

Economic Optimization of Shell and Tube Heat Exchanger Using Nanofluid

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Abstract : Economic optimization of shell and tube heat exchanger (STHE) is presented in this paper. To increase the rate of heat transfer, copper oxide (CuO) nanoparticle is added into the tube side fluid and their optimum results are compared with the case of without additive nanoparticle. Total annual cost (TAC) is selected as fitness function and nine decision variables related to the heat exchanger parameters as well as concentration of nanoparticle are considered. Optimization results reveal the noticeable improvement in the TAC and in the case of heat exchanger working with nanofluid compared with the case of base fluid (8.9%). Comparison of the results between two studied cases also reveal that the lower tube diameter, tube number, and baffle spacing are needed in the case of heat exchanger working with nanofluid compared with the case of base fluid.

Keywords : shell and tube heat exchanger, nanoparticles additive, total annual cost, particle volumetric concentration

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