

Heat Exchanger Networks

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Entry no.: 2022CHB1048

Q1.

Stream Type	T_in	T_out	Heat load	C_p
Cold	40	110	14	0.2
Hot	160	40	-12	0.1

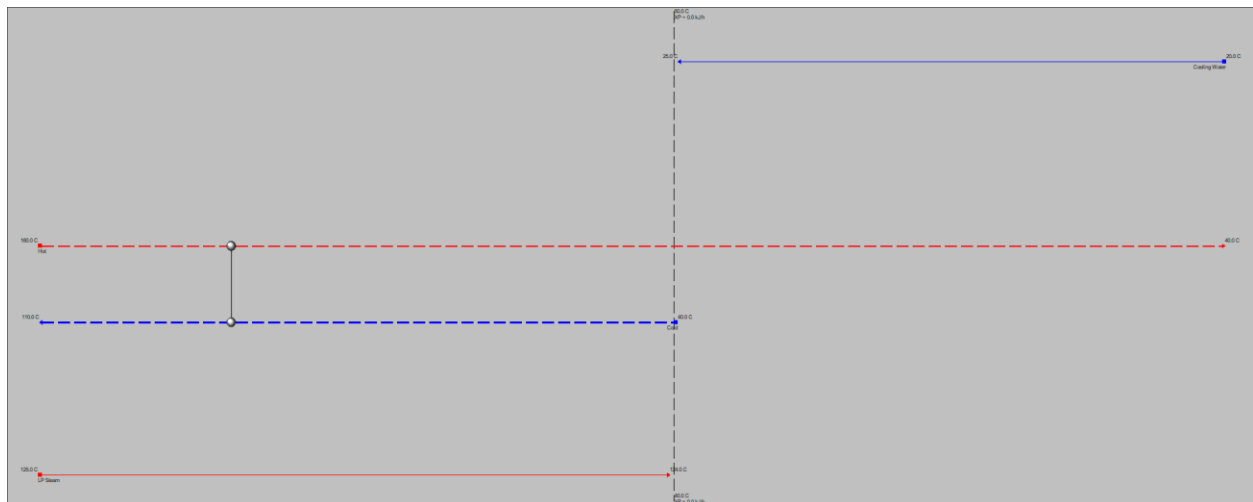
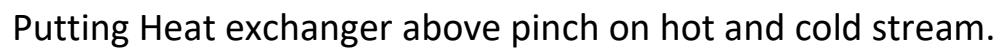
del $T_{\min} = 10\text{ C}$

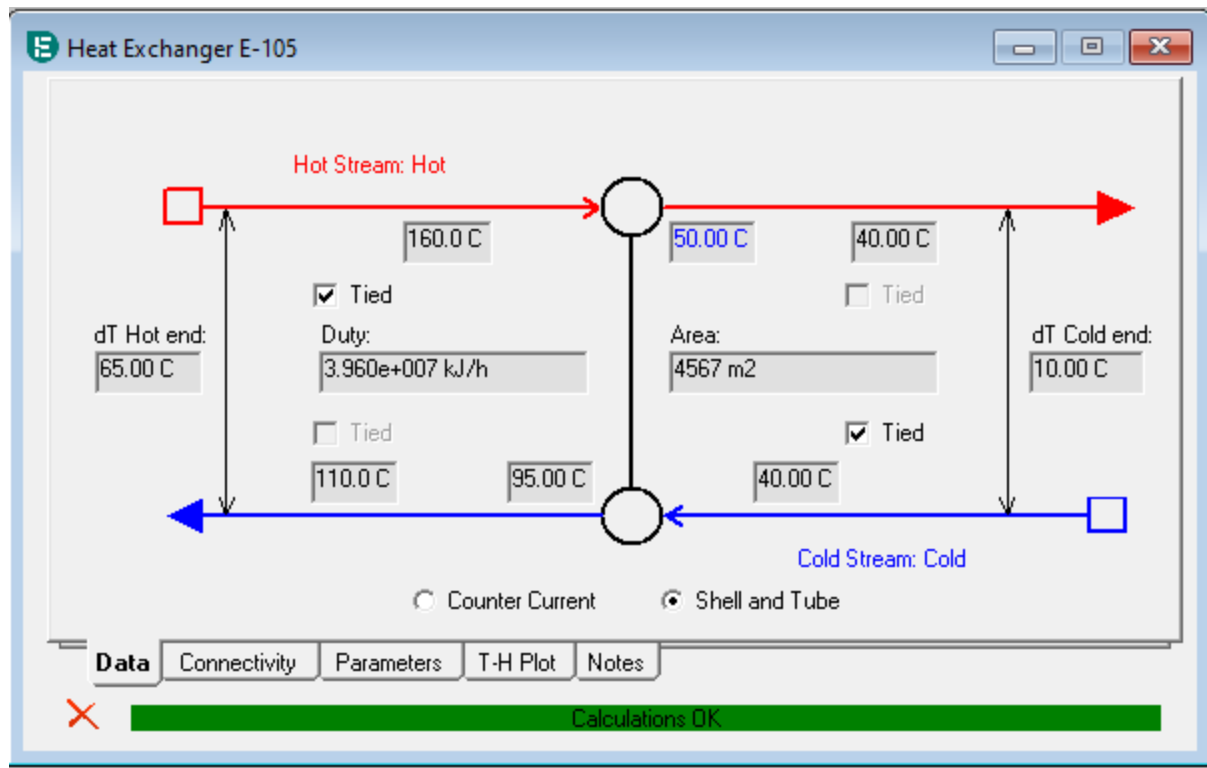
[illegible]

Using Low pressure for hot utility and cooling water for cold utility.

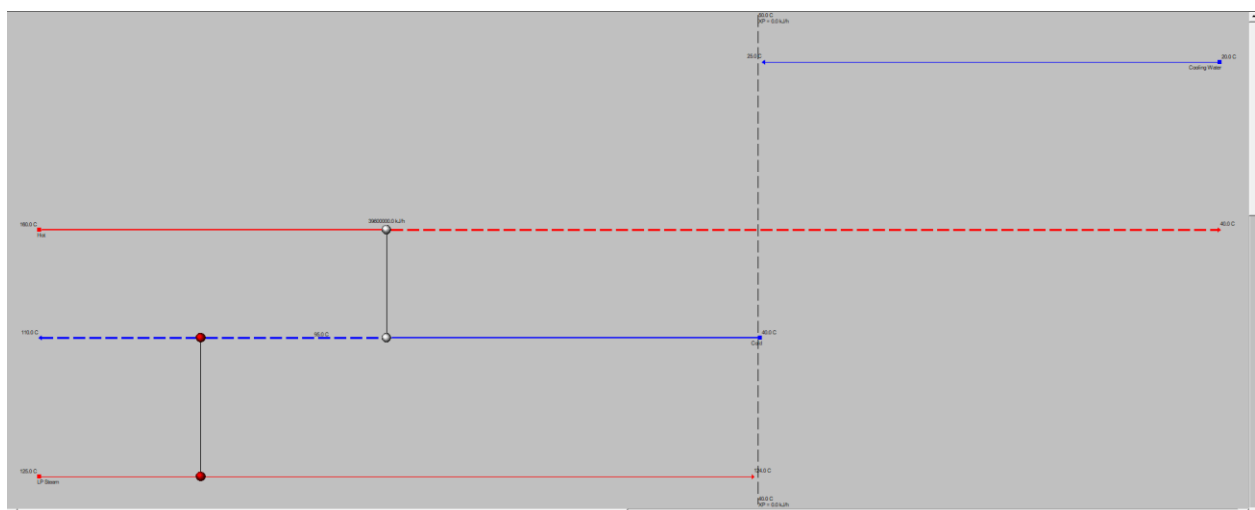
Name	Inlet T [C]	Outlet T [C]	Cost Index [Cost/kJ]	Segm.	HTC [kJ/h-m2-C]	Target Load [kJ/h]	Effective Cp [kJ/kg-C]	Target Flowrate [kg/h]	DT Cont. [C]
LP Steam	125.0	124.0	1.900e-006		2.160e+00	1.080e+007	2196	4917	Global
Cooling Water	20.0	25.0	2.125e-007		1.350e+00	3.600e+006	4.183	1.721e+005	Global

and cold pinch at 40 C

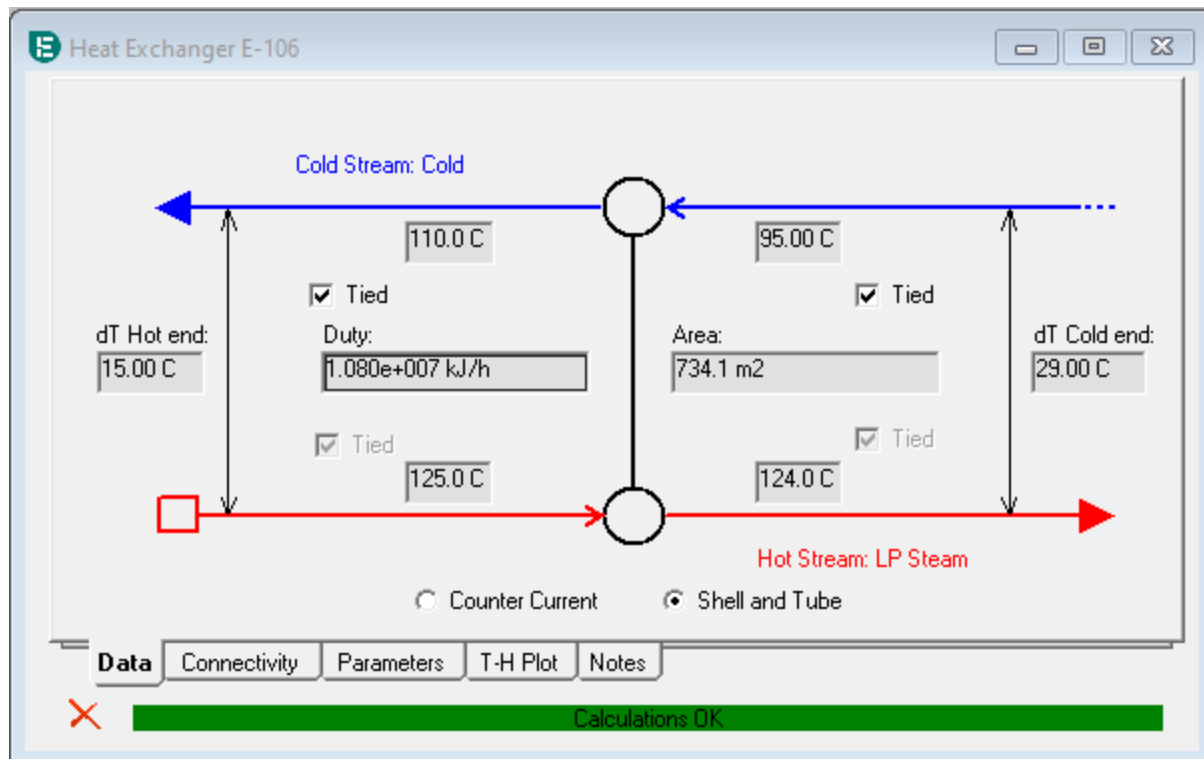




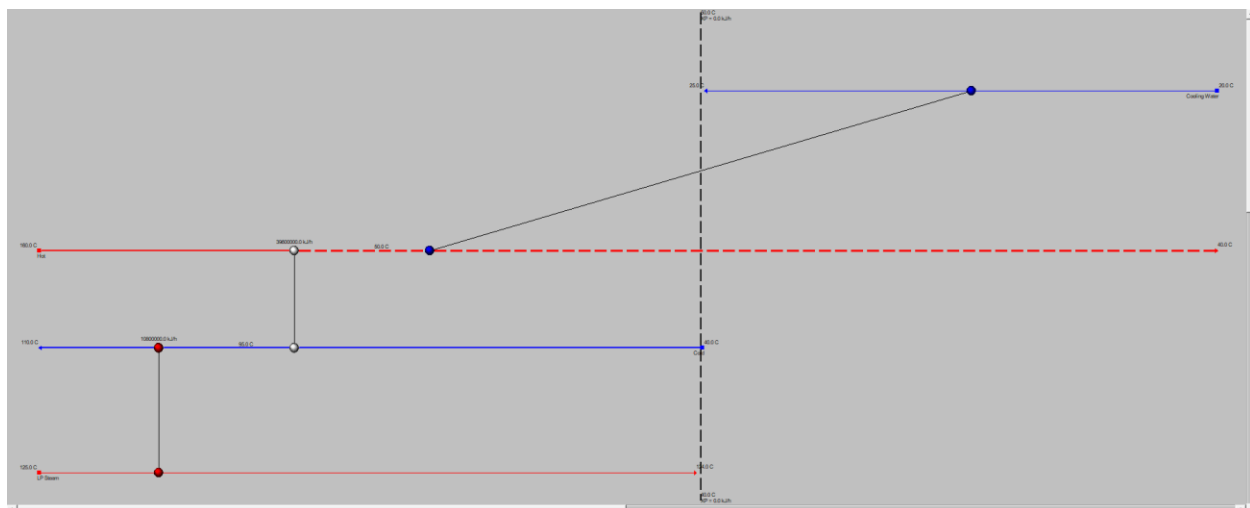
Then a reboiler for hot utility:



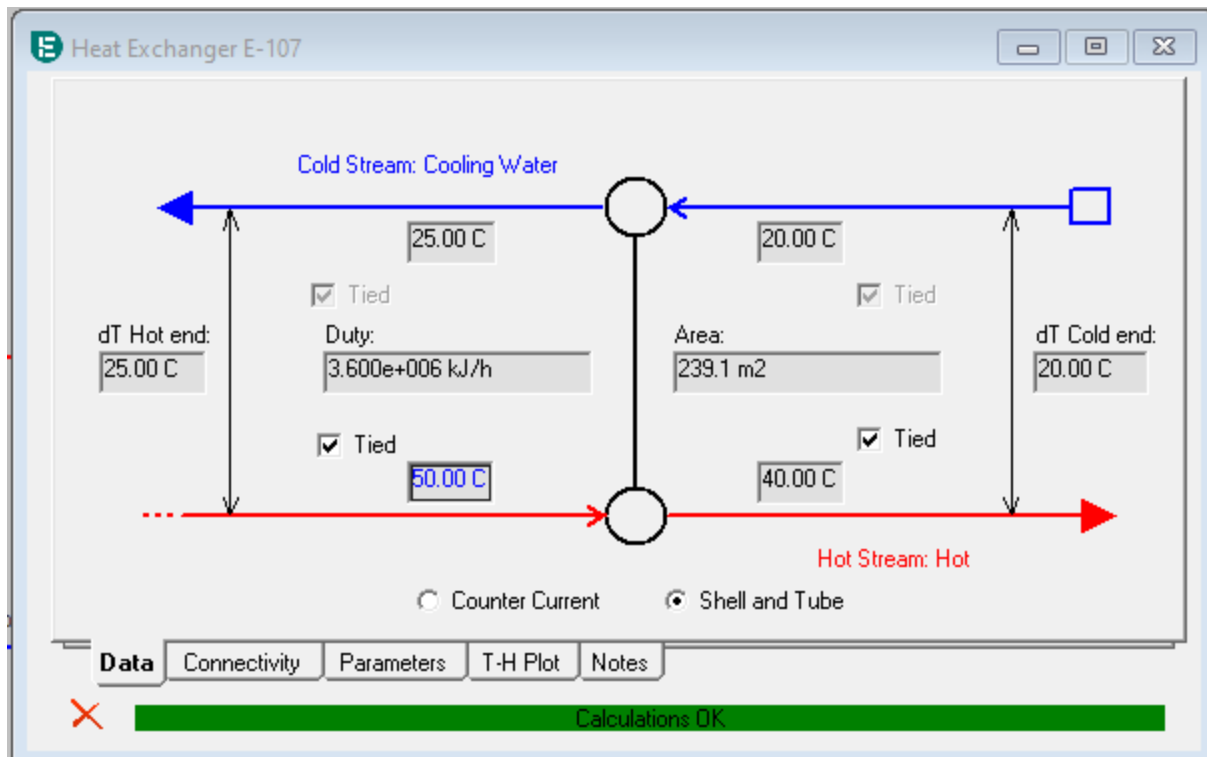
A reboiler of 3 MW utility is required here.



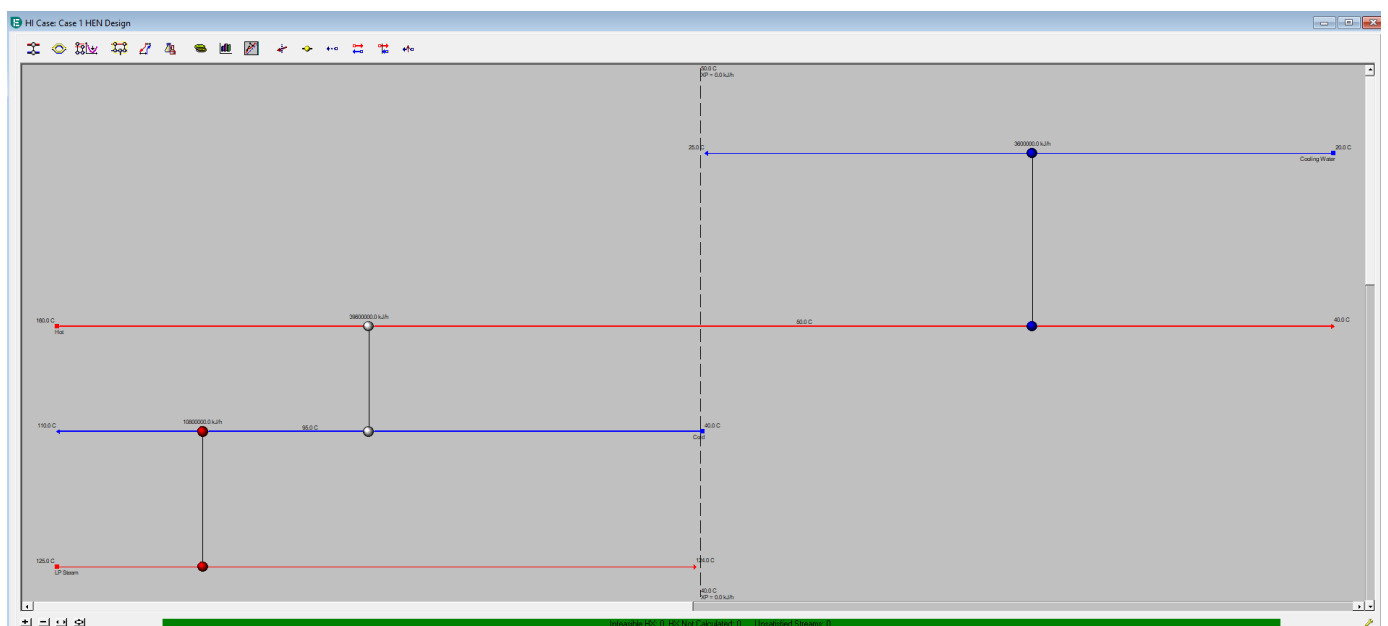
Then a condenser for cold utility



A condenser of 1 MW utility is required here.



Finally, the heat exchanger networks look like this.



Q2.

	Stream	T_in	T_out	C_p	Heat load
1	Hot-1	300	80	0.15	-33
2	Hot-2	200	40	0.225	-36
3	Cold-1	40	180	0.2	28
4	Cold-2	140	280	0.3	42

del T_min = 20 C

HI Case: Case 2										
Name		Inlet T [C]	Outlet T [C]	MCp [kJ/C-h]	Enthalpy [kJ/h]	Segm.	HTC [kJ/h-m ² -C]	Flowrate [kg/h]	Effective Cp [kJ/kg-C]	DT Cont. [C]
Hot-1		300.0	80.0	5.400e+00E	1.188e+008		720.0	---	---	Global
Hot-2		200.0	40.0	8.100e+00E	1.296e+008		720.0	---	---	Global
Cold-1		40.0	180.0	7.200e+00E	1.008e+008		720.0	---	---	Global
Cold-2		140.0	280.0	1.080e+00E	1.512e+008		720.0	---	---	Global

For hot utility we are using fired heat, and for cold utility cooling water is used.

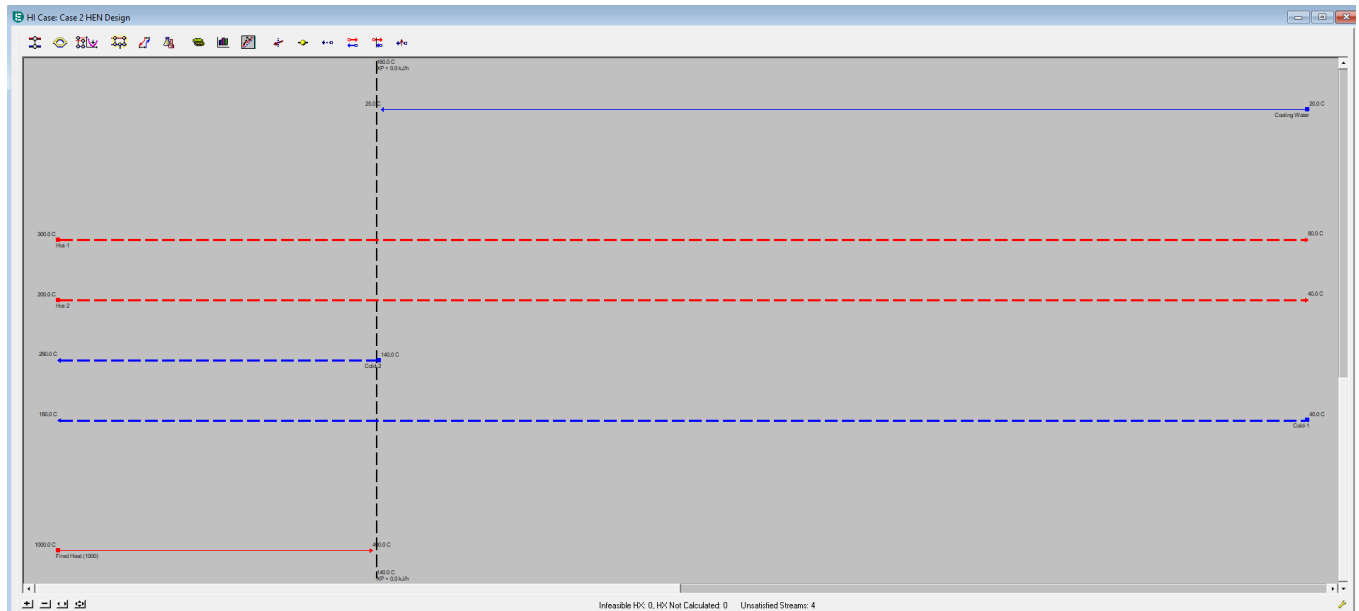
HI Case: Case 2										
Name		Inlet T [C]	Outlet T [C]	Cost Index [Cost/kJ]	Segm.	HTC [kJ/h-m ² -C]	Target Load [kJ/h]	Effective Cp [kJ/kg-C]	Target Flowrate [kg/h]	DT Cont. [C]
Cooling Water		20.0	25.0	2.125e-007		1.350e+00	6.840e+007	4.183	3.270e+006	Global
Fired Heat (1000)		1000.0	400.0	4.249e-006		399.6	7.200e+007	1.000	1.200e+005	Global
<empty>										

del T_min = 20 C

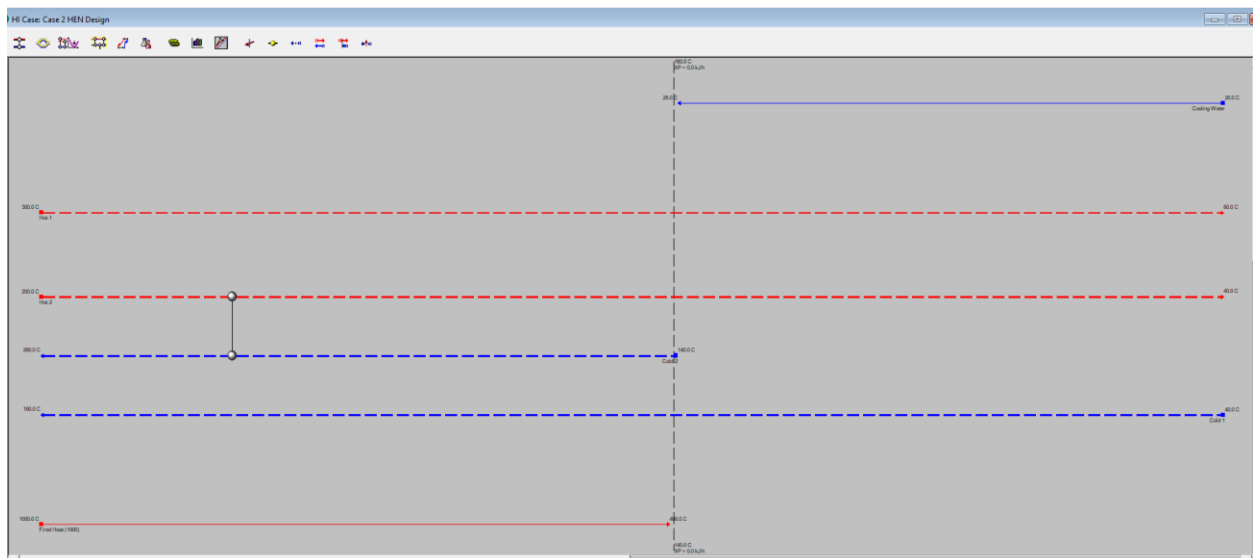
Doing pinch analysis, we got:

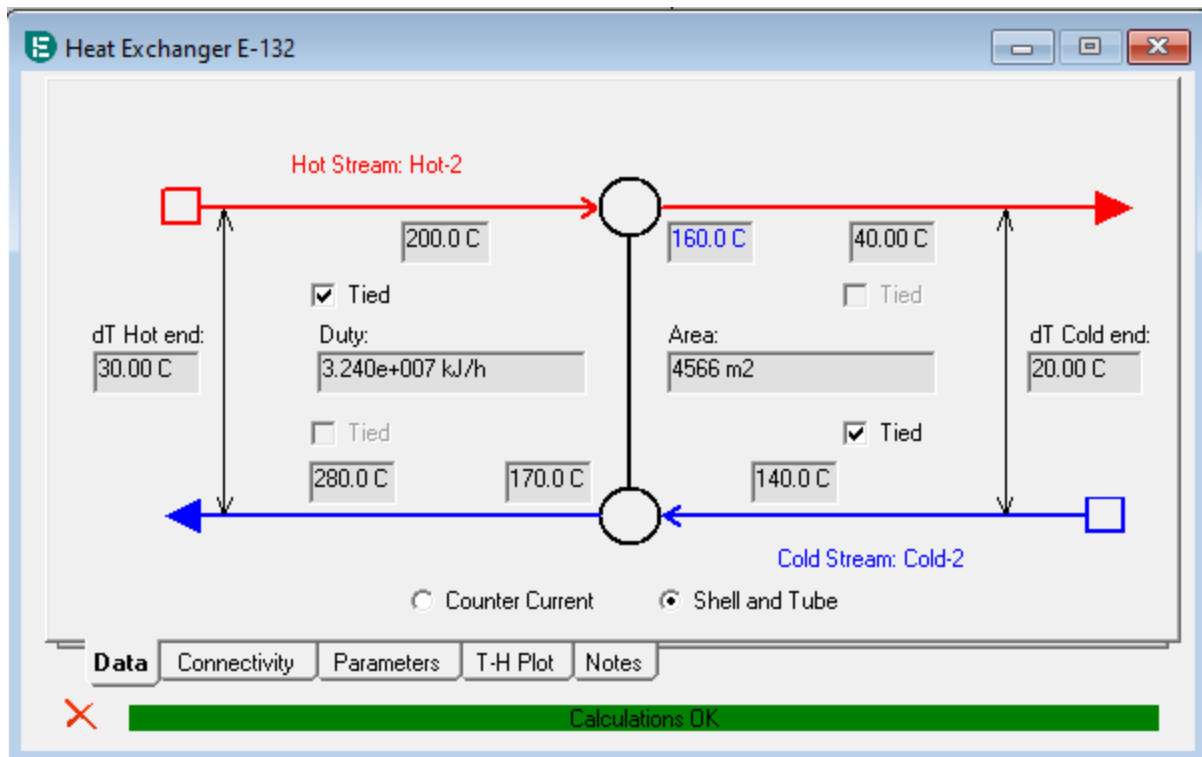
Hot pinch at 160 C

Cold pinch at 140 C

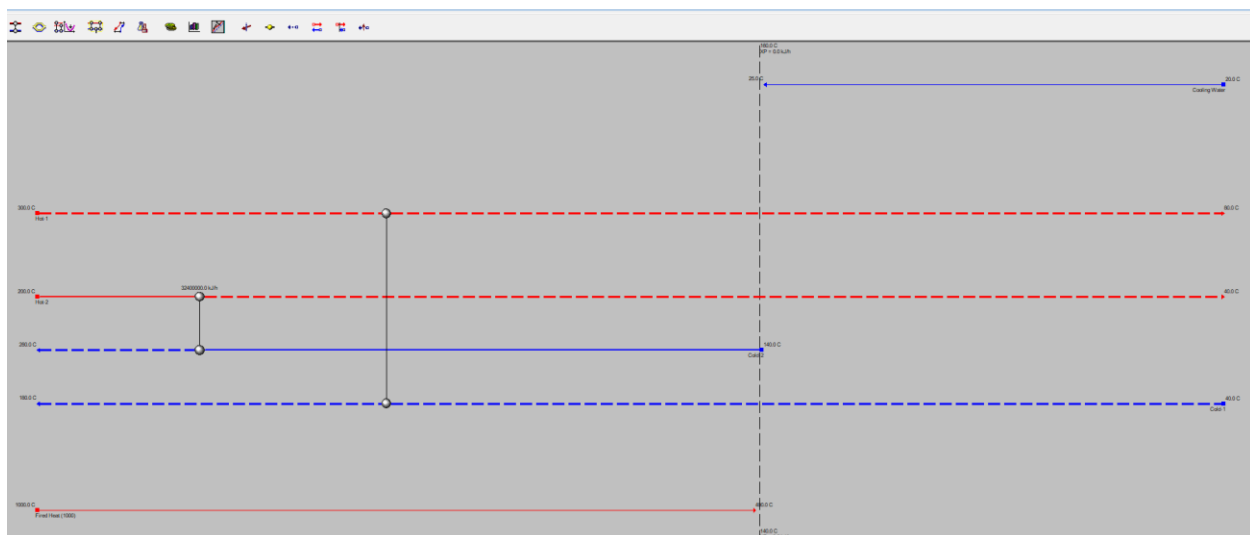


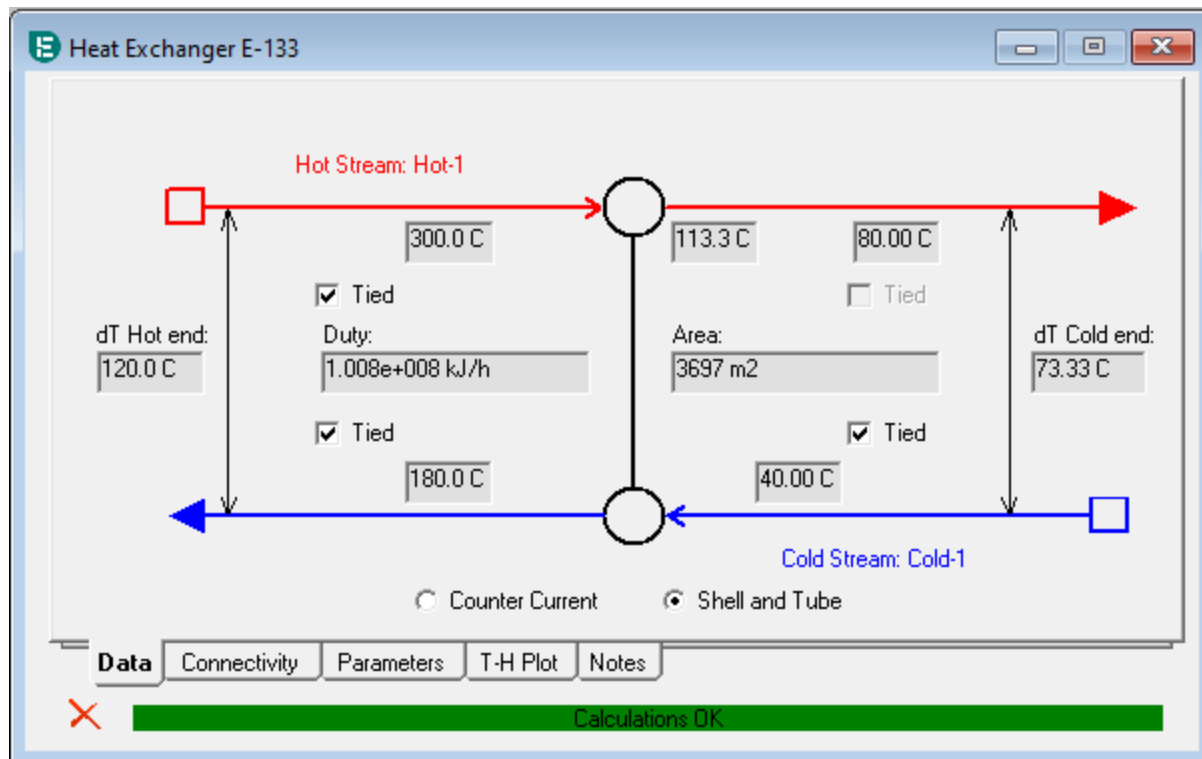
Putting heat exchanger between hot-2 and cold-2.



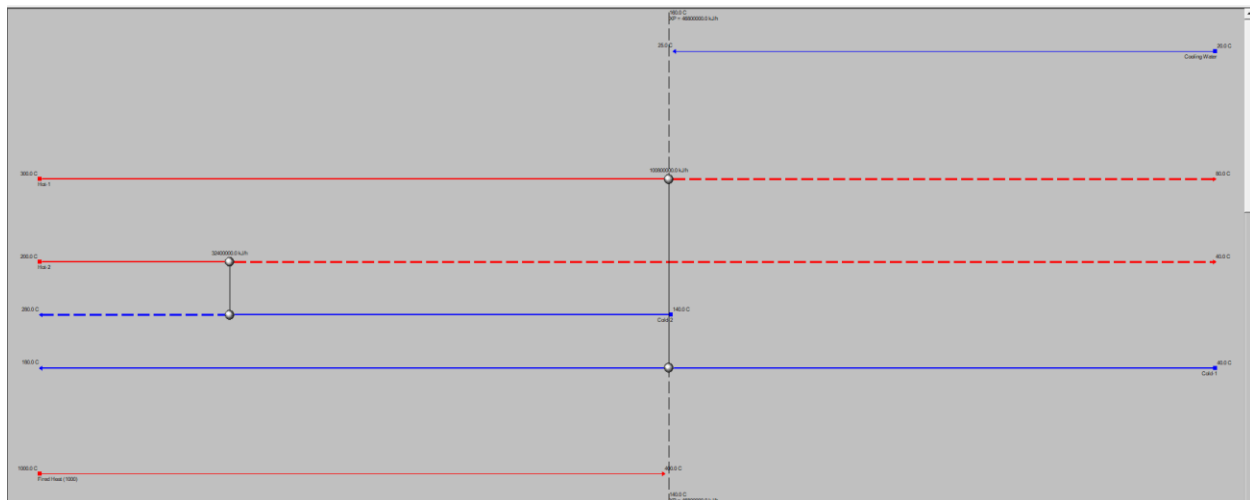


Putting heat exchanger between hot-1 and cold-1.

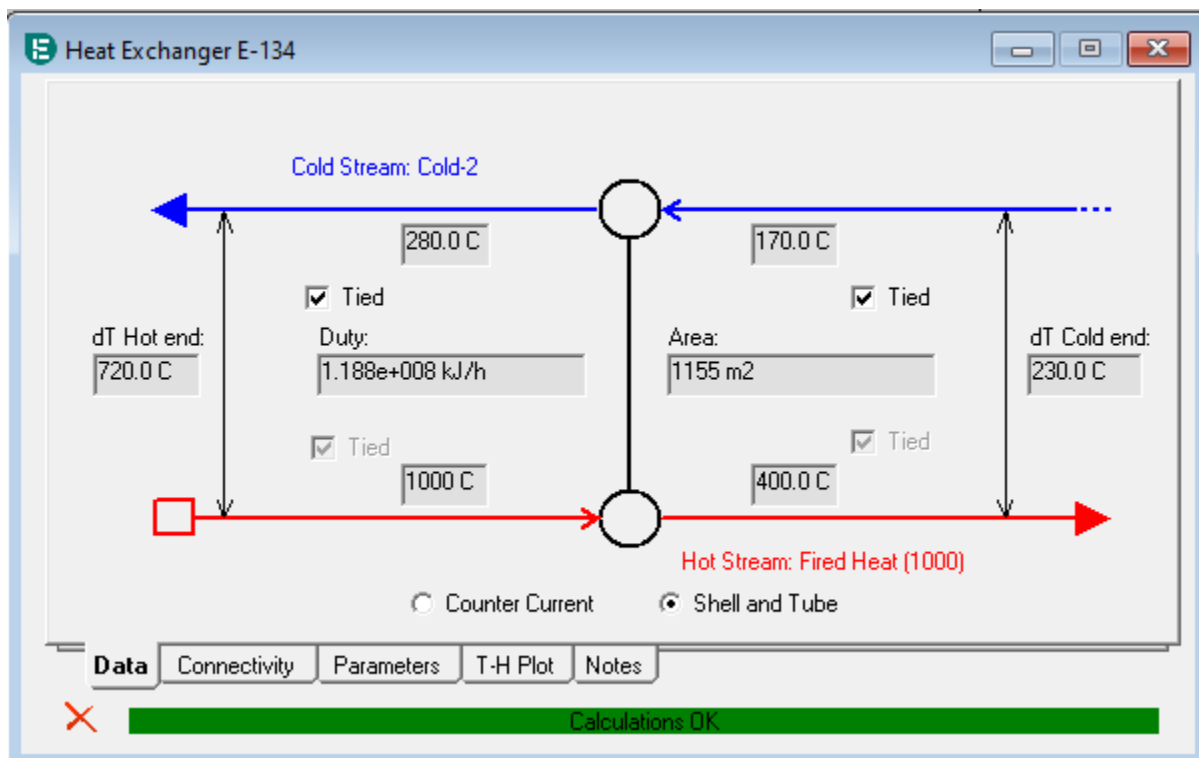
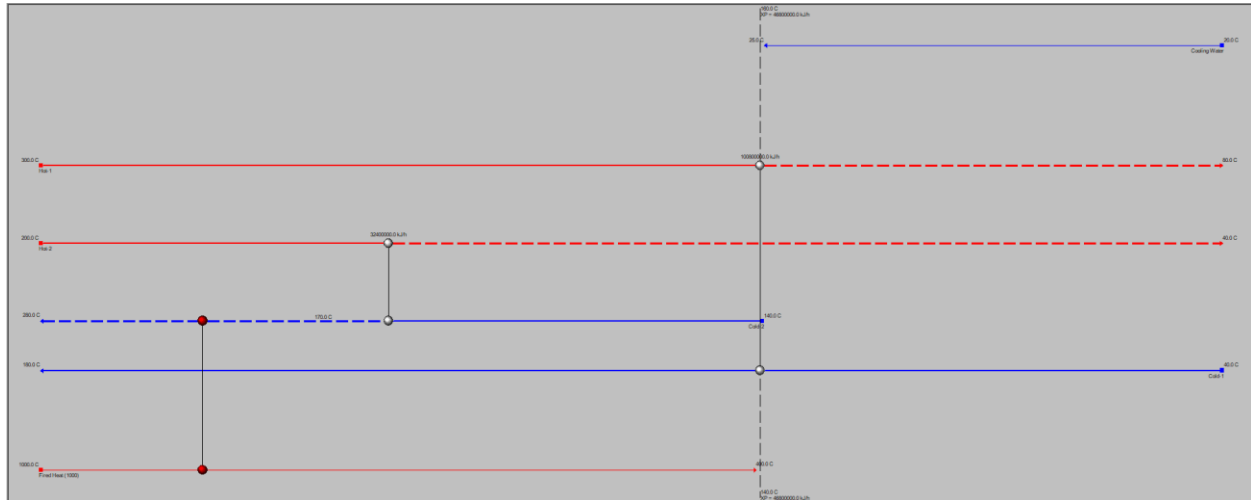




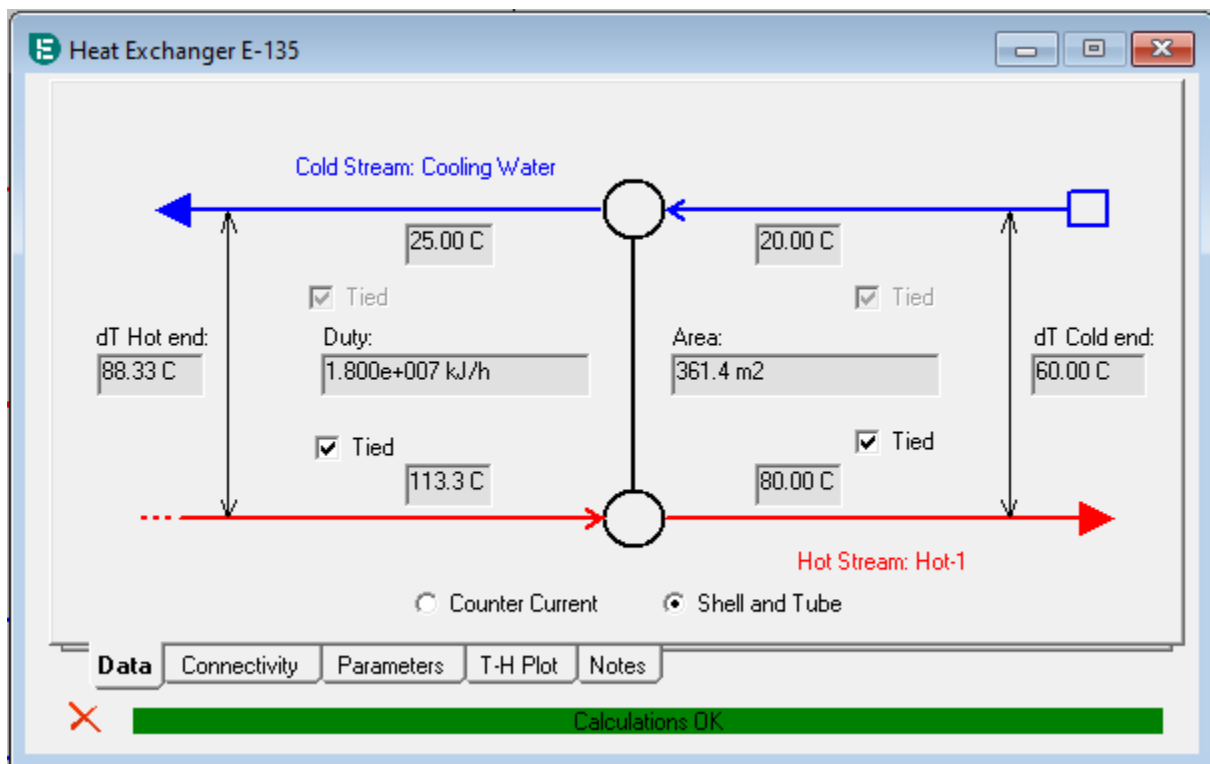
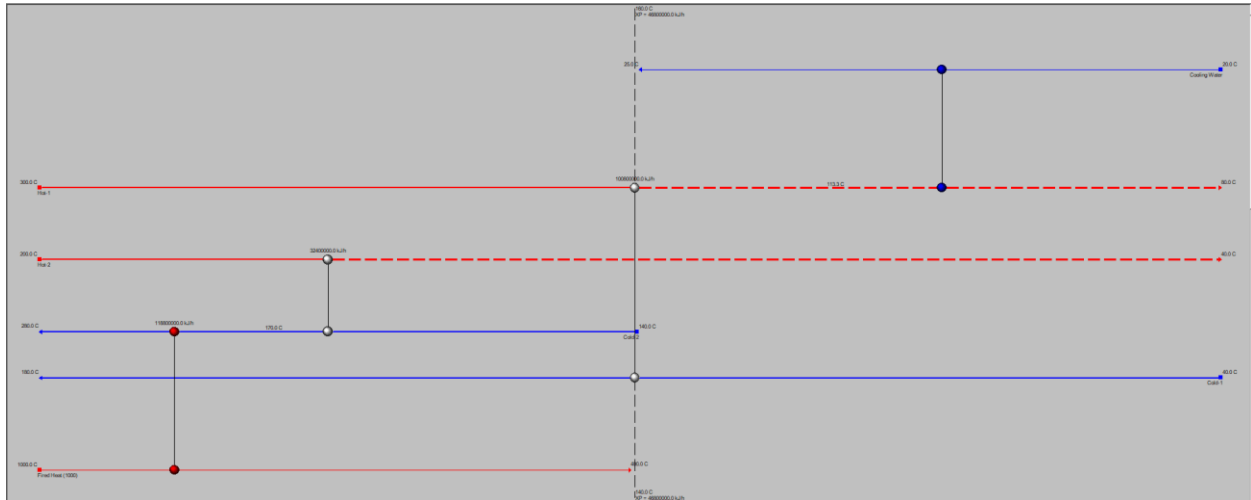
For the remaining streams, put the utilities, hot utility above pinch and cold utility below pinch.



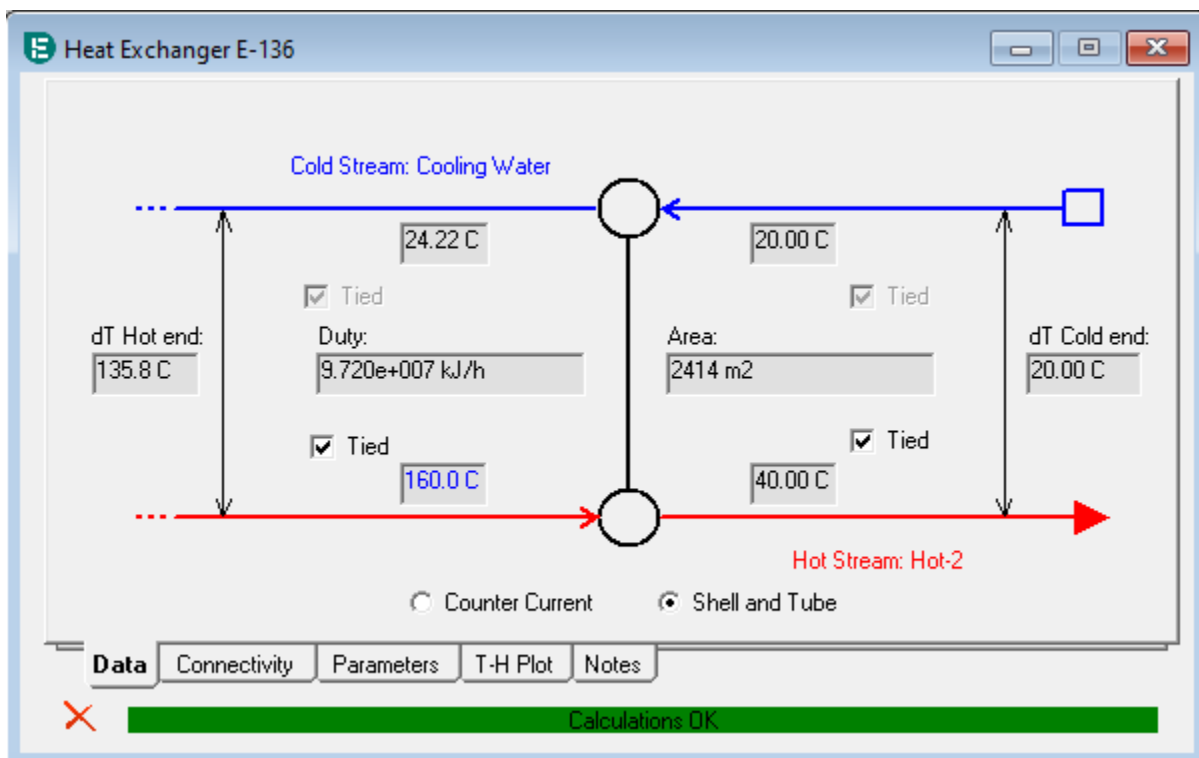
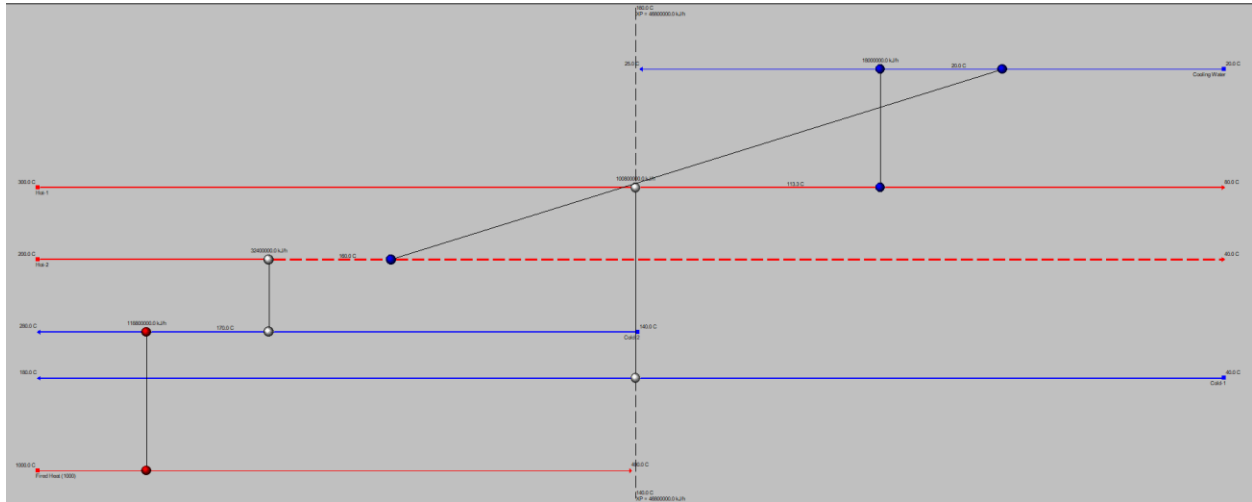
Putting hot utility on stream cold-2:



Putting cold utility on hot-1 stream:



Putting cold utility on hot-2 stream:



So, the final heat exchanger network looks like this with 2 heat exchanger, 1 hot utility and 2 cold utility.

