Problem Statement
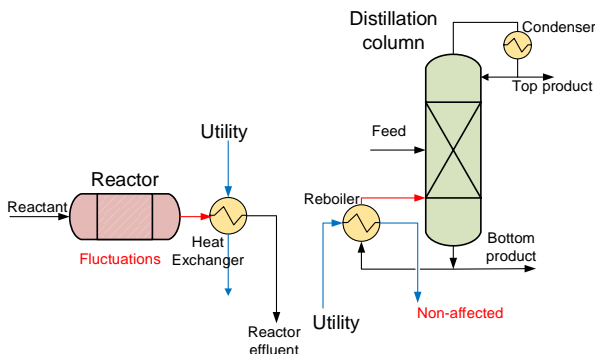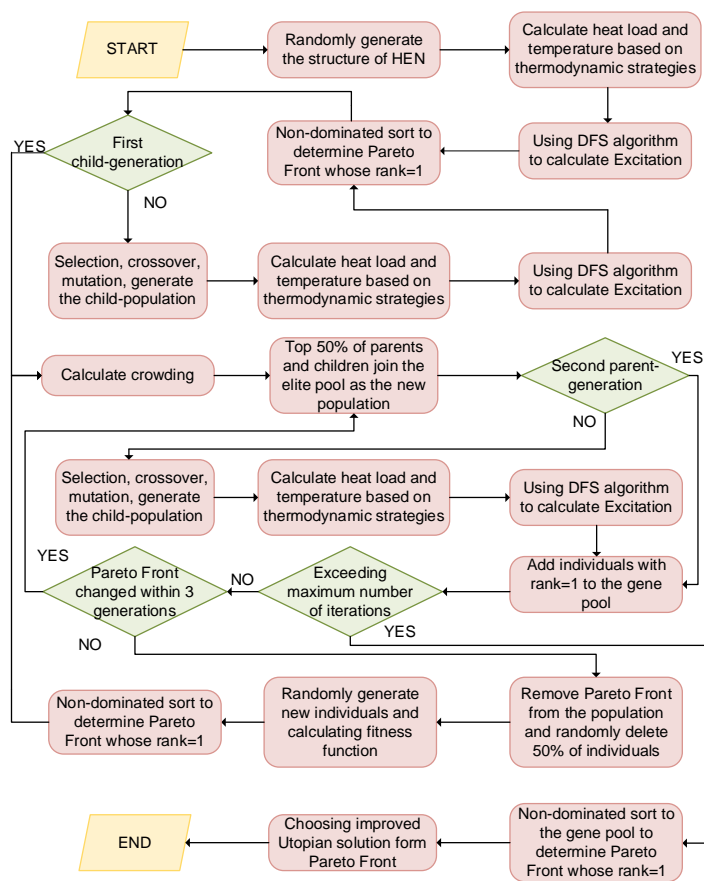

Overall Procedure

START → Randomly generate the structure of HEN → Calculate heat load and temperature based on thermodynamic strategies

First child-generation — YES / NO

Non-dominated sort to determine Pareto Front whose rank=1 ← Using DFS algorithm to calculate Excitation

Selection, crossover, mutation, generate the child-population → Calculate heat load and temperature based on thermodynamic strategies → Using DFS algorithm to calculate Excitation

Calculate crowding → Top 50% of parents and children join the elite pool as the new population → Second parent-generation — YES / NO

Selection, crossover, mutation, generate the child-population → Calculate heat load and temperature based on thermodynamic strategies → Using DFS algorithm to calculate Excitation

Pareto Front changed within 3 generations — YES / NO ← Exceeding maximum number of iterations — NO / YES ← Add individuals with rank=1 to the gene pool

Non-dominated sort to determine Pareto Front whose rank=1 ← Randomly generate new individuals and calculating fitness function ← Remove Pareto Front from the population and randomly delete 50% of individuals

END ← Choosing improved Utopian solution form Pareto Front ← Non-dominated sort to the gene pool to determine Pareto Front whose rank=1

Case Study

Maximum irrelevant subsystem

H6 — E02 — E04
C3 — 16,240kW
C6 ← 15,561kW — 20,420kW

Secondary maximum irrelevant subsystem

H1 — E01 — 2,257kW
C1 ← 711kW — 39,143kW

Irrelevant subsystem 3

H2 — E03 — 13,406kW
C2 ← 1,340kW

Other irrelevant subsystems

H3 — 85kW
H4 — 1,204kW
H5 — 2,265kW
H7 — 37,935kW
H8 — 553kW
H9 — 1,126kW
H10 — 672.8kW
C4 ← 1,204kW
C5 ← 39,270kW
C7 ← 35,981kW

Utilities = 117,617kW Excitation = 3.69