

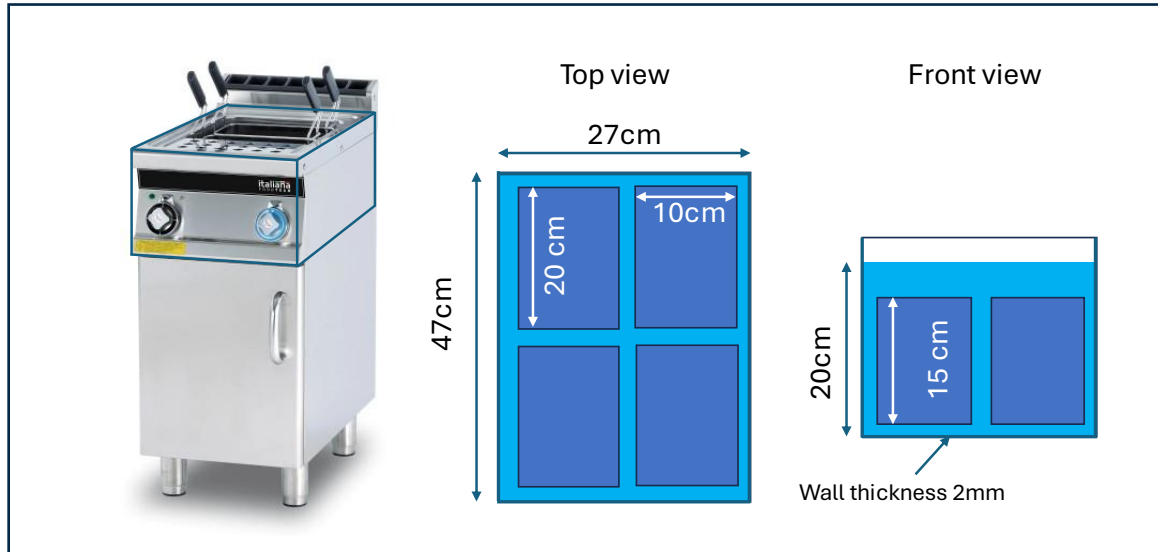
Heat pump for cooking pasta in a restaurant

Student Project Introduction
Sustainable Heating and Cooling

May 30, 2025



Commercial pasta cooker



Usually operated with electrical heaters
- Can you do it with a heat pump?

1. https://www.instagram.com/arcobalenopasta/reel/DEU2abvO_n3/



Your tasks

1. System Requirements

Determine system constraints and find a control strategy

2. Design

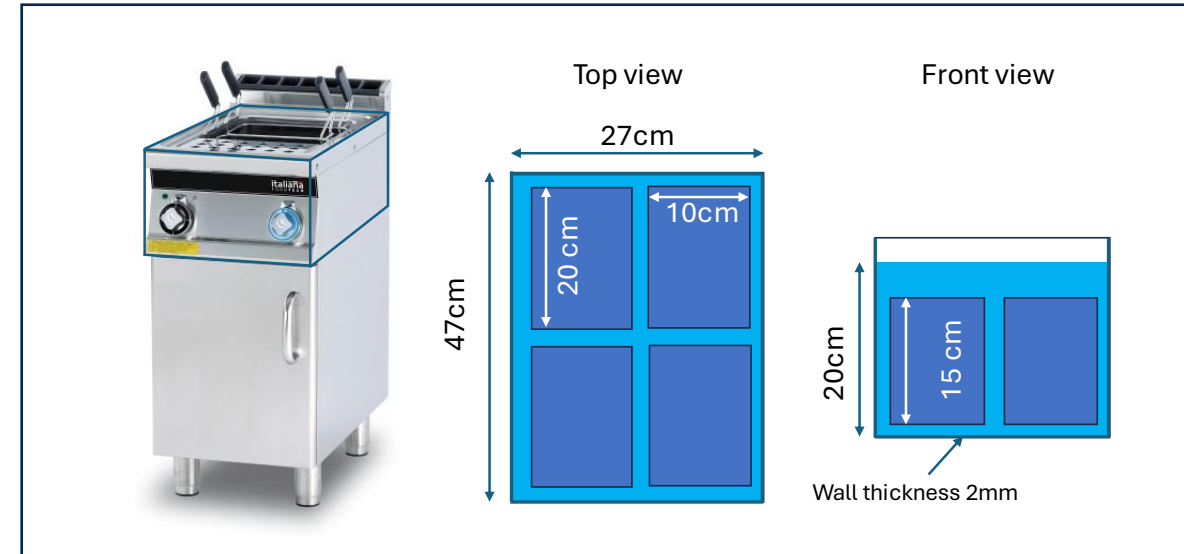
Consider equipment sizes and the refrigerant to design the heat pump process

3. Simulation

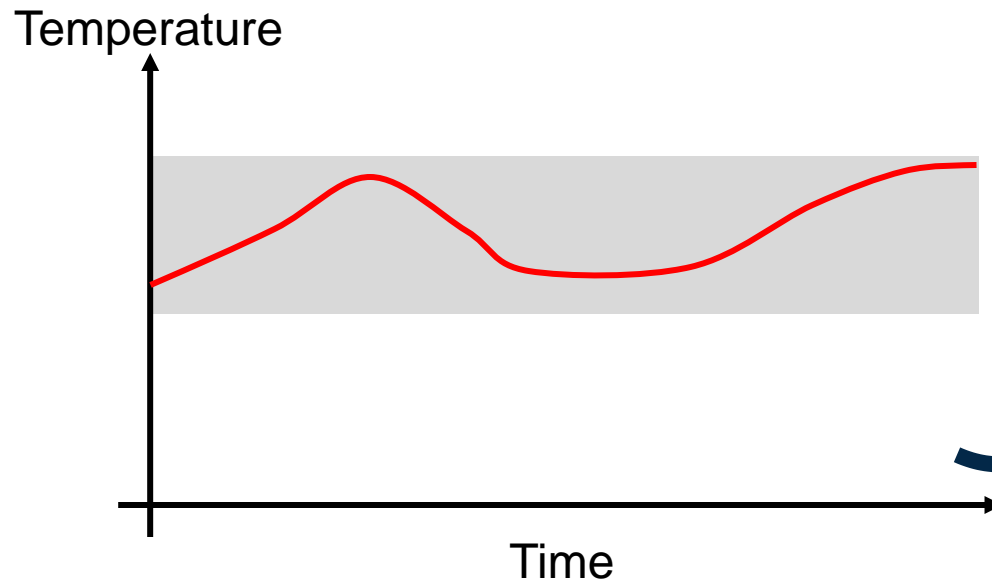
Simulate the operation and iterate your design

4. Benchmarking

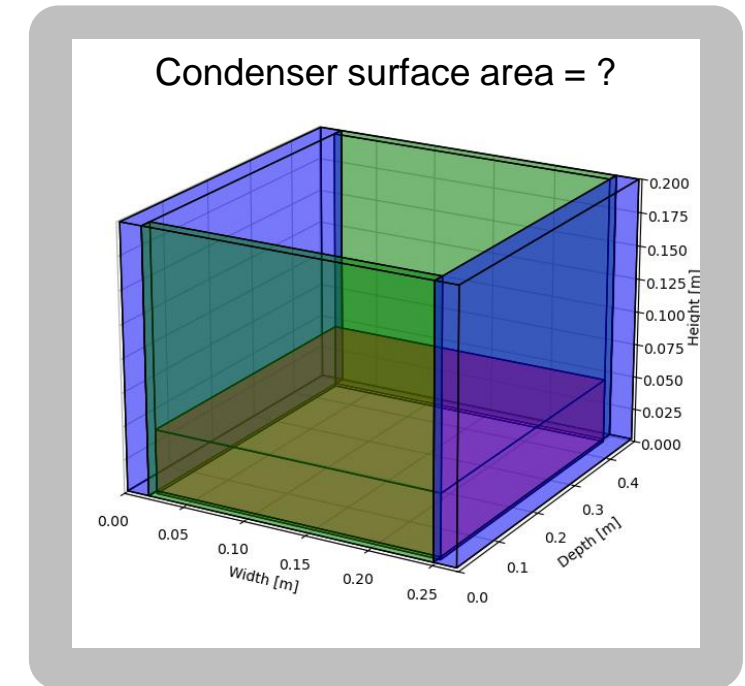
Compare your design against a conventional solution



- Heat transfer areas?
- On/off control to keep water in required temperature range
- What is the maximum heating capacity during operation?



$$\dot{Q}_h(t) = ?$$



Design

Take the system requirements into account and design the optimal process!

Consider your design options:

| | D = 35 mm | D = 40 mm | D = 45 mm | D = 50 mm |
|----------------|-----------|-----------|-----------|-----------|
| Isobutane | | | | |
| Butane | | | | |
| Isobutene | | | | |
| Dimethyl ether | | | | |

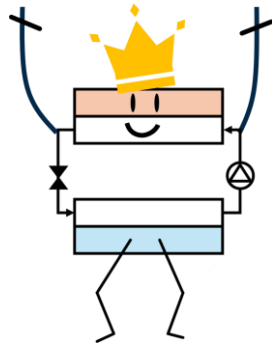
`recip_comp_corr_SP(param, refrigerant)`



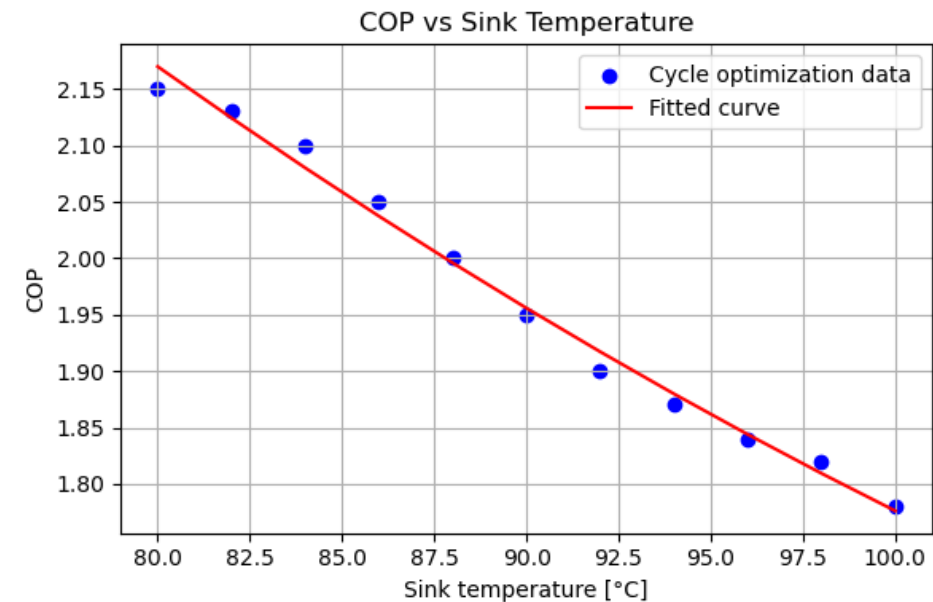
returns `eta_is`, `m_dot`

- 4 cylinders
- Available in 4 sizes

Simulate the system performance over a full day and determine your best heat pump design. Explain your selection criteria and discuss your decision!

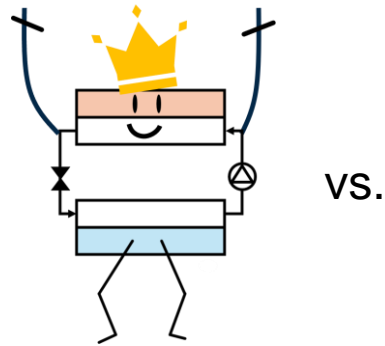


For maximum efficiency, a COP-optimal operation of the heat pump at all times is desirable. To avoid repeated cycle optimization during simulation, we recommend to determine the COP and heating capacity as functions of the sink temperature!



Compare your best heat pump design against a conventional electrical heating solution.
Calculate energy savings, electricity cost savings, and CO₂ emission reductions.

State your assumptions and discuss the results.



vs.



- Groups have been assigned → Contact us if there are any issues!
- Report
 - You may use the provided template (additional information)
 - Completeness over length!
 - Clean figures, clear and readable labels
- Office hours: May 28, 02:15 - 03:45 PM, HG E 19
- Submission: June 29