

Non-energy benefits of heat integration retrofits

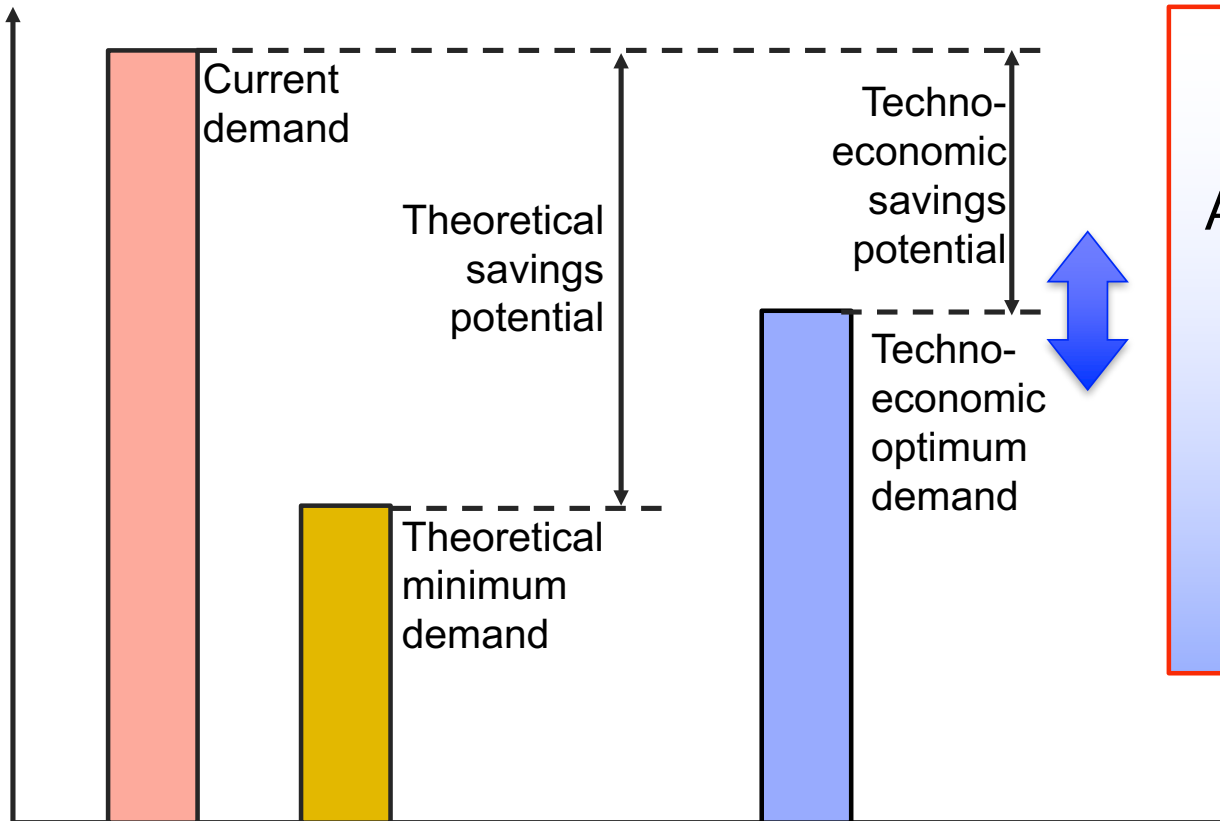
Case study at a large oil refinery in Sweden

Presenter: Sofie Marton, PhD Student
Supervisors: Simon Harvey, Elin Svensson



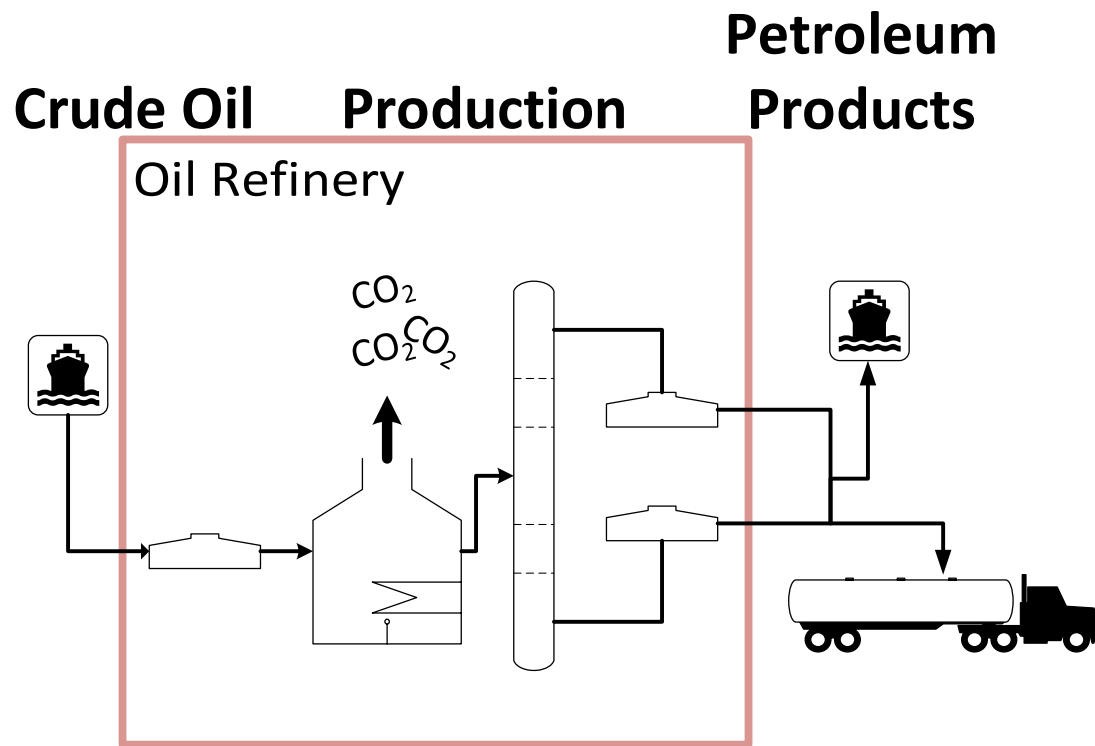
Heat recovery potentials in industrial processes

Process heat demand



Also important to consider technical feasibility:
Operability
Practical implementation

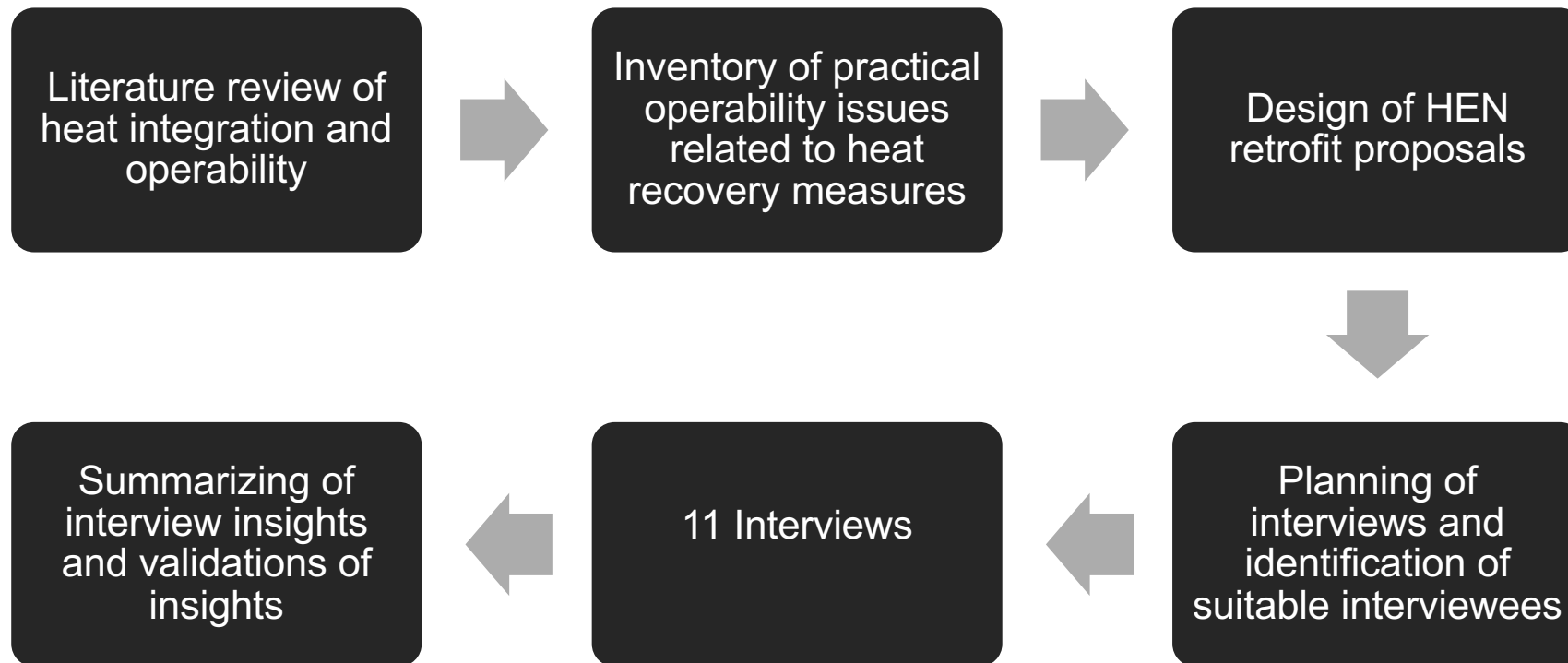
Oil refinery – case study



⚙ **Crude oil:**
11.4 Mton/year

⚙ **CO₂ emissions:**
1.7 Mton/year

Work flow interview study

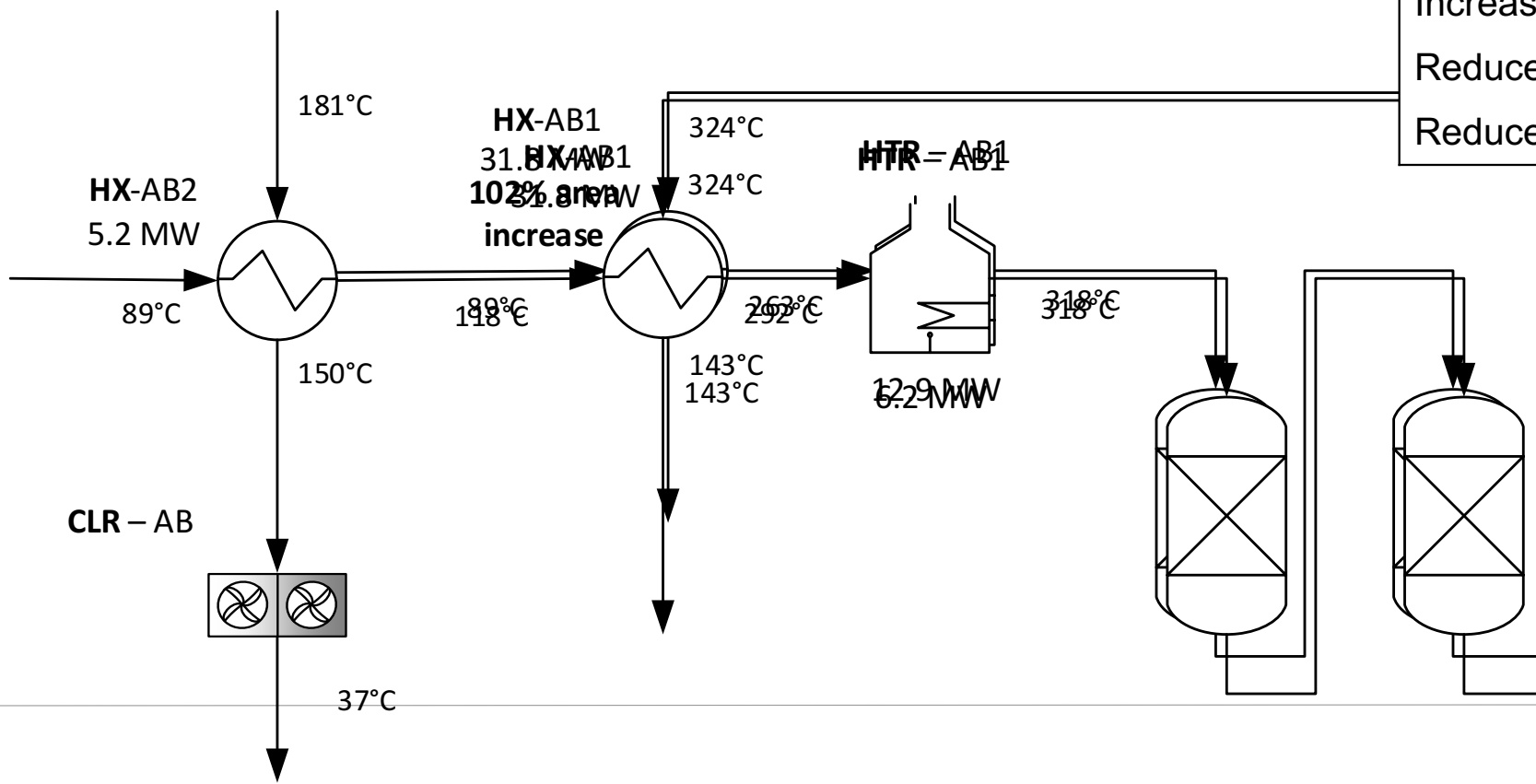


Main results

- ⊗ Practical issues in most retrofit proposals – solutions are usually possible
 - ⊗ Non-energy benefits important
 - ⊗ De-bottlenecking
 - ⊗ Increased yield of desirable products
 - ⊗ Decreased load on limiting air coolers
 - ⊗ A simultaneous energy saving can motivate replacing existing heat exchangers with operating problems
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Example

Heat exchanger network retrofit proposal



Retrofit proposal
New heat exchanger, HX-AB2
Increased area in HX-AB1
Reduced load on HTR-AB1
Reduced load on CLR-AB

Example

Main potential issues and benefits for the retrofit proposal

Potential issues

Decreased flexibility and controllability from heat exchange between process units

Spatial limitations → current HX must be replaced to provide space

Time limitations during rebuilds

Increased pressure drop

Benefits

Fuel gas savings from reduced furnace load

Production increase

Decreased CO₂ emissions

Reduced load on limiting air cooler

Increased flexibility from reduced load on heater and cooler

Example

Monetary values of non-energy benefits

	Investment cost	Energy cost savings	Reduced CO₂ emissions cost	Annual revenues from production increase	Annual cash flow	Pay back period
Retrofit proposal without NEBs	2.66 M€	1.54 M€/year	--	--	1.54 M€/year	1.72 years

Thank you for listening!

Questions for discussion: Do we start at the wrong end when designing energy system modifications? Should non-energy benefits and process issues be included at an earlier stage?