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CSDENGINEERS INGENIOUS BY NATURE

HEIG-VD

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HIGH TEMPERATURE HEAT PUMPS

24 MARCH 2023 | ITTIGEN

Pinch Analysis and HTHP Integration

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Outline – Part 2

Practical application, ELSA case study example

- Collecting data and defining process heat transfer requirements
- Building CCs and GCC
- CIP: local versus global integration
- Practical constraints

Collecting data to define heat transfer requirements

Back to the roots of process heating and cooling requirements

Process flowsheets, P&ID, screenshots

Process recipes, product yield

Thermophysical properties data

Previous analysis reports (audits, …)

Energy consumptions & monitoring data

Perform heat & mass balances

Take measurements (T, $\dot{m}$, …) as needed

Equipment data sheets

Operation schedule

Production data

Planned evolution of processes

Future planned product, quantities, schedule

Streams	*T supply* [°C]	*T target* [°C]	CP [kW/K]	$\Delta\dot{H}$ [kW]	*h* [W/m²K]
Hot Stream 1	70	35	18.9	661.5	2000
Hot Stream 2	58	35	9.24	212.52	2000
Hot Stream 3	45	25	21	420	2000
Cold Stream 1	35	45	16.8	168	2000
Cold Stream 2	45	55	73.5	735	2000
Cold Stream 3	10	70	7.56	453.6	2000

Critically analyse process and operation data

Keep Hot Streams Hot

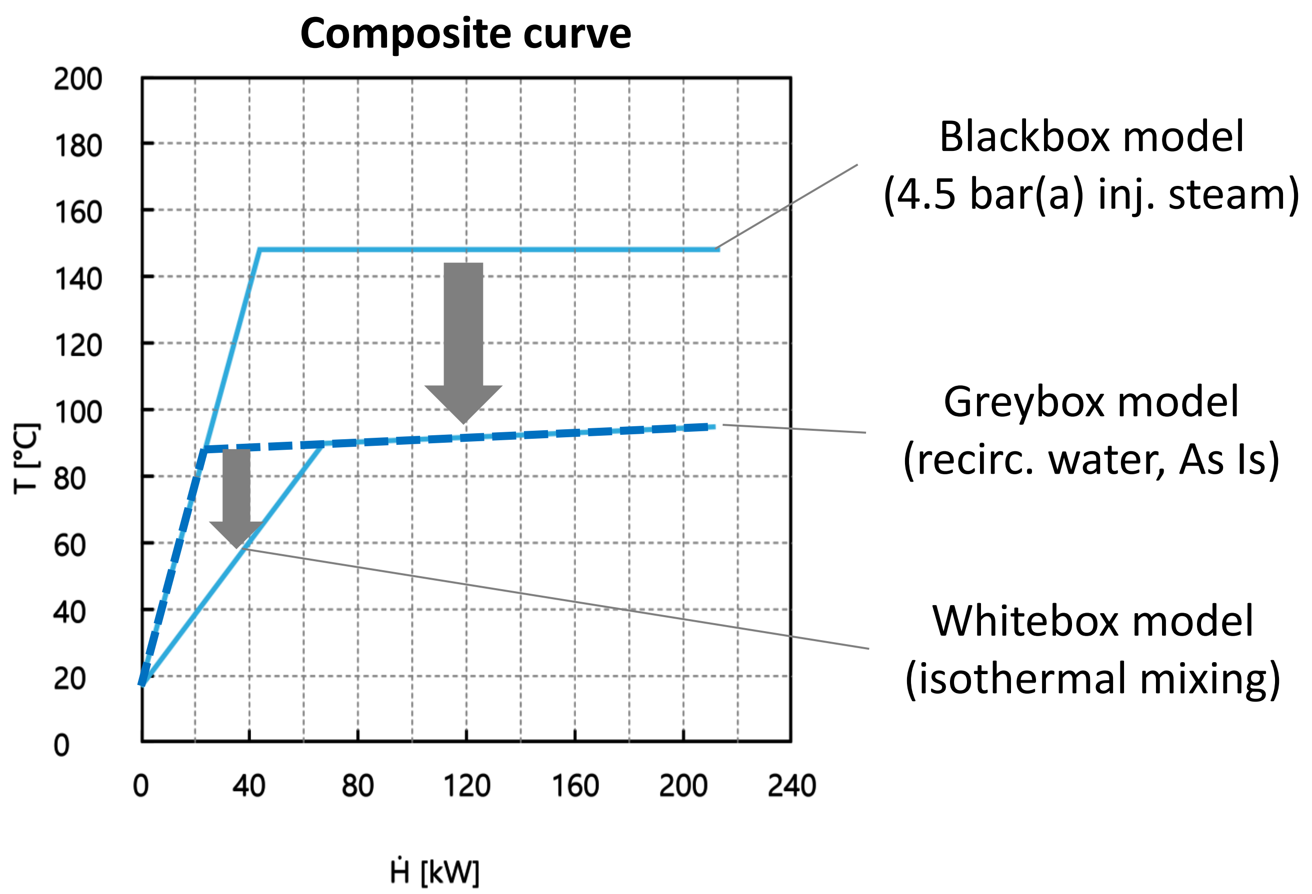
Optimise operation conditions

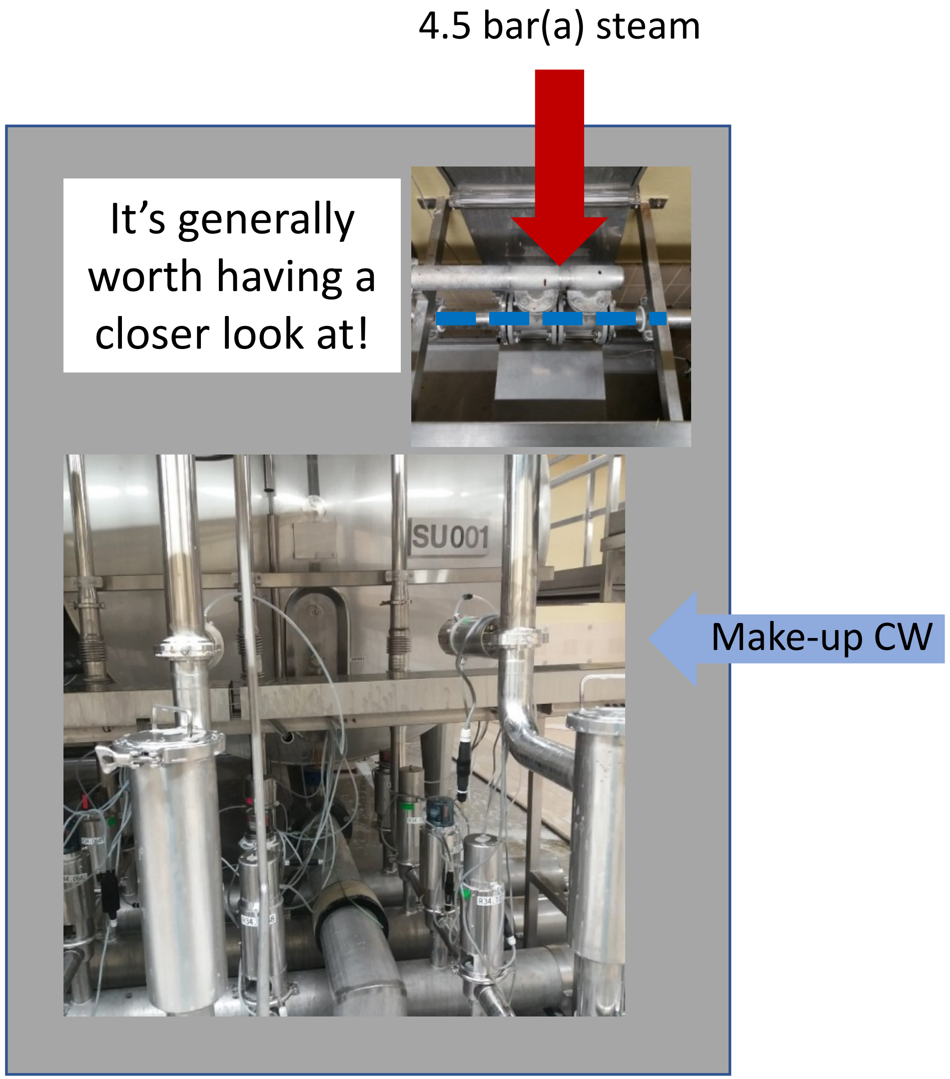
Avoid non isothermal mixing

Keep Cold Streams Cold

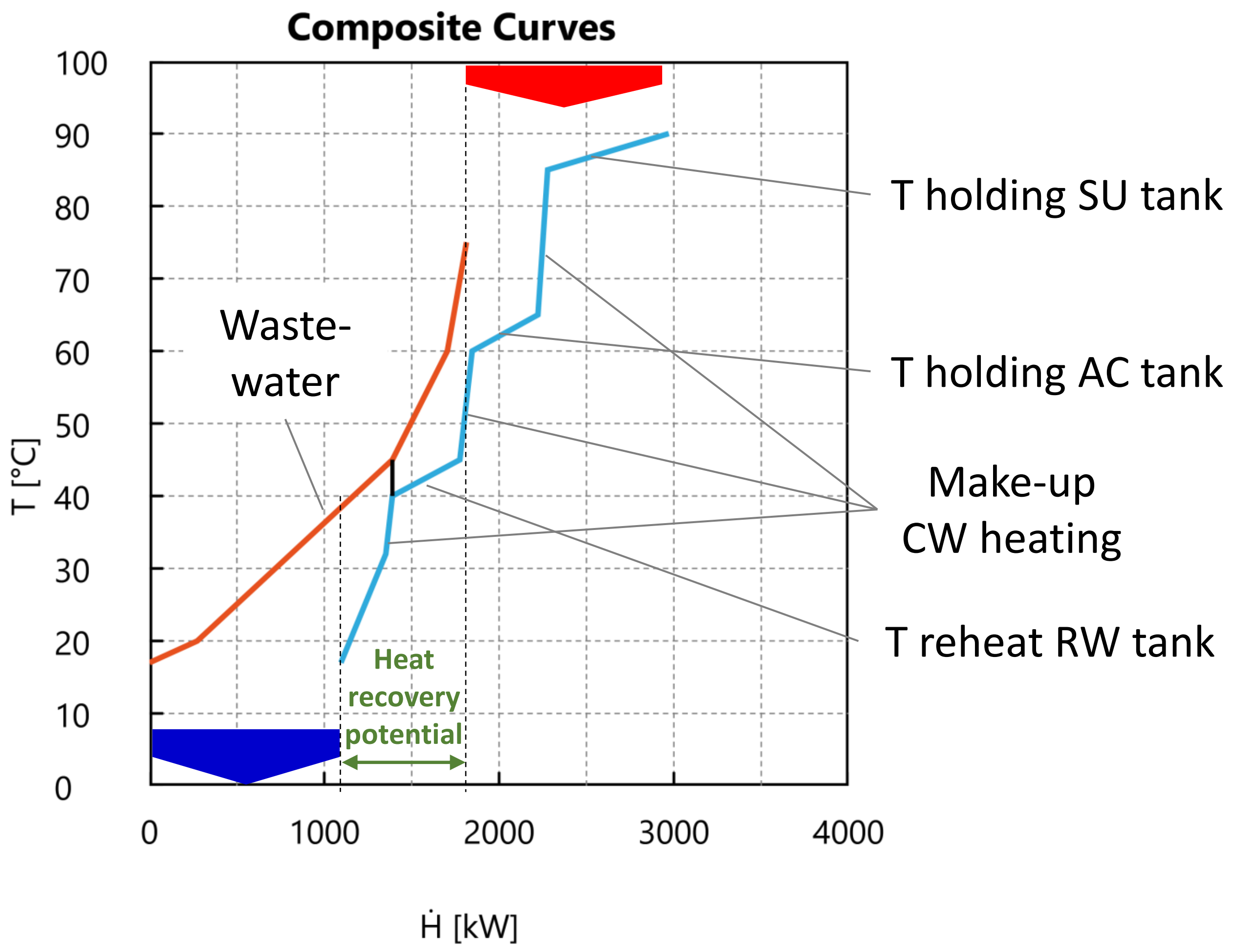
ELSA CIP0 / SU tank: minimising T of required heat

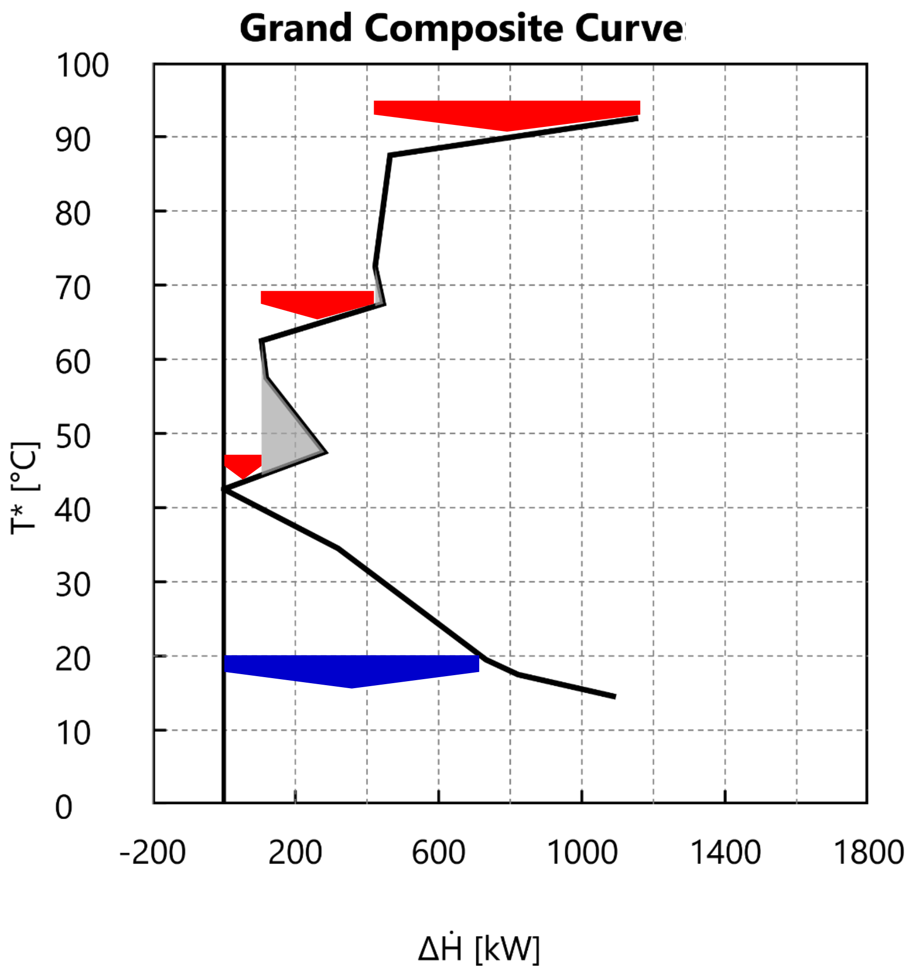
Heating requirements for make-up water heating and temperature holding





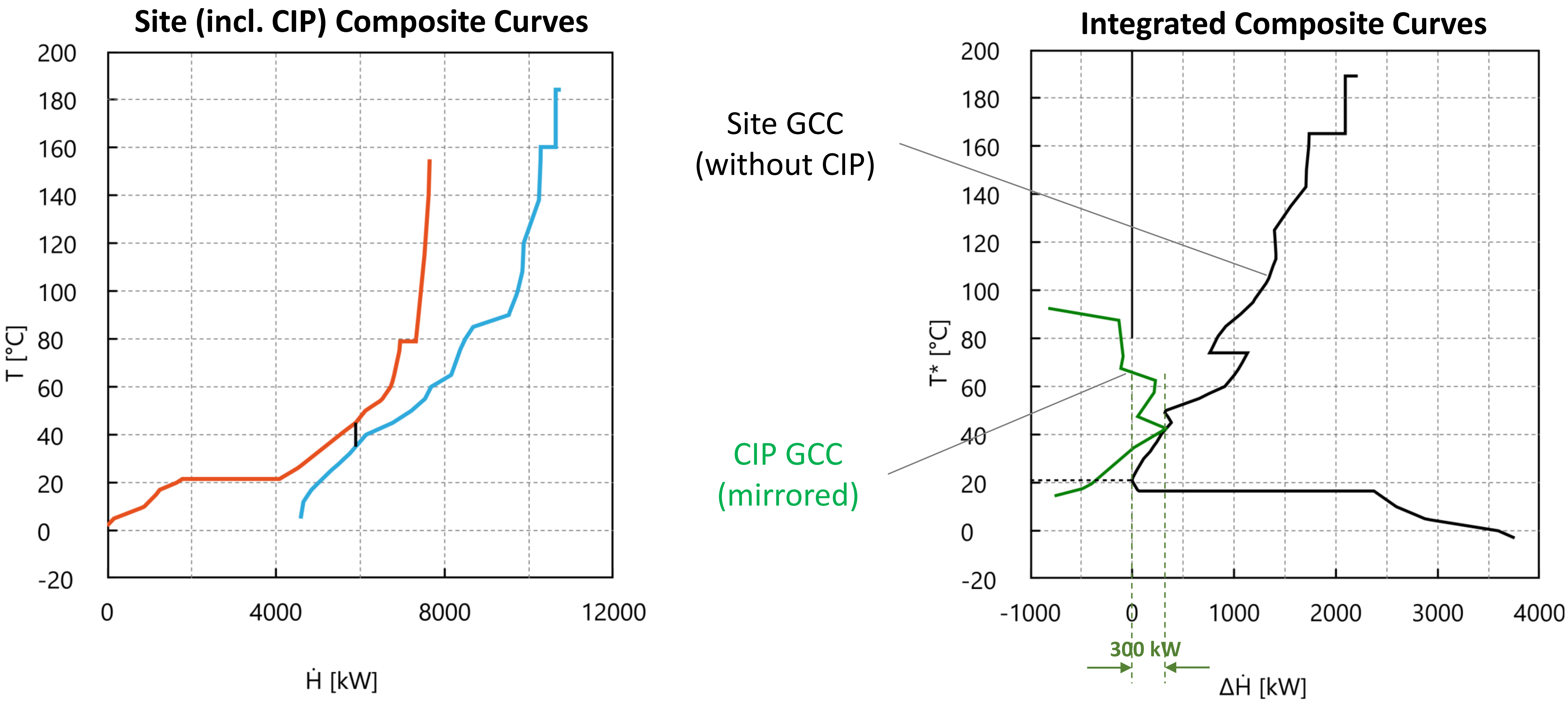
CIP0-3-4 Stations: Composite Curves and GCC





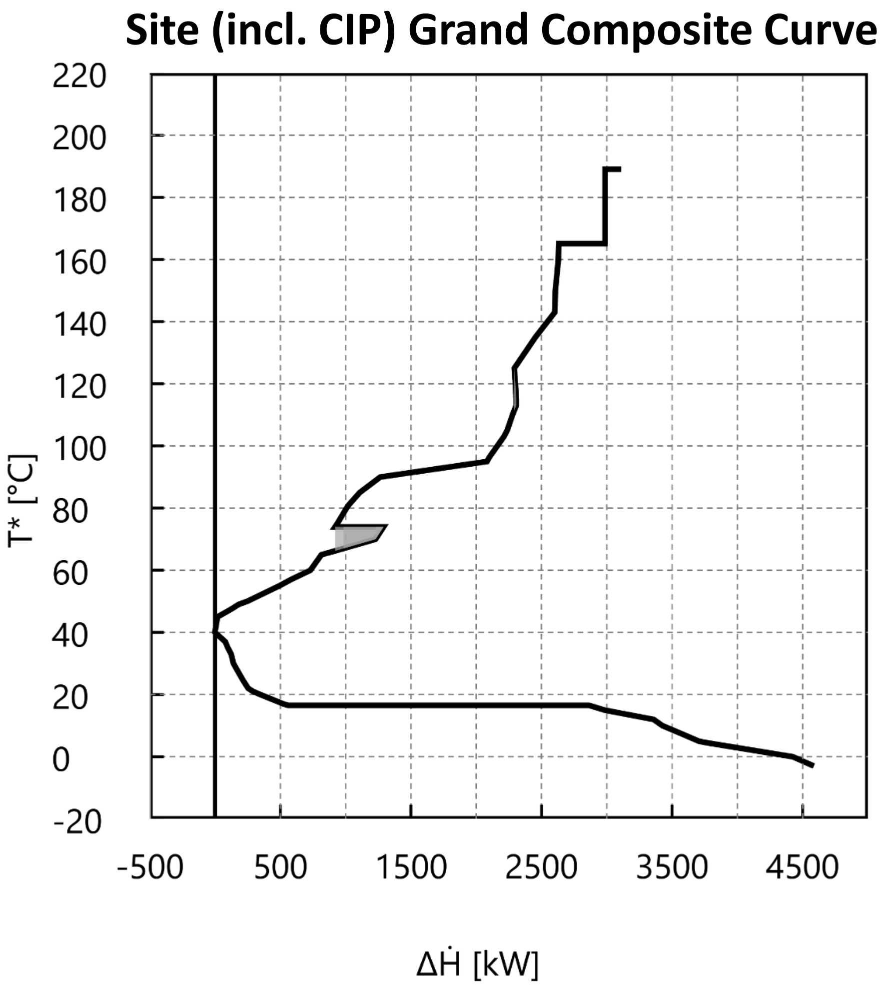
Mixing of wastewater flows at different temperature negatively impact the heat recovery potential

CIP0-3-4 in the background site context: synergies



Integrating CIP with the site processes can potentially increase the heat recovery up to 300 kW, practical constraints and strategic priorities of ELSA will later make decision whether this is possible or not

Site GCC: sound basis for heat pump integration



Practical constraints for ELSA (non exhaustive shortlist !):

- Very little space available in the production areas
- CIP: large number of circuits and heat exchangers
- Need to reduce load of the cooling towers to lower the condenser temperature of NH_3 chillers

Thank you for your attention !