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Heat transfer enhancement of a heat exchanger using novel multiple perforated magnetic turbulators (MPMT): An experimental study

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Abstract
The magnetic turbulator and electromagnetic vibration (EMV) methods have recently been employed to enhance heat transfer in heat exchangers. This method involves placing a magnetic oscillator inside the tube and attaching a magnet with specific dimensions to this oscillator. Creating an AC magnetic field near the tube causes the magnet and the oscillator to vibrate, acting as a magnetic turbulator. In this study, multiple perforated magnetic turbulators were used inside the tube of a heat exchanger for the first time, and their impact on hydrothermal parameters was assessed. Various factors were examined, including perforation diameter, pitch, and fluid flow rate. The thermal enhancement factor (TEF) was used to identify the optimal configuration. The results showed that simple and perforated turbulators increased heat transfer up to 156% and 150%, respectively. However, the pressure drop in the presence of these turbulators was up to 1.97 and 1.86 times higher than that of a simple heat exchanger. In addition, the maximum value of TEF was observed in the presence of a perforated magnetic turbulators with a hole diameter of 2 mm and a hole pitch of 12 mm. This turbulator was the optimal choice, providing a TEF equivalent to 2.06. © 2023 Elsevier Masson SAS

Author Keywords
EMV; Heat transfer enhancement; Multi magnetic turbulator; Pressure drop; Thermal enhancement factor

Index Keywords
Drops, Flow of fluids, Heat exchangers, Heat transfer coefficients; AC magnetic fields, Electromagnetic vibrations, Fluid flow rates, Heat Transfer enhancement, Magnetic oscillator, Multi magnetic turbulator, Simple++, Thermal enhancement factors, Turbulators, Vibration method; Pressure drop

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