SKF4153- PLANT DESIGN

HEAT EXCHANGER NETWORK

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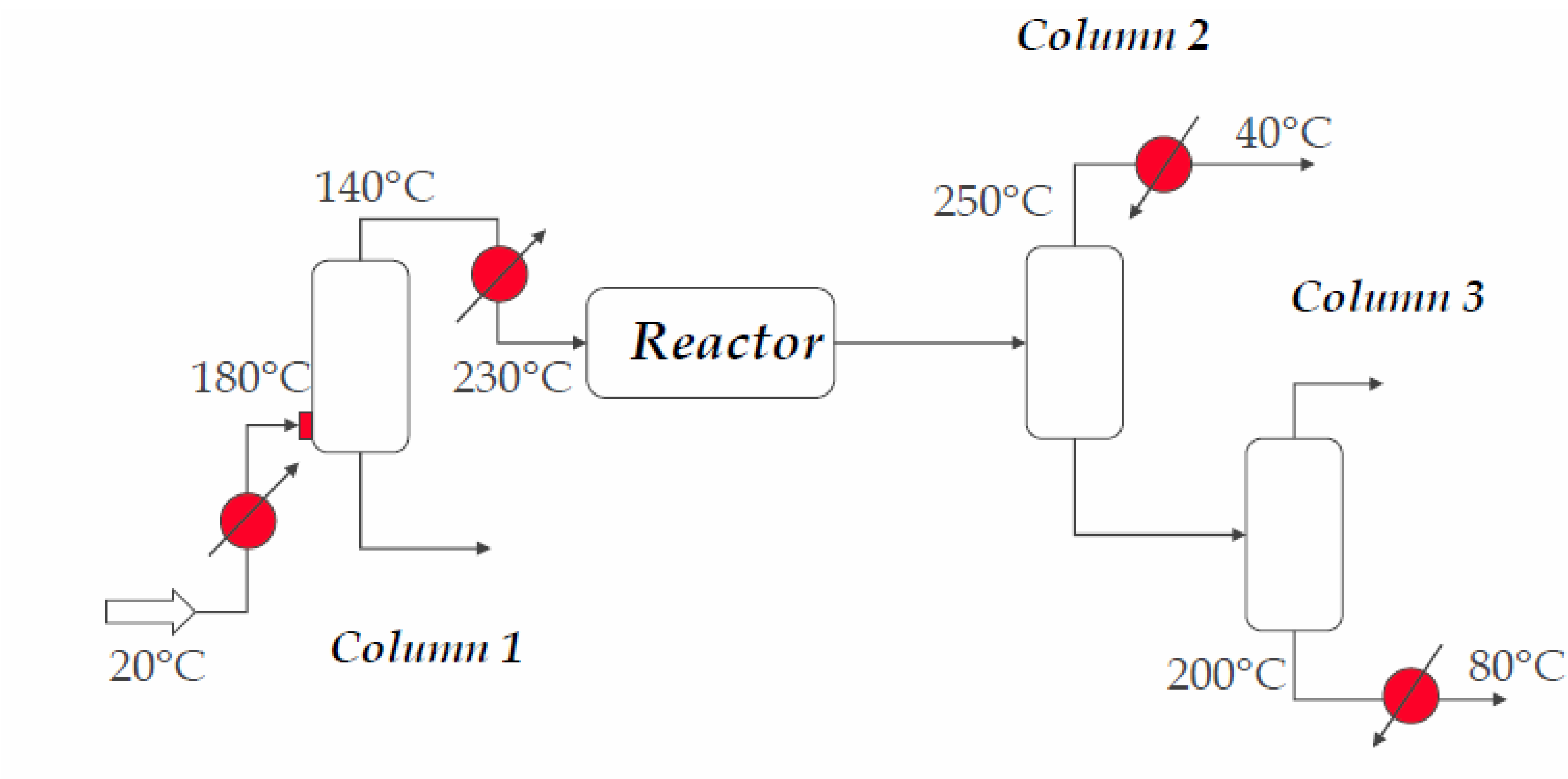
Candidate for Heat Integration



Stream Data for Maximum Energy Recovery

Stream data

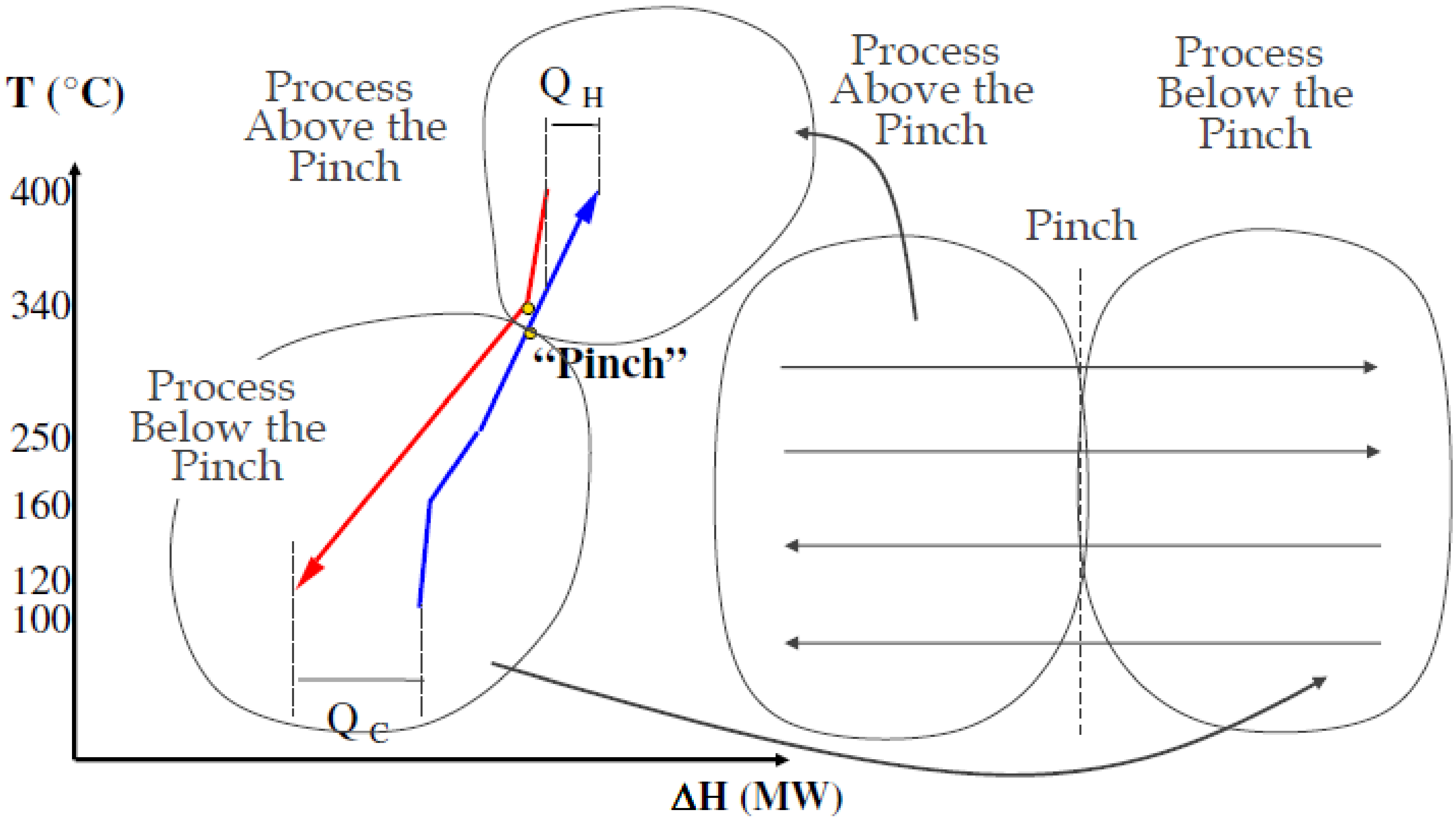
$\Delta T_{min} = 10°C$

Stream	Type	T_{supply} (°C)	T_{target} (°C)	FC_P (MW/K)
1	Cold	20	180	0.20
2	Hot	250	40	0.15
3	Cold	140	230	0.30
4	Hot	200	80	0.25

From the Composite Curves / Problem Table Algorithm

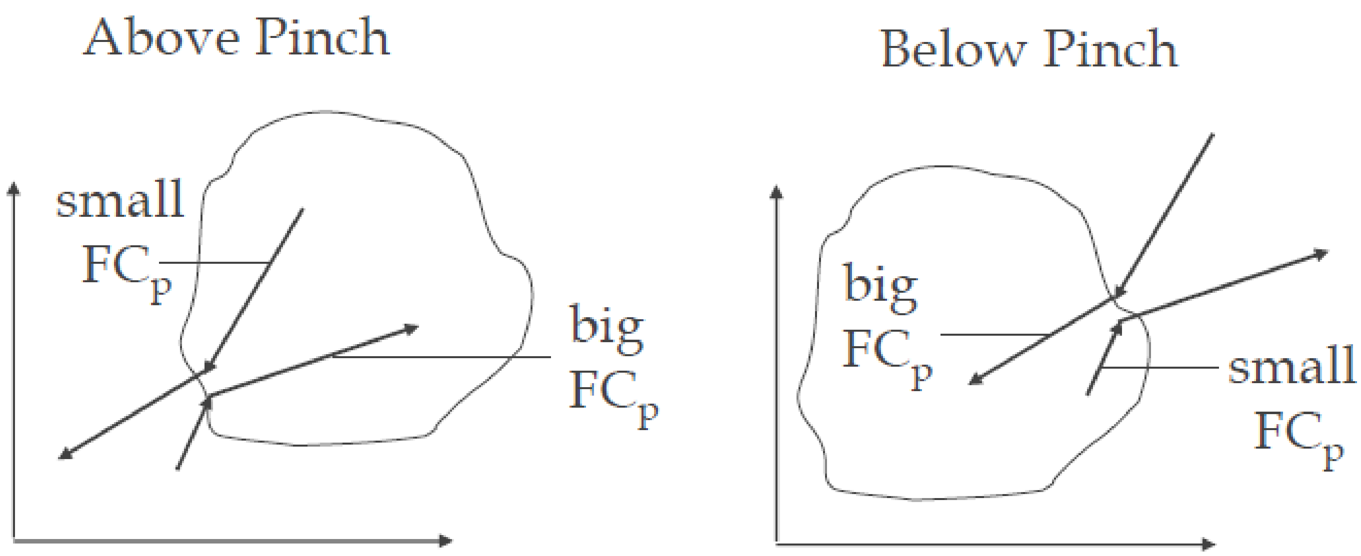
- $Q_{H\,min}$ = 7.5 MW
- Q_{Cmin} = 10.0 MW
- Hot Stream Pinch Temperature = 150°C
  Cold Stream Pinch Temperature = 140°C

Grid Diagram- Temperature Levels



ΔT_{min} Rule for Stream Matching

To guarantee ΔT_{min} is observed……

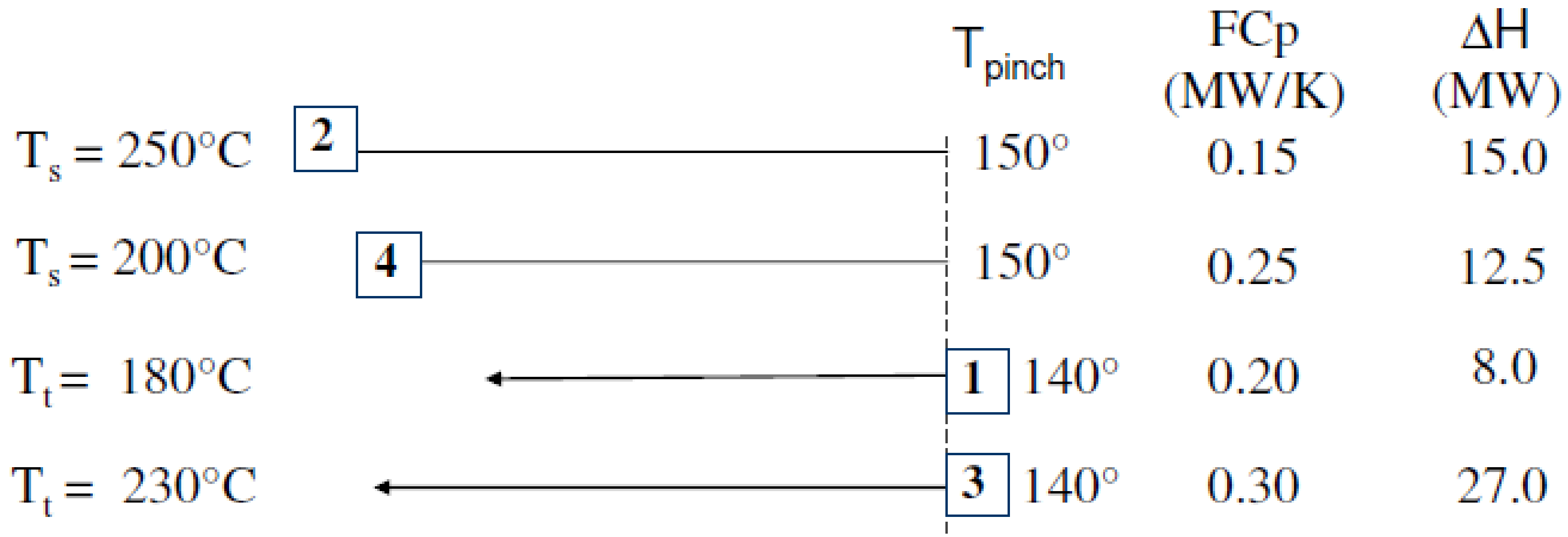


$FC_{pHOT} < FC_{pCOLD}$ $\quad$ $FC_{pHOT} > FC_{pCOLD}$

In general, to guarantee feasible heat exchange,

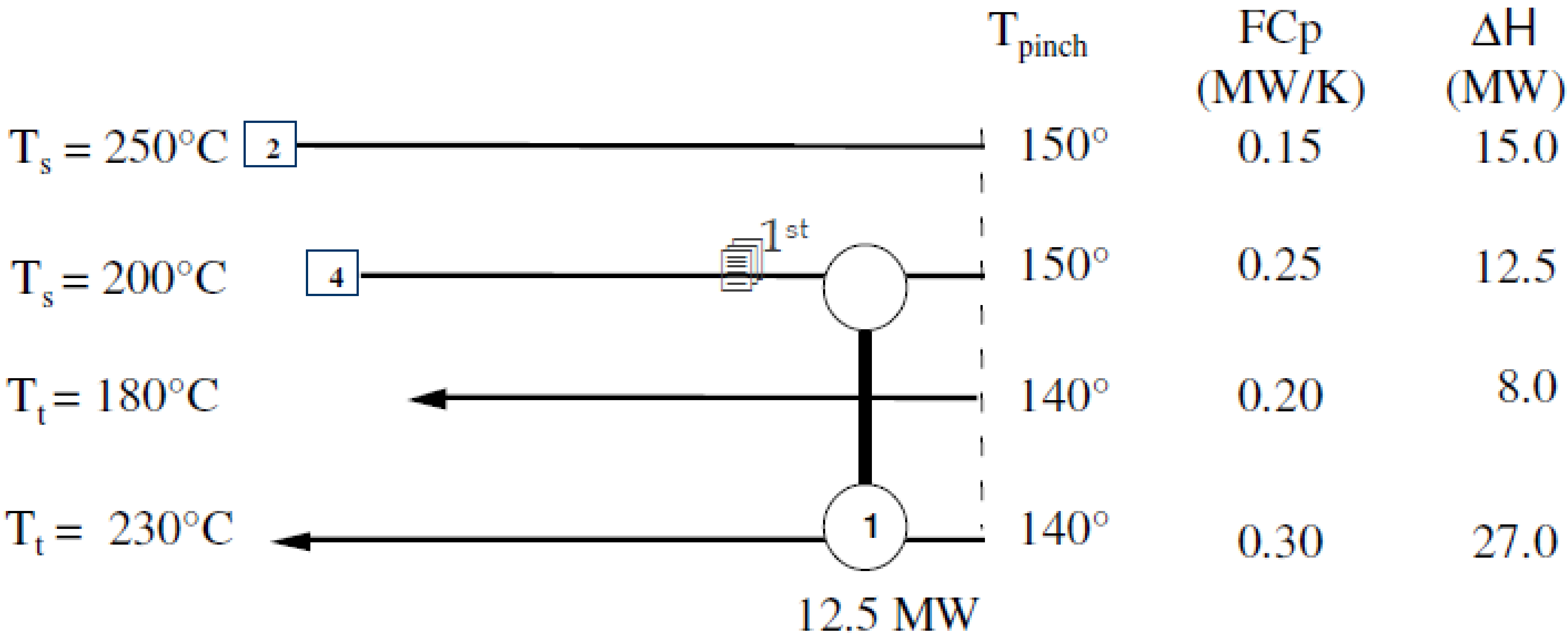
Match $FC_{p,out} > FC_{p,in}$

Design Above the Pinch



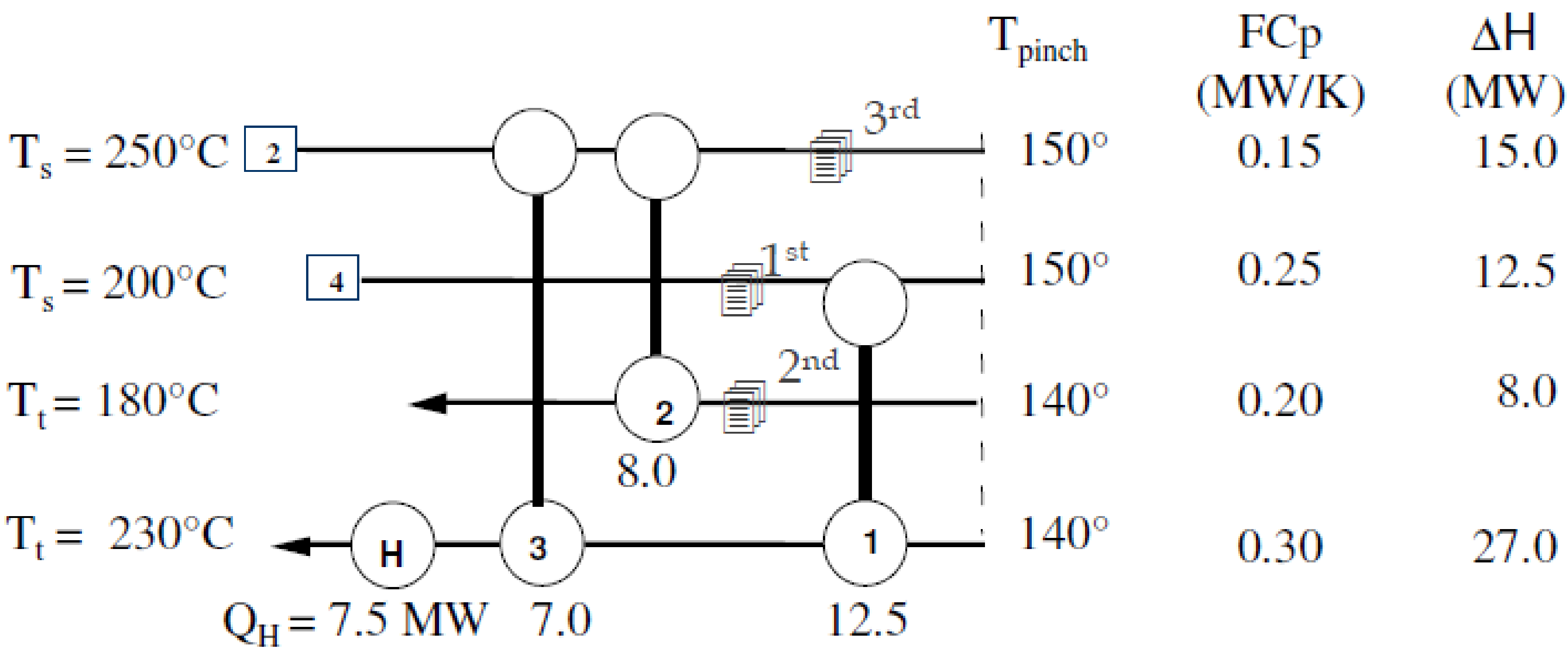
- Start design from the pinch temperature, and move away (from the pinch)
- Above the pinch, match streams with $FC_{P,HOT} < FC_{P,COLD}$ (FC_P inequality)
- Start with the hot stream with the biggest (FC_P)
- Maximize the HE load, and tick off streams for which the enthalpy balance has been fully satisfied (due to heat exchange)
- Fill in the rest of the exchangers in same manner, checking for temperature feasibility for heat exchange (ΔT_{min})

Above the Pinch- HEX#1



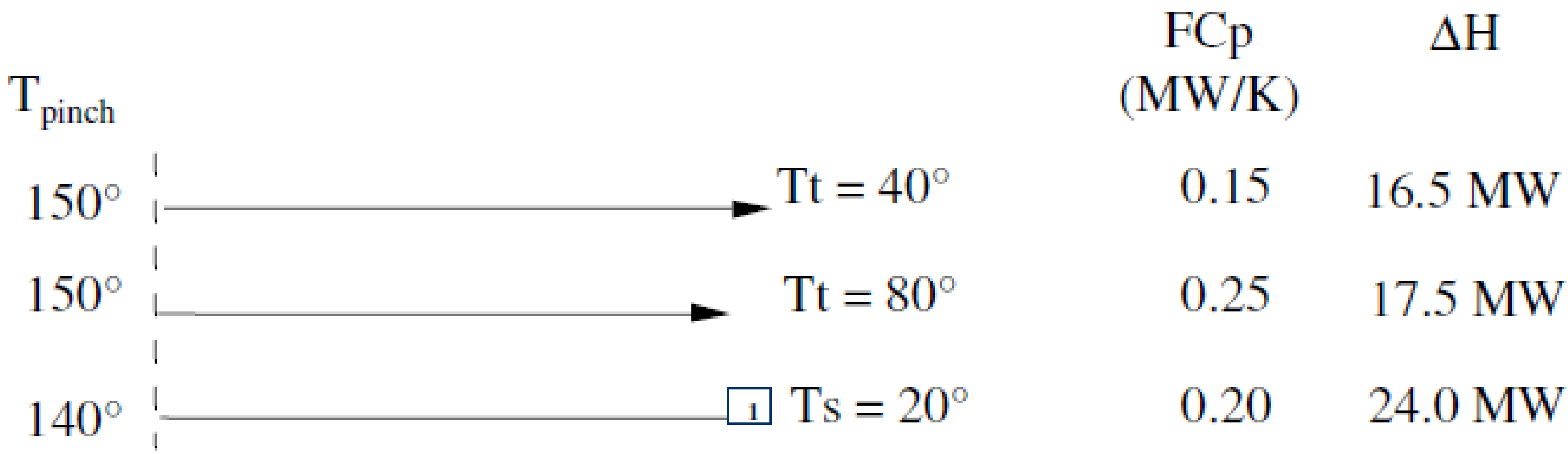
Match $FC_{P,C} > FC_{P,H}$, tick off stream

Above the Pinch- Fill in the Rest



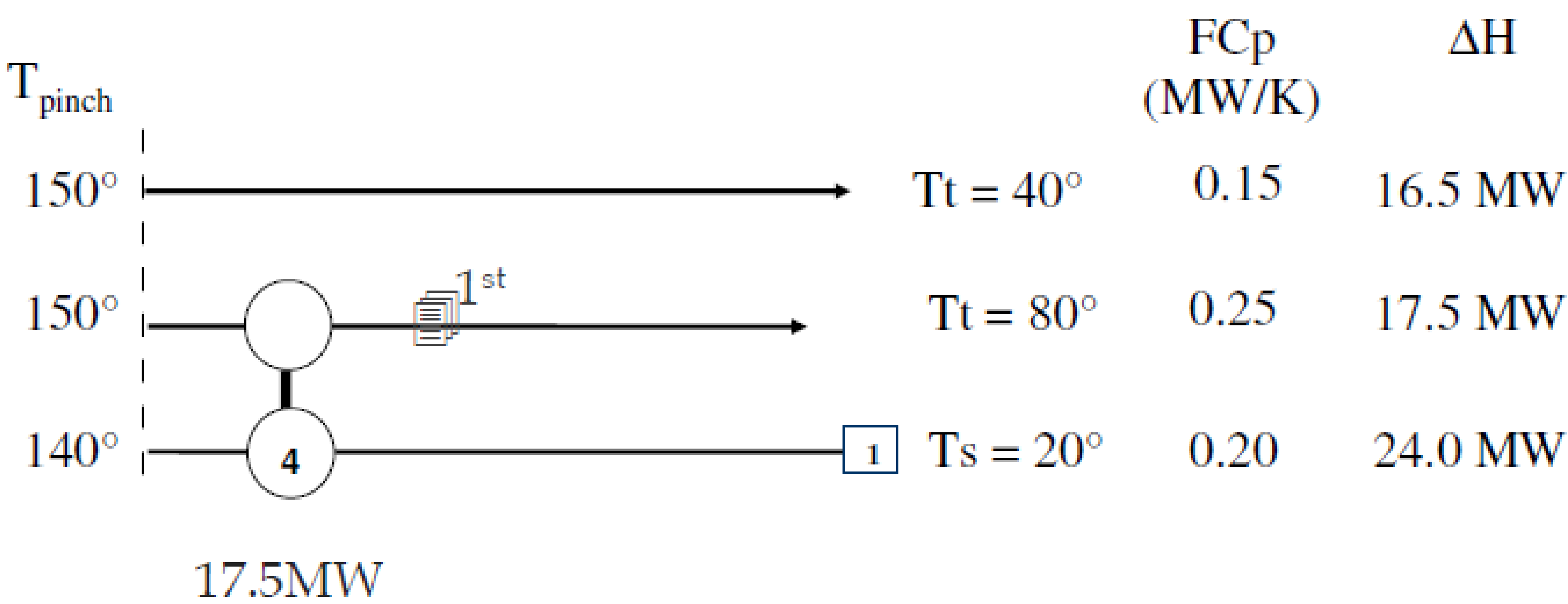
Observe : No Cold Utility Above the Pinch

Design Below the Pinch



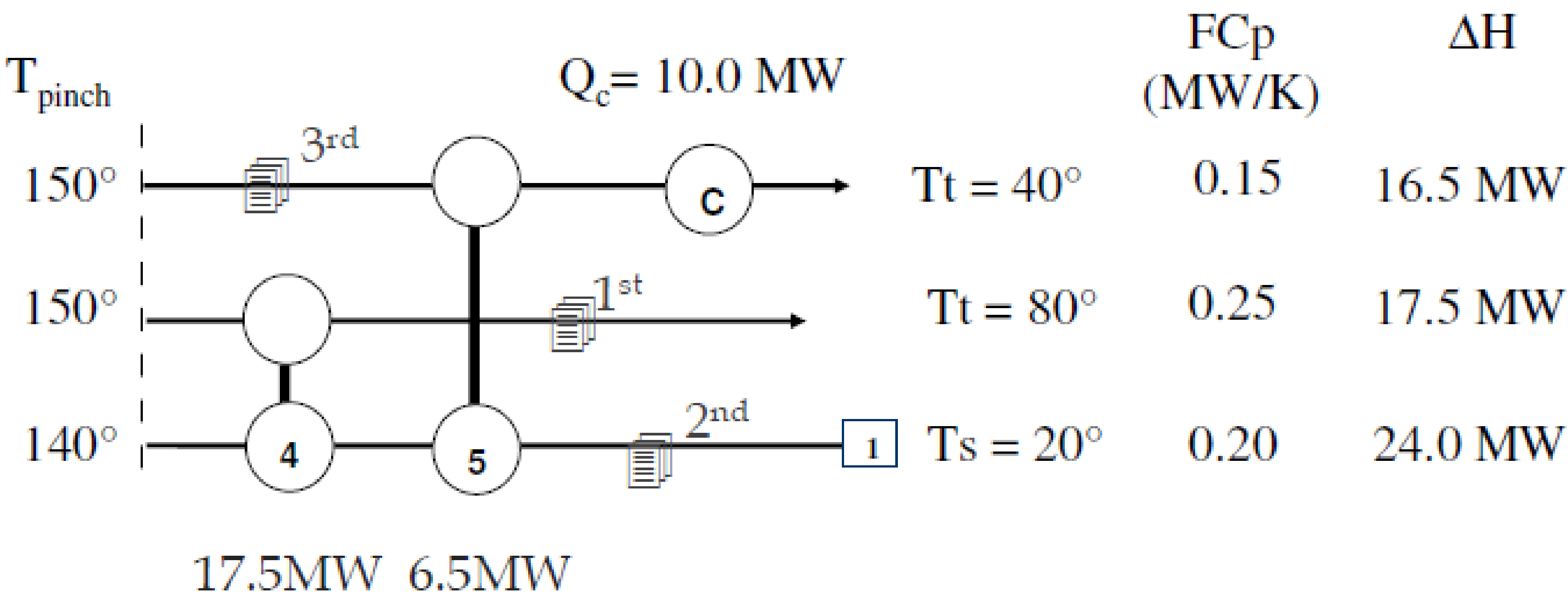
- Start design from the pinch temperature, and move away (from the pinch)
- Below the pinch, follow $FC_{P,HOT} > FC_{P,COLD}$ (FC_P inequality) for pinch match
- Start with the cold stream with the biggest (FC_P)
- Maximize the HE load, and tick off streams for which the enthalpy balance has been fully satisfied (due to heat exchange)
- Fill in the, rest, checking for temperature feasibility for heat exchange

Below the Pinch- HEX#1



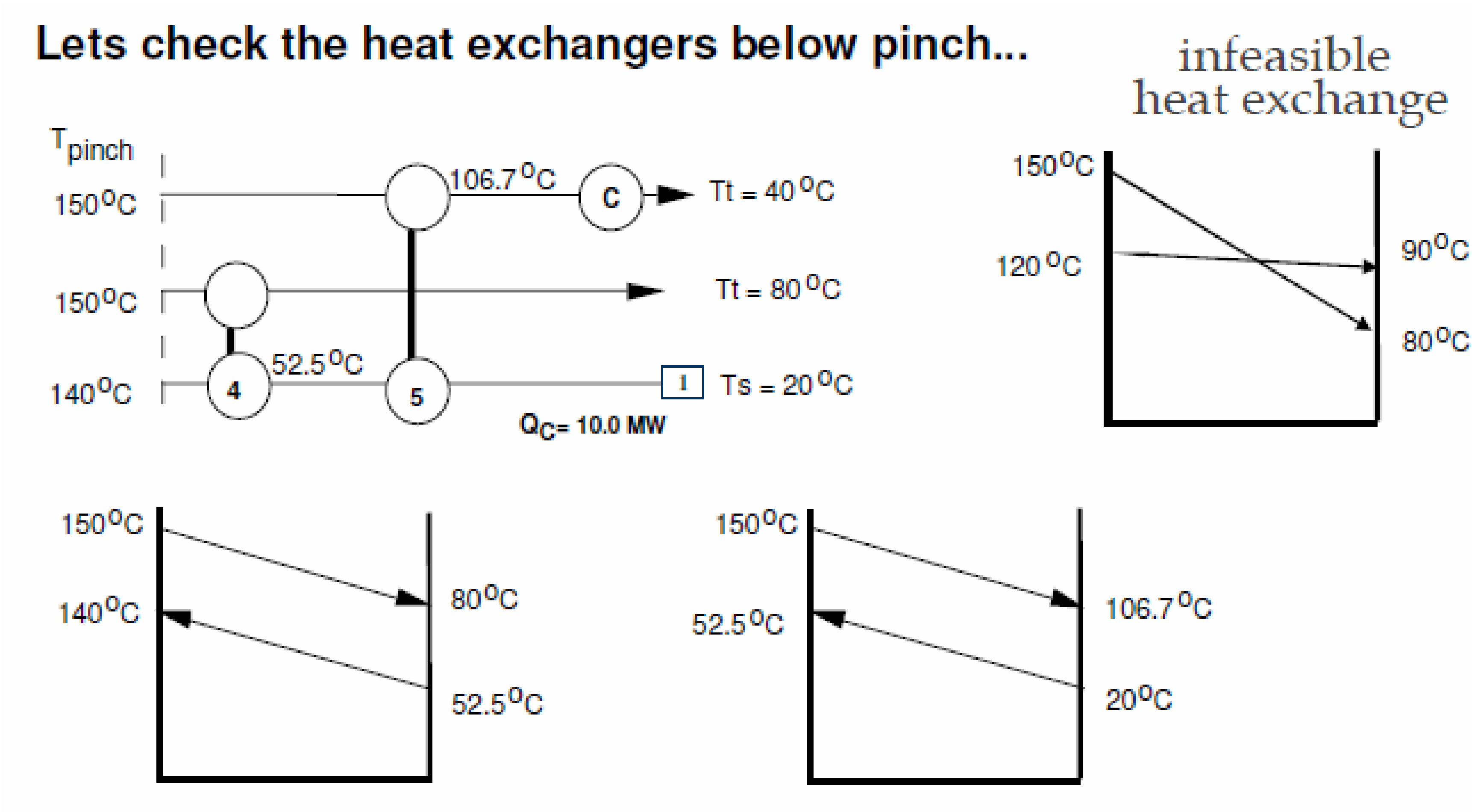
Match $FC_{P,H} > FC_{P,C}$, tick off stream

Below the Pinch- Fill in the Rest

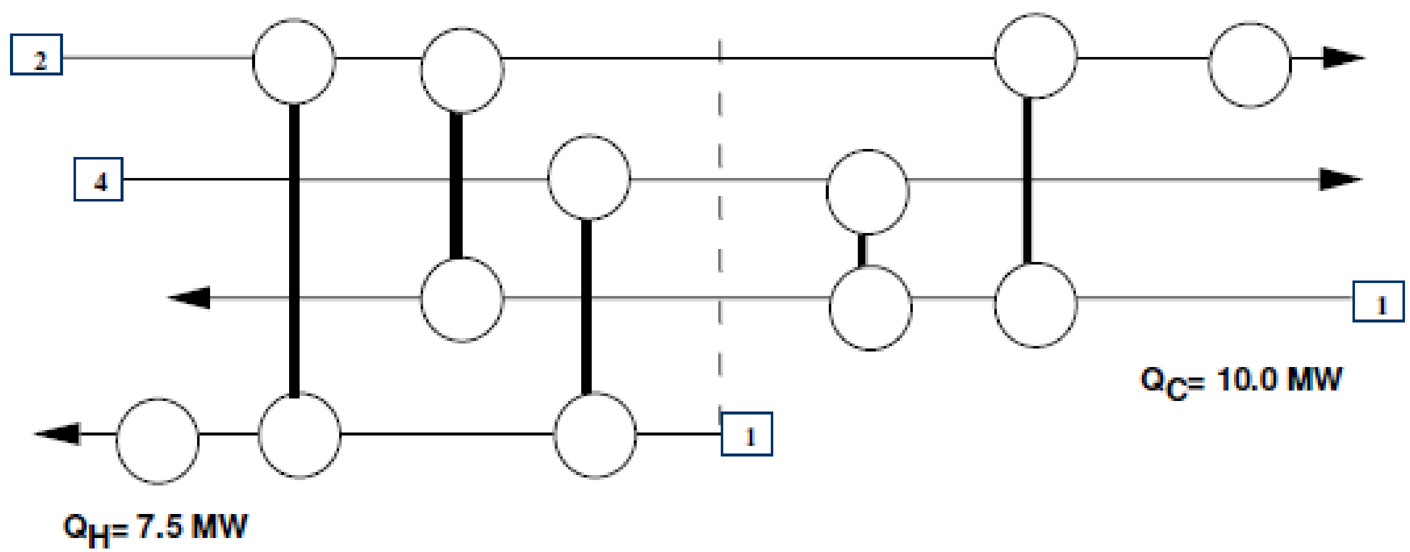


Observe : No External Heating

Feasible Heat Exchange



Maximum Energy Recovery



U_{min} MER = U_{min} above pinch + U_{min} below pinch

= (5-1) + (4-1)

= 7

References

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- L.T. Biegler, I.E. Grossman, A.W. Westerberg, Systematic Methods of Chemical Process Design, Prentice Hall, 1997.
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