



# Application of simulated annealing for multi-period heat exchanger network retrofit

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## Goal

To develop an optimization framework for existing multi-period heat exchanger network (HEN) retrofit using simulated annealing (SA).

## Case Study

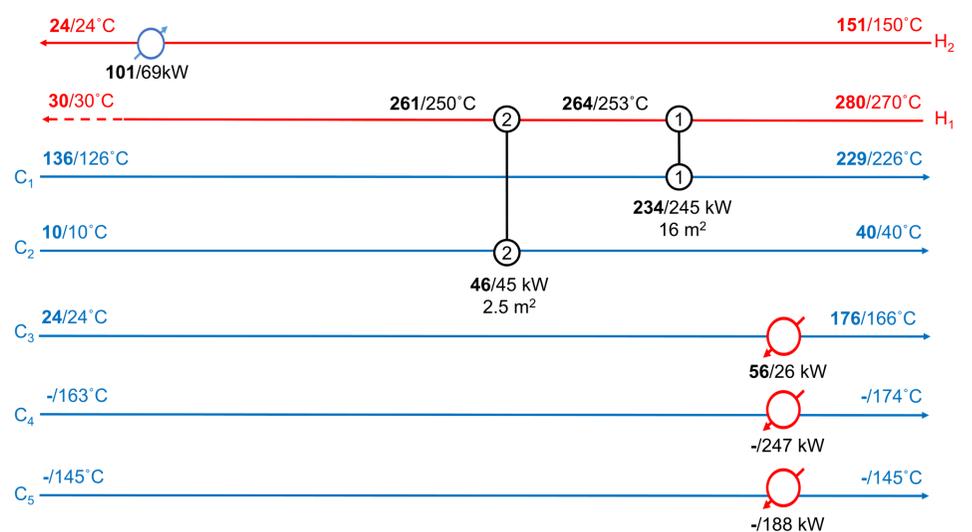
### Existing HEN on regular/cractive potato chip production

- Temp. and heat loads presented as **operating period 1 (OP1)/ operating period 2 (OP2)**.
- $H_1$  is a soft stream, while  $C_4$  and  $C_5$  are only active during OP2.
- Fixed streams and area for **heat exchanger (HEX) 1**.



### Apply SA-based optimization framework

- Objective: Minimize total annual cost (TAC).

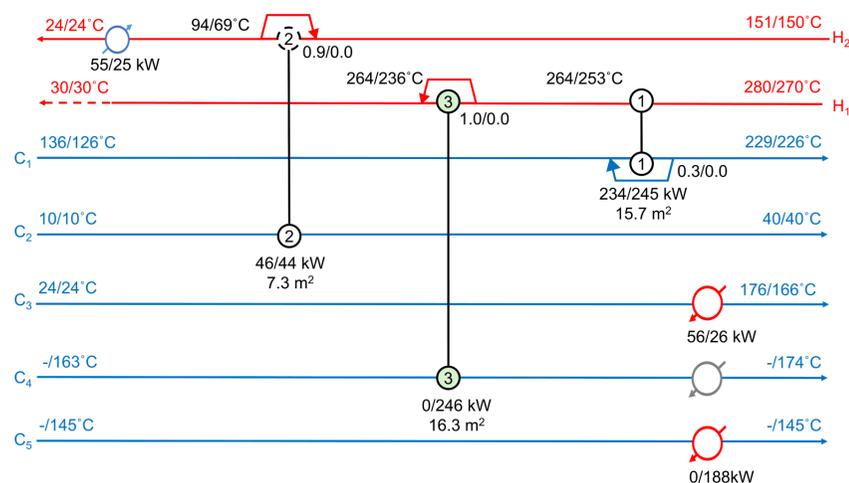


## Results

Retrofit HEN designs have reduced hot utility (HU) demand, cold utility (CU) demand, and TAC, while considering existing process constraints.

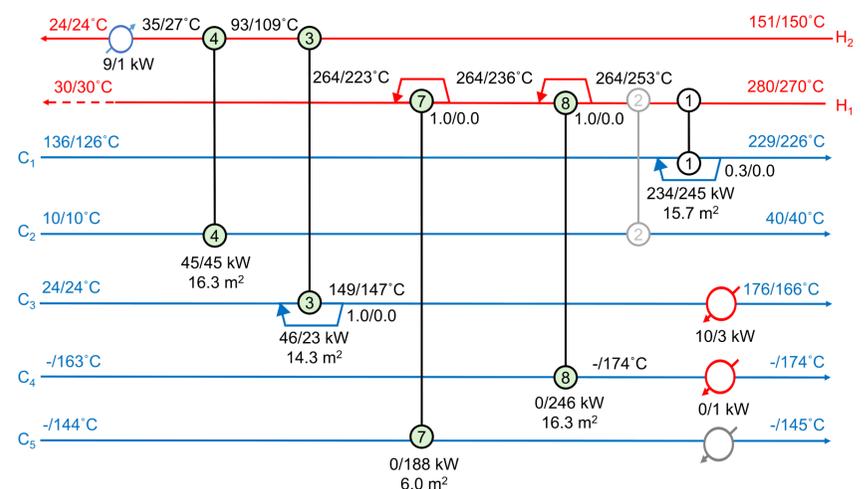
**Examples:** Vary the max. possible number of new HEXs added into the HEN,  $N_{HEX,new}$

$N_{HEX,new}: 1$



Parameter	Unit	Existing	Retrofit
HU demand	MWh/y	1'451	807 (-44%)
CU demand	MWh/y	623	307 (-51%)
TAC	CHF/y	141'080	103'580 (-27%)

$N_{HEX,new}: 7$



Parameter	Unit	Existing	Retrofit
HU demand	MWh/y	1'451	55 (-96%)
CU demand	MWh/y	623	42 (-93%)
TAC	CHF/y	141'080	31,304 (-78%)

## Conclusions

- Successful application of the SA-based optimization framework for multi-period HEN retrofit.
- Further studies on its application are recommended to validate robustness and scalability.
- Further evaluation if the current framework can be extended for heat pump (HP) integration.