamic viscosity, $\text{kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$ |
| θ | Tubes inclination respect to horizontal line |
| ρ | Density, $\text{kg}\cdot\text{m}^{-3}$ |
| ξ | Number of intervals in function form, Equation (30) |
| ν | Liquid kinematic viscosity, $\text{m}^2\cdot\text{s}^{-1}$ |
| δ | Film thickness of boundary layer, m |
| φ | Solution of the heat transfer problem, (Equation (26)) |
| ψ | Source function, (Equation (24)) |
| τ | Temperature in Green's functional, (Equation (22)) |
| $\bar{\omega}$ | Substituting term employed in Equation (28) |

Subscripts

| | |
|-----|--------|
| L | Liquid |
| V | Vapor |