

Effect of Number of Baffles on Pressure Drop and Heat Transfer in a Shell and Tube Heat Exchanger

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Abstract : In this paper for a given heat duty, study of number of baffles on pressure drop and heat transfer is considered in a STHX (Shell and Tube Heat Exchanger) with single segmental baffles. The effect of number of baffles from 9 to 52 baffles (baffle spacing variations from 4 to 24 inches) over OHTC (Overall Heat Transfer Coefficient) to pressure drop ratio ($U/\Delta p$ ratio). The results show that $U/\Delta p$ ratio is low when baffle spacing is minimum (4 inches) because pressure drop is high; however, heat transfer coefficient is very significant. Then, with the increase of baffle spacing, pressure drop rapidly decreases and OHTC also decreases, but the decrease of OHTC is lower than pressure drop, so ($U/\Delta p$) ratio increases. After increasing baffles more than 12 inches, variation in pressure drop is gradual and approximately constant and OHTC decreases; Consequently, $U/\Delta p$ ratio decreases again. If baffle spacing reaches to 24 inches, STHX will have minimum pressure drop, but OHTC decreases, so required heat transfer surface increases and $U/\Delta p$ ratio decreases. After baffle spacing more than 12 inches, variation of shell side pressure drop is negligible. So optimum baffle spacing is suggested between 8 to 12 inches (43 to 63 percent of inside shell diameter) for a sufficient heat duty and low pressure drop.

Keywords : shell and tube heat exchanger, single segmental baffle, overall heat transfer coefficient, pressure drop

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