Metodo Bell- Dellaware

DATOS PARA ANALISIS DE COEFICIENTE GLOBAL

DIMENSIONES DEL INTERCAMBIADOR ANALIZADO

Tubos

$Nt = 9$ Número de tubos del intercambiador

$di = 0.01655$ Diámetro interno de tubo

$do = 0.01905$ Diámetro externo de tubo

$Lt = 3.54$ Longitud de tubo

$L_{bc} = 0.21$ Distancia de bafle central

$L_{bb} = 0.01$ distancia entre dotl y los tubos

$D_{OTL} = 0.13$ [m] Diametro exterior de haz de tubos

$$Ltp = \frac{15}{16} \cdot 0.0254$$

$$Dctl = D_{OTL} - do$$

$$S_m = L_{bc} \cdot \left[L_{bb} + \frac{Dctl}{Ltp} \cdot (Ltp - do) \right]$$ Area de flujo cruzado

FLUIDO EN LOS TUBOS -AGUA DE ENFRIAMIENTO-

R$ = 'Water' string variable used to hold name of refrigerant

$t_1 = 19.7$

$t_2 = 28.7$

$Pp = 101.325$

$$Tp = \frac{t_1 + t_2}{2}$$ Temperatura de película fluido tubos

Propiedades del fluido frio

$k_1 = \mathbf{k}$ [R$, T= Tp , P= Pp]

$\rho_1 = \rho$ [R$, T= Tp , P= Pp]

$\mu_1 = \mathbf{Visc}$ [R$, T= Tp , P= Pp]

$Pr_1 = \mathbf{Pr}$ [R$, T= Tp , P= Pp]

$cp_1 = \mathbf{Cp}$ [R$, T= Tp , P= Pp]

$h_1 = \mathbf{h}$ [R$, T= Tp , P= Pp]

$s_1 = \mathbf{s}\left[R\$, h = h_1, P = Pp\right]$

$\rho_2 = \rho\left[R\$, T = t_2, P = Pp\right]$

Lectura de rotámetro lado tubo

$V_{rotámetro} = 3$ [GPM]

$$\dot{V} = V_{rotámetro} \cdot \frac{3.785}{60 \cdot 1000}$$

$\dot{m} = \dot{V} \cdot \rho_2$ Flujo total

$$\dot{m}_t = \frac{\dot{m}}{Nt}$$ Flujo por cada tubo

$$Ai = \pi \cdot \left[\frac{di}{2}\right]^2$$ Area transversal tubo

$$G_t = \frac{\dot{m}_t}{Ai}$$ Masa velocidad de tubo

$$Re_t = \frac{di \cdot G_t}{\mu_1}$$ Reynolds de tubo

Temperaturas de agua solar caliente

$T1 = 29.9$

$T2 = 20.8$

$$T_p = \frac{T1 + T2}{2}$$

Propiedades del fluido caliente

$h_2 = \mathbf{h}\left[R\$, T = T_p, P = Pp\right]$

$s_2 = \mathbf{s}\left[R\$, h = h_1, P = Pp\right]$

$k_2 = \mathbf{k}\left[R\$, T = T_p, P = Pp\right]$

$\rho_3 = \rho\left[R\$, T = T_p, P = Pp\right]$

$\mu_2 = \mathbf{Visc}\left[R\$, T = T_p, P = Pp\right]$

$Pr_2 = \mathbf{Pr}\left[R\$, T = T_p, P = Pp\right]$

$cp_2 = \mathbf{Cp}\left[R\$, T = T_p, P = Pp\right]$

Lectura del rotámetro lado coraza

$V_{rot} = 9$ [GPM]

$$\dot{V}_2 = V_{rot} \cdot \frac{3.785}{60 \cdot 1000}$$

$\rho_4 = \rho\left[R\$, T=34, P=Pp\right]$

$\dot{m}_2 = \dot{V}_2 \cdot \rho_4$ Flujo total

$G_c = \dfrac{\dot{m}_2}{S_m}$ Masa velocidad de la coraza

$Re_c = \dfrac{do \cdot G_c}{\mu_2}$ Reynolds de coraza

Calculo de factor de friccion con la ecuación de Konakov

$f = \left[1.8 \cdot \mathbf{log}\left(Re_t\right) - 1.5\right]^{-2}$

Calculo de Nusselt a traves de f y Re_t

$N.u_t=(((f/8)*(Re_t-1000)*Pr_1)/(1+12.7*((f/8)^{(1/2)})*((Pr_1^{(2/3)})-1)))*(1+(di/Lt))^{(2/3)}$

$N.u_t = 0.023 \cdot Re_t^{0.8} \cdot Pr_1^{0.4}$

Calculo de coeficiente de convecciòn interior -tubos-

$hi = N.u_t \cdot \dfrac{k_1}{di}$

$hio = hi \cdot \dfrac{di}{do}$ corrección por area

Calculo de coeficiente global de tubos ideal ho_i

$Ji=0.02713+1.492e-5*(Re_c-600)$

Factor de correcciòn Ji

$Ji = 0.0233 - 0.000005201 \cdot \left[Re_c - 1000\right]$

$hci = ho_c$

$ho_c = cp_2 \cdot G_c \cdot Ji \cdot Pr_2^{\left[\frac{-2}{3}\right]} \cdot 1000 \cdot 0.6$

$\dfrac{1}{U_{teórico}} = \dfrac{1}{hio} + \dfrac{1}{ho_c}$

$R_f = 0.0001$

$\dot{Q} = \dot{m} \cdot cp_1 \cdot \left[t_2 - t_1\right] \cdot 1000$

$\dot{Q}_2 = \dot{m}_2 \cdot cp_2 \cdot \left[T1 - T2\right] \cdot 1000$

$A_{TC} = \pi \cdot do \cdot Lt \cdot Nt$

$DT_1 = T2 - t_1$

$$DT_2 = T1 - t_2$$

$$DT_{ml} = \frac{DT_1 - DT_2}{\ln\left[\frac{DT_1}{DT_2}\right]}$$

$$\dot{Q} = U_{experimental} \cdot A_{TC} \cdot DT_{ml} \cdot F_C$$

$$R = \frac{T1 - T2}{t_2 - t_1}$$

$$P = \frac{t_2 - t_1}{T2 - t_1}$$

$$F_C = 1$$

Unit Settings: [kJ]/[C]/[kPa]/[kg]/[degrees]

$Ai = 0.0002151$
$A_{TC} = 1.907$
$Dctl = 0.111$
$di = 0.01655$
$do = 0.01905$
$DT_1 = 1.1$
$DT_2 = 1.2$
$DT_{ml} = 1.149$
$D_{OTL} = 0.13$ [m]
$f = 0.05287$
$F_C = 1$
$G_c = 83.52$
$G_t = 97.361$
$hci = 1188$
$hi = 689.045$
$hio = 598.6$
$ho_c = 1188$
$Ji = 0.01913$
$Lt = 3.54$
$Ltp = 0.02381$
$L_{bb} = 0.01$
$L_{bc} = 0.21$
$\dot{m} = 0.188501$ [kg/s]
$\dot{m}_2 = 0.564555$
$\dot{m}_t = 0.02094$
$N.u_t = 19.22$
$Nt = 9$
$P = 8.182$
$Pp = 101.3$
$\dot{Q} = 7097$
$\dot{Q}_2 = 21490$
$R = 1.011$
R$ = 'Water'
$Re_c = 1801$
$Re_t = 1776.590$
$R_f = 0.0001$
$S_m = 0.0067599$
$T1 = 29.9$
$T2 = 20.8$
$Tp = 24.2$
$t_1 = 19.7$
$t_2 = 28.7$
$T_p = 25.35$
$U_{experimental} = 3238$
$U_{teórico} = 398$
$\dot{V} = 1.893E-04$
$\dot{V}_2 = 0.0005678$
$V_{rot} = 9$ [GPM]
$V_{rotámetro} = 3$ [GPM]

Arrays Table

	cp_i [kJ/kg-K]	h_i [kJ/kg]	k_i [W/m-K]	μ_i [kg/m-s]	Pr_i	ρ_i [kg/m3]	s_i [kJ/kg-K]
1	4.183	101.5	0.5934	0.000907	6.393	997.3	0.3557
2	4.183	106.3	0.5954	0.0008835	6.207	996	0.3557
3						997	
4						994.4	