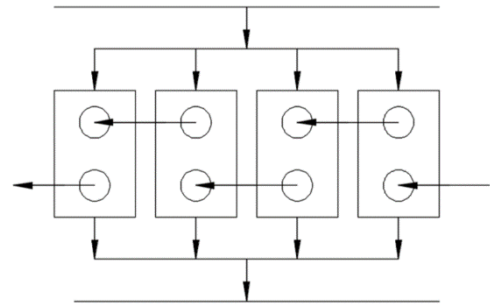


1) 7.10 in your textbook. {change the cold mass flow rate in the annulus from 20,000 kg/h to 24,000 kg/h}



2) Iterative design of Double pipe Heat Exchange

Use the iterative procedure to size a double pipe i.e. finding inner pipe diameters d_i , D_i , heat transfer area A_o , heat exchanger length L , pressure drop in the tube and annulus sides. The required Residual Sum of Squares R_{ss} should be less than 100 Pa. The input data is given in the following table

Given data

Tube side mass flow rate	Annulus side mass flow rate	Tube side fluid	Annulus side fluid	Inside fouling factor	Outside fouling factor	Tube wall thickness
$\dot{m}_t=1.4$	$\dot{m}_a=1.5$	water	water	$R_{fi}=0.00018$	$R_{fo}=0.00018$	$t=2$
[kg/s]	[kg/s]			[$m^2.K/W$]	[$m^2.K/W$]	[mm]

Inlet cold fluid temp.	Outlet cold fluid temp.	Inlet hot fluid temp.	Outlet hot fluid temp.	Tube side Max. allowable pressure drop	Annulus Max. allowable pressure drop
$T_{ci}=25$	$T_{co}=50$	$T_{hi}=150$	T_{ho}	$\Delta P_{t,max}=1500$	$\Delta P_{a,max}=1500$
[°C]	[°C]	[°C]	[°C]	[Pa]	[Pa]

Tube side operating pressure	Annulus side operating pressure	Which fluid in the tube side	Tube thermal conductivity
$P_t=2$	$P_a=150$	hot	$k_t=60$
[MPa]	[kPa]		W/m.K

At least perform three iterations. Summarize your results in tables.