

CEN4417
PROCESS DESIGN I

Temperature Correction Factor:

$$\Delta T_m = F_T \Delta T_{lm}$$

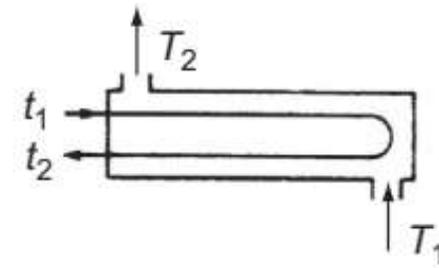
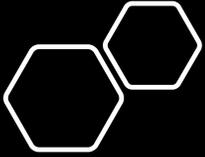
ΔT_m : True (mean) temperature difference to use in the design

ΔT_{lm} : Log mean temperature difference considering countercurrent flow

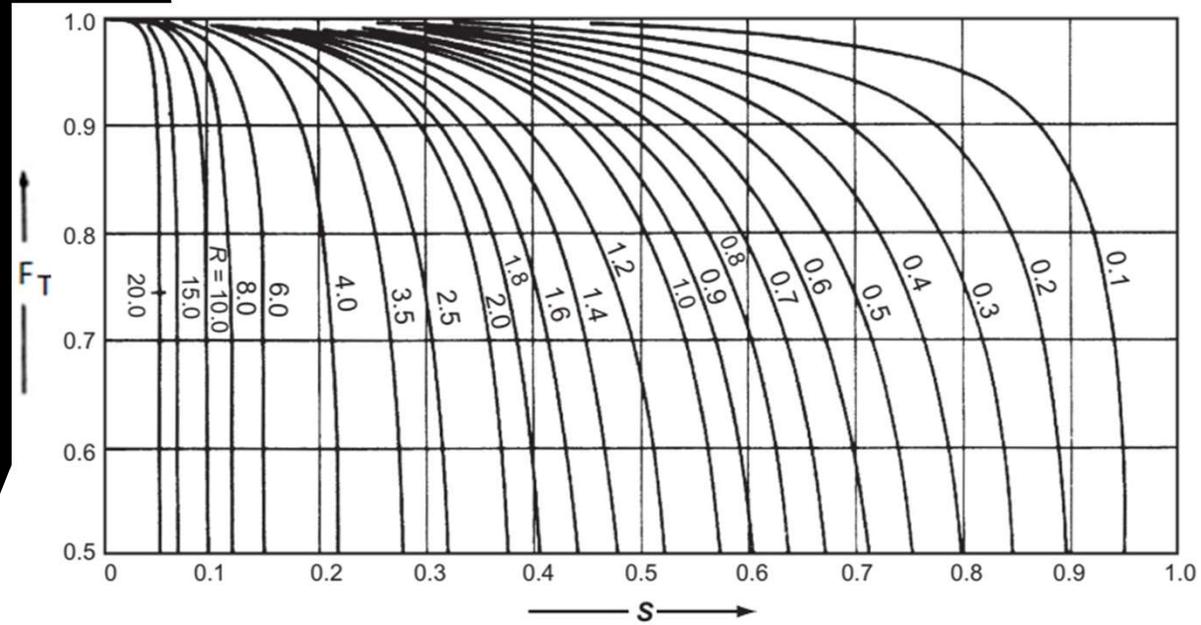
F_T : Temperature correction factor

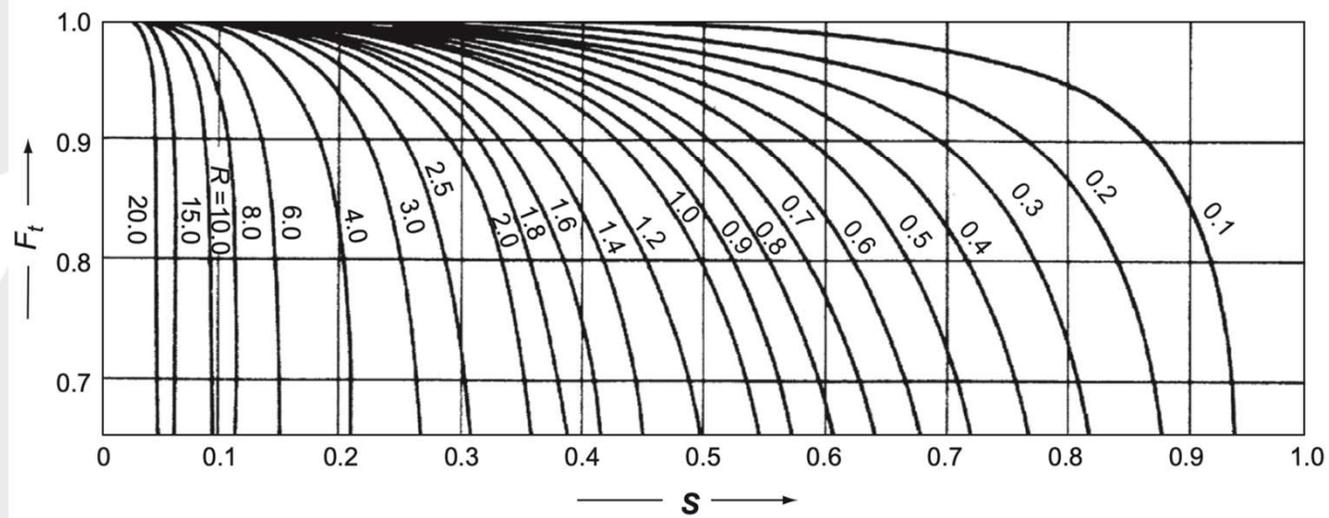
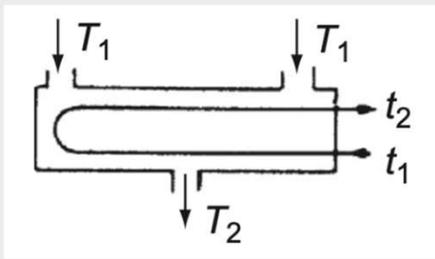
$$R = \frac{T_1 - T_2}{t_2 - t_1} = \frac{\text{Temperature Decrease in the Hot Fluid}}{\text{Temperature Increase in the Cold Fluid}}$$

$$S = \frac{t_2 - t_1}{T_1 - t_1} = \frac{\text{Temperature Increase in the Cold Fluid}}{\text{Maximum Possible Temperature Difference}}$$



- Temperature correction factor; **one shell pass; two or more even tube passes**



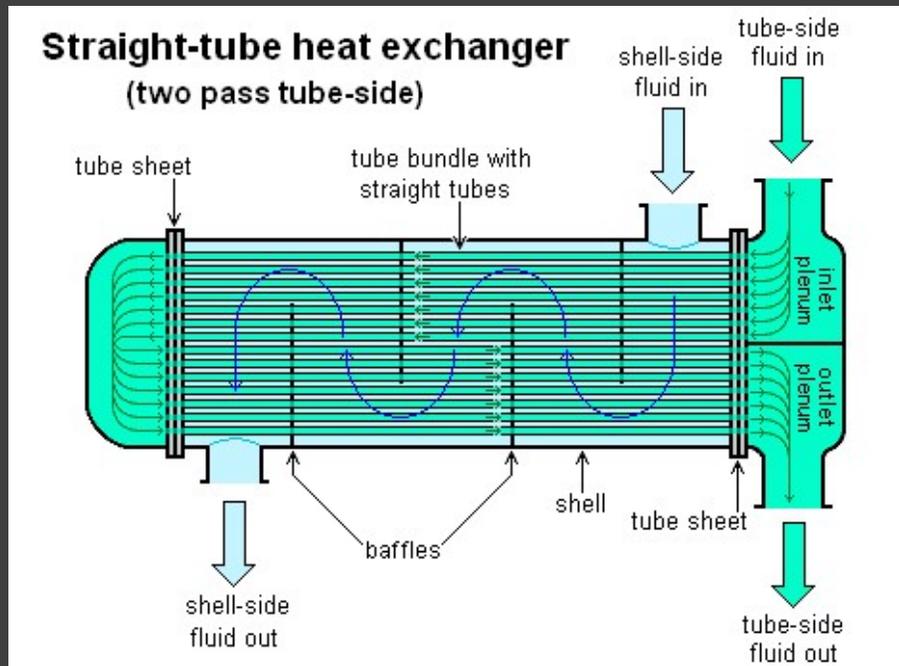


Assumptions in the calculation of F_T

1. Equal heat transfer areas in each pass.
2. A constant overall heat-transfer coefficient in each pass.
3. There is no leakage of fluid between shell passes.

SHELL AND TUBE EXCHANGERS

Shell & tube heat exchangers are the most widely used ones in the chemical and related industries.



REFERENCES

1. Sinnott, R.K. 1999, *Coulson's & Richardson's Chemical Engineering, Volume 6, Chemical Engineering Design*, ButterWorth Heinemann, Oxford.
2. Turton R., Bailie R.C., Whitin W.C., Shaeiwitz J.A. 1998, *Analysis, Synthesis and Design of Chemical Processes*, Prentice Hall, New Jersey.