### **Abstract**

In this paper, the hydrothermal performance of a tubular heat exchanger is developed numerically by inserting metallic foam fins (MFF) in several configurations: straight single-, single-helical, and double-helical MFF. The working fluid is water, whereas the volume of the MFF is kept constant throughout the whole manuscript. The geometric parameters investigated here are the aspect ratio of the rectangular porous fin, the number of turns of the fin, the number of fins, and the pores per inch for a wide range of laminar Reynolds number. The finite volume method is adopted for solving the governing equations of the laminar flow regime. The results are presented in terms of Nusselt number, friction factor, hydrothermal performance (JF), velocity, and temperature contours. The results show that the heat transfer of the smooth pipe is enhanced when a straight MFF is used. More heat removal enhancement is recorded when the MFF is twisted helically with the circumference of the pipe. Additional thermal augmentation is observed with an increase in the number of turns of the helical MFF up to a certain value. Unexpected heat transfer enhancement is recorded when a double-helical MFF is used instead of a single-helical one. The maximum enhancement in the JF observed is 1.7 using double-helical MFF with two turns.