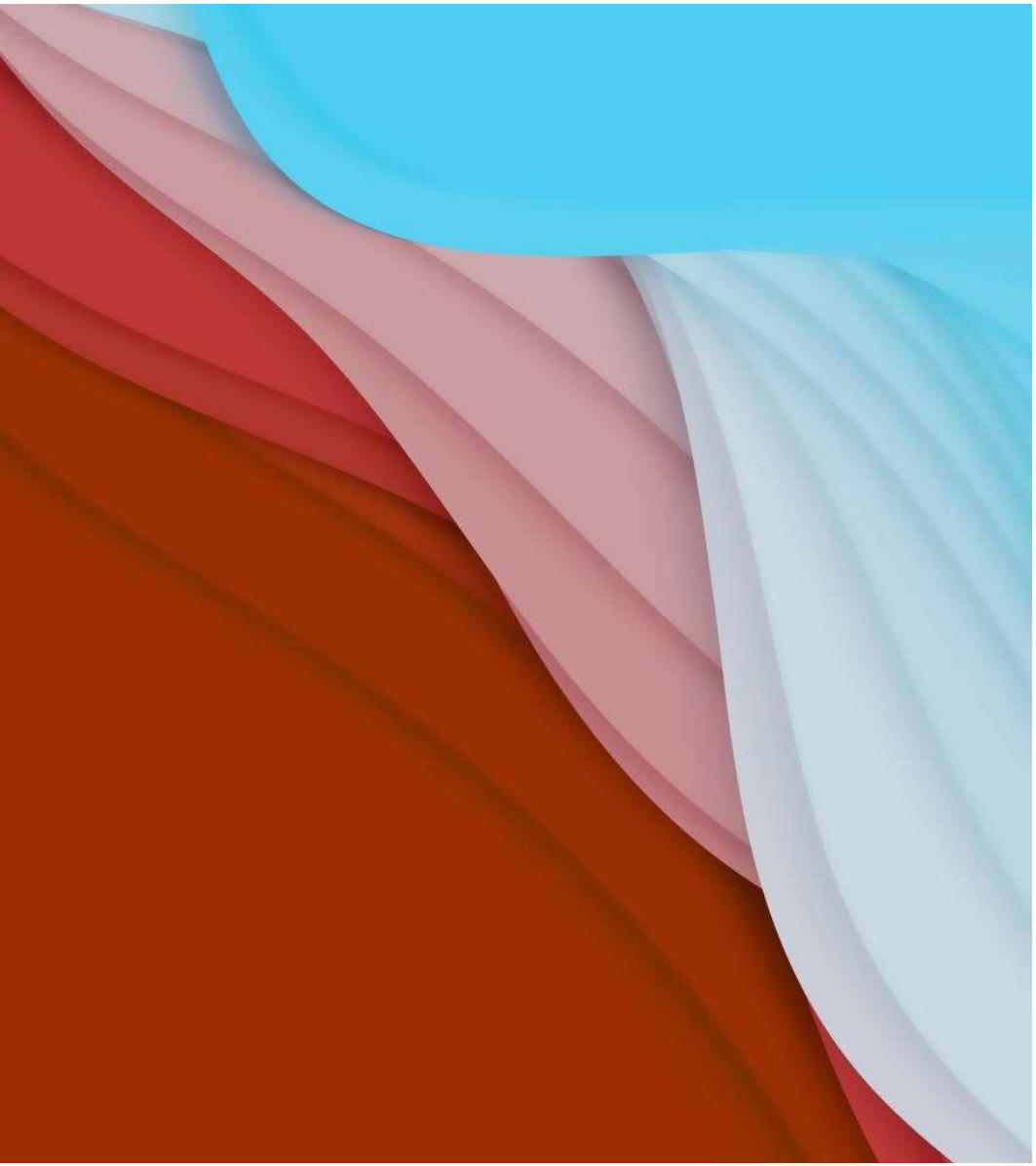


CEN4415
PROCESS DESIGN I

Temperature Correction Factor:

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

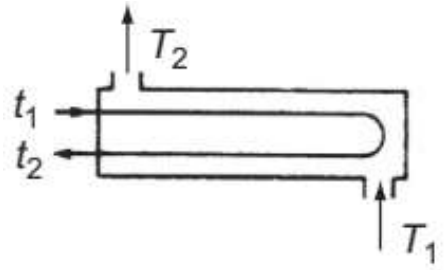
ΔT_m : True (mean) temperature difference to use in the design

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

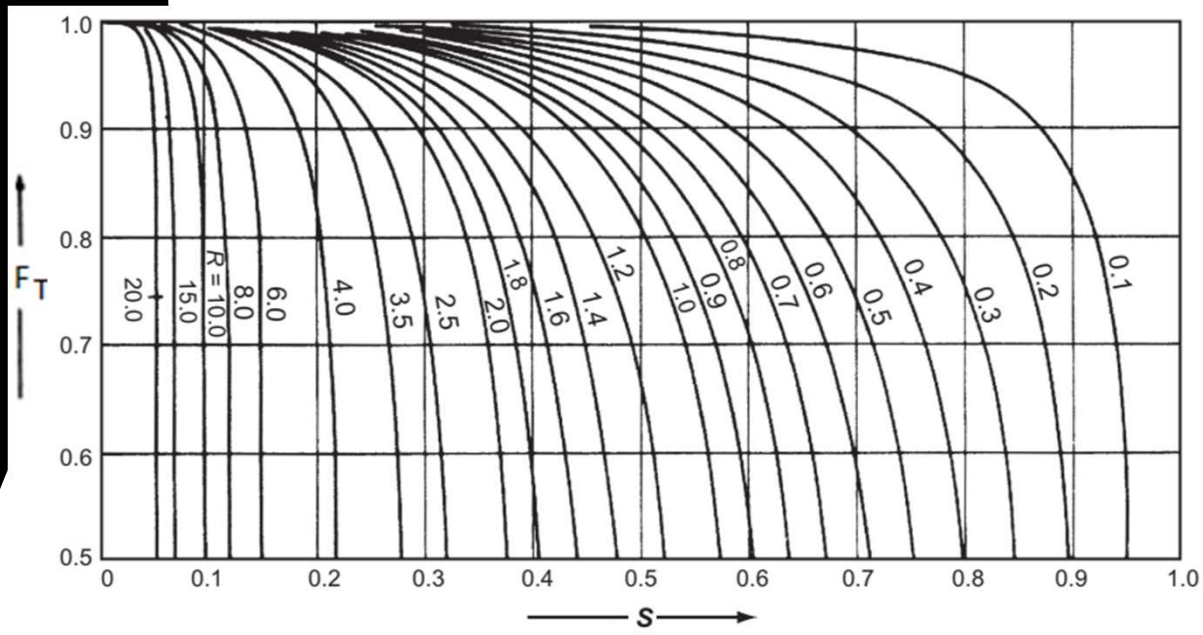
F_T : Temperature correction factor

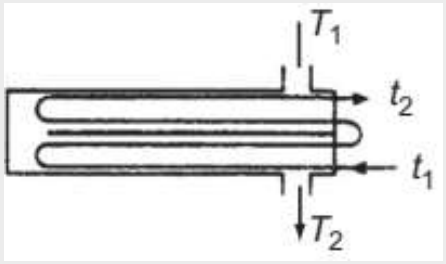
$$R = \frac{T_1 - T_2}{t_2 - t_1} = \frac{Temperature\ Decrease\ in\ the\ Hot\ Fluid}{Temperature\ Increase\ in\ the\ Cold\ Fluid}$$

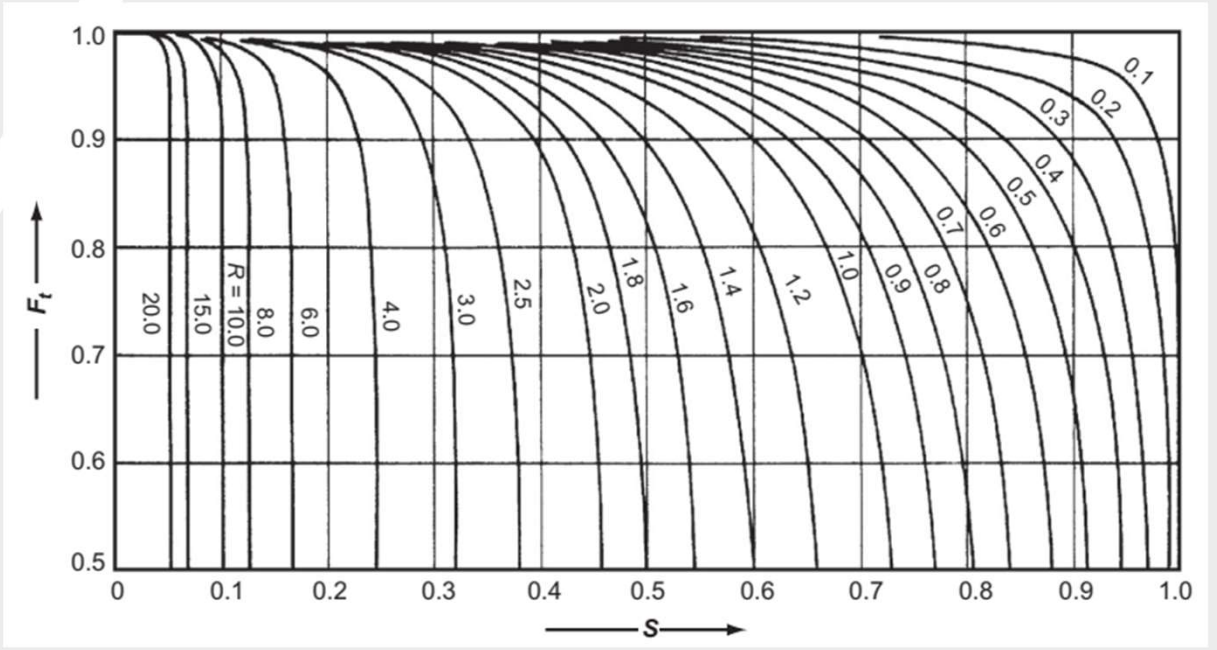
$$S = \frac{t_2 - t_1}{T_1 - t_1} = \frac{Temperature\ Increase\ in\ the\ Cold\ Fluid}{Maximum\ Possible\ Temperature\ Difference}$$

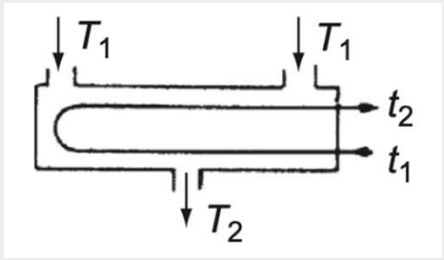


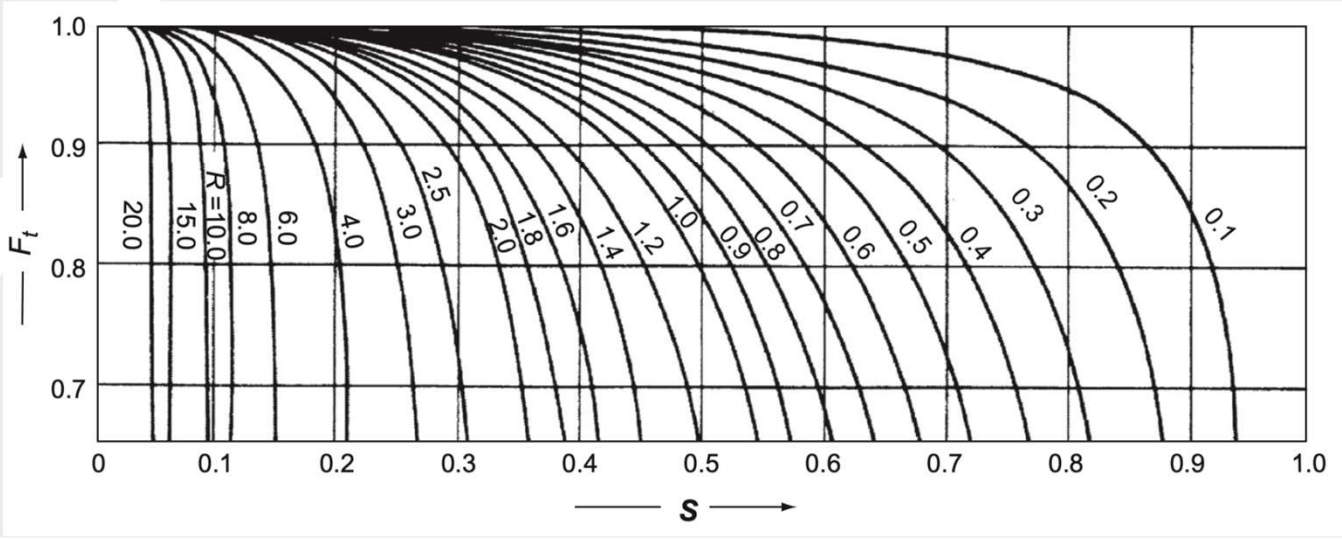
- Temperature correction factor; ***one shell pass; two or more even tube passes***




T_1
t_2
t_1
T_2


1.0
0.9
0.8
0.7
0.6
0.5
F_t
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
S
R = 10.0
20.0
15.0
8.0
6.0
4.0
3.0
2.5
2.0
1.8
1.6
1.4
1.2
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1


T_1
T_1
t_2
t_1
T_2


1.0
0.9
0.8
0.7
F_t
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
S
R=10.0
20.0
15.0
8.0
6.0
4.0
3.0
2.5
2.0
1.8
1.6
1.4
1.2
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1

Assumptions in the calculation of F_T

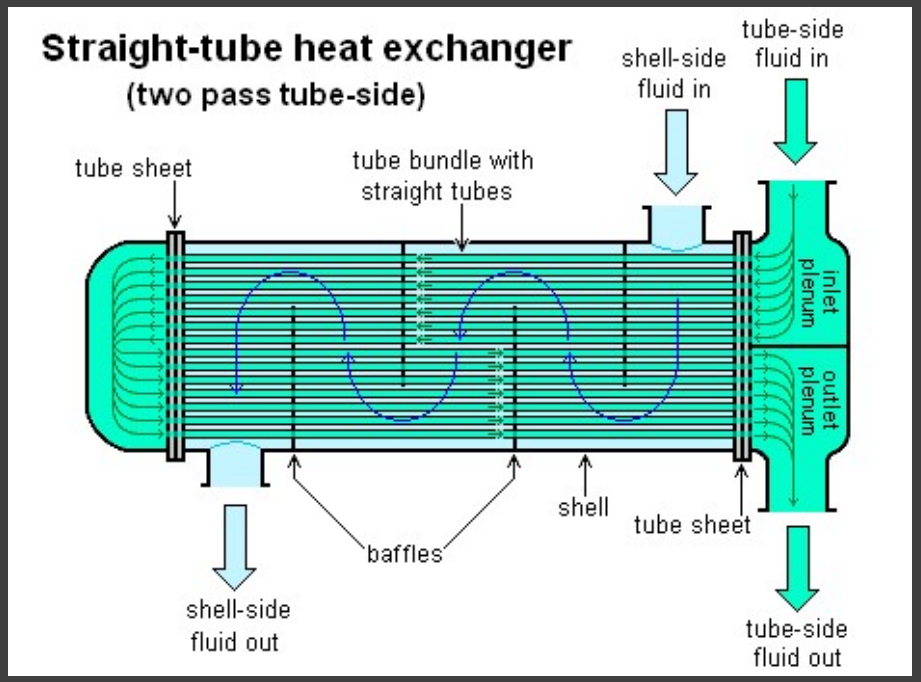
1. Equal heat transfer areas in each pass.

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. Sinnot, 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.