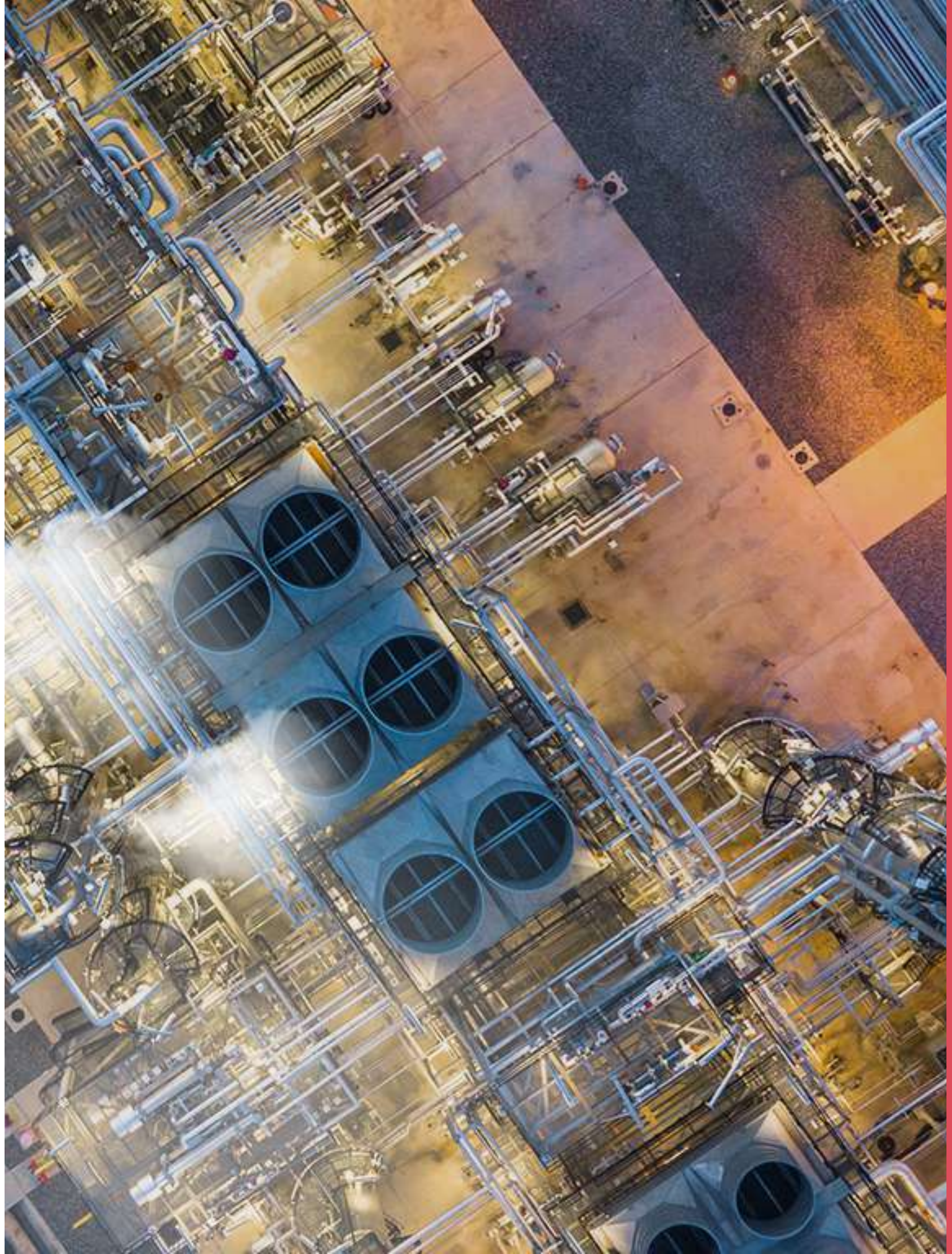
Qpinch Heat Transformer

A quantum leap for downstream decarbonization



QPINCH

100 MW

PROCESS HEAT

=

200 000 t

CO_2

Executive Summary

The decarbonization challenge in downstream operations

Energy efficiency is key to reducing emissions on a large scale. It provides a fast track to make headway by 2030, reduces the Opex and hedges the rising CO_2 cost.

Waste heat: The tell-tale of potential energy efficiency

Refineries and petrochemicals cool hundreds, up to thousands, of megawatts to the atmosphere. Tapping into this vast reservoir of energy brings substantial and immediate reductions in CO_2 emissions and Opex.

Qpinch: The breakthrough to exploit your waste heat

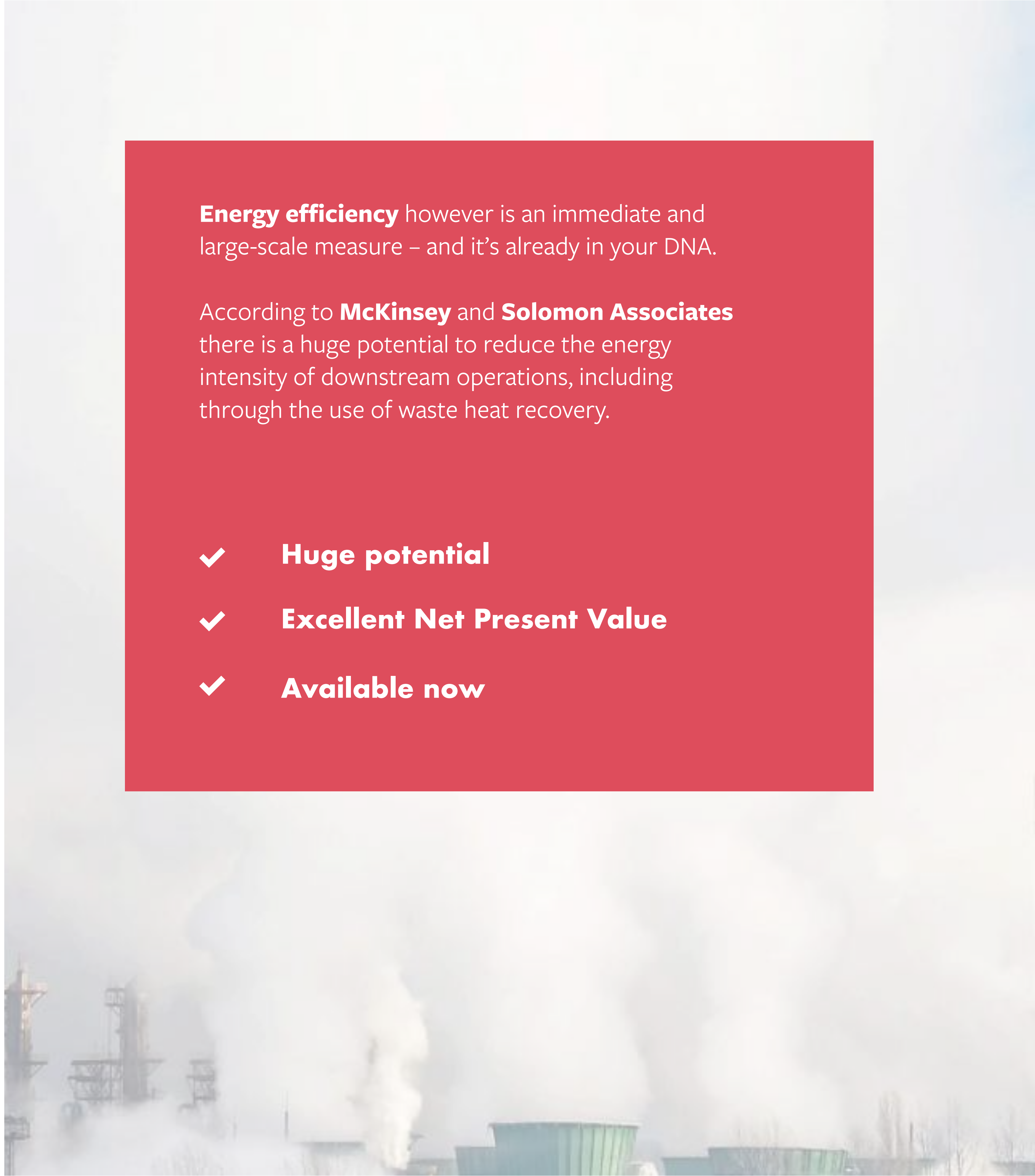
The Qpinch Heat Transformer uses a novel way to transform waste heat energy into process heat.

For the first time, a heat pump is capable of delivering large temperature increases, on a large, relevant scale and resulting in a substantial NPV.

Reducing your downstream emissions

The challenge to achieve **net-zero emissions** has our industry scrambling for solutions. Rolling waves of innovation will bring incremental improvements from now till 2050, many of which will require **large investments**, resulting in an **increased operational** cost, and will **take time** to implement.

- Renewable hydrogen
- **Energy Efficiency**
- Integration
- Greener feedstocks
- Electrification
- Carbon Capturing
- Digitization
- Biogases

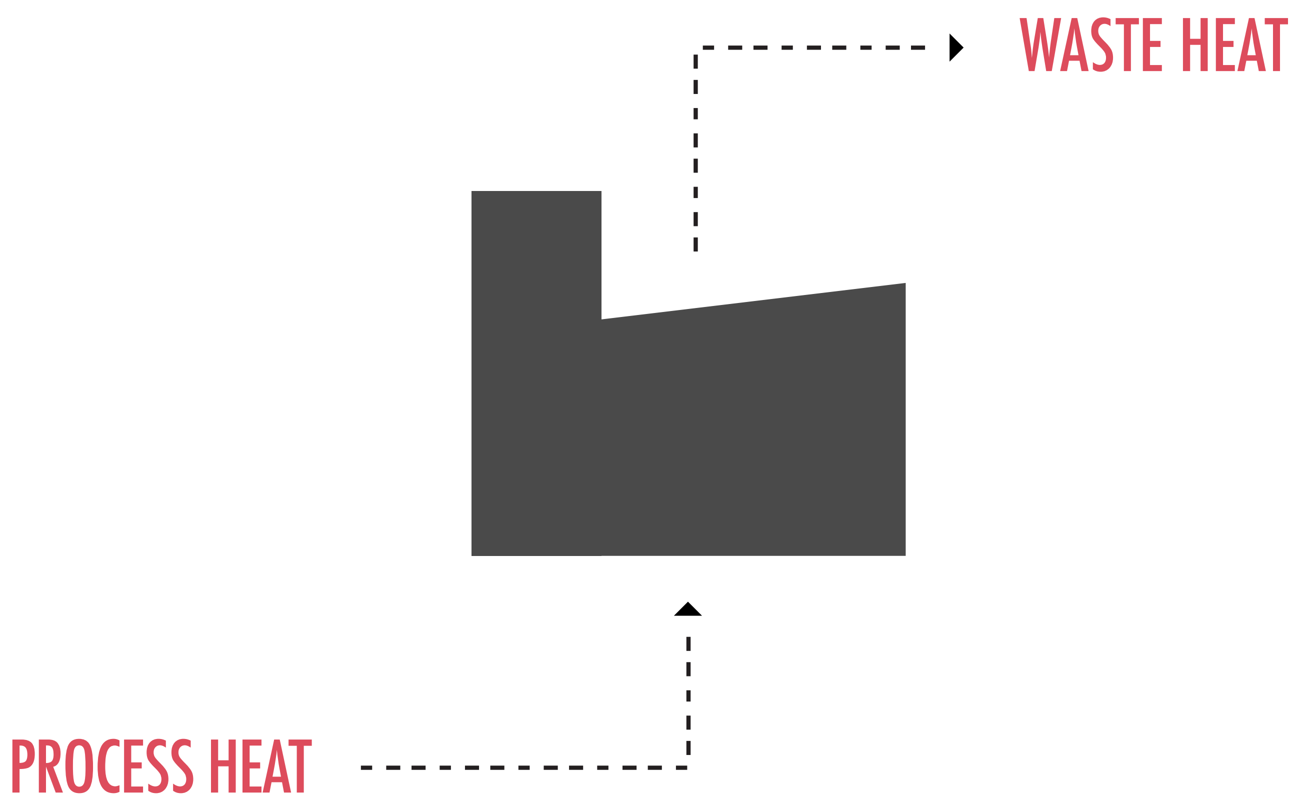


Energy efficiency however is an immediate and large-scale measure – and it's already in your DNA.

According to **McKinsey** and **Solomon Associates** there is a huge potential to reduce the energy intensity of downstream operations, including through the use of waste heat recovery.

- ✓ **Huge potential**
- ✓ **Excellent Net Present Value**
- ✓ **Available now**

Your biggest potential for energy efficiency



Energy waiting to be harvested

Refineries and petrochemicals consume large amounts of process heat which eventually turns into waste heat that is disposed of.

Upgrading waste heat to process heat results in a substantial reduction in the energy intensity of a plant and its emissions.

The challenges to recover your waste heat

Large increases in temperature

To exploit waste heat, its temperature needs to rise substantially.

Existing solutions mostly fail to deliver the required temperature lifts.

A relevant scale for petrochemicals

Petrochemical complexes consume hundreds, up to thousands, of megawatts.

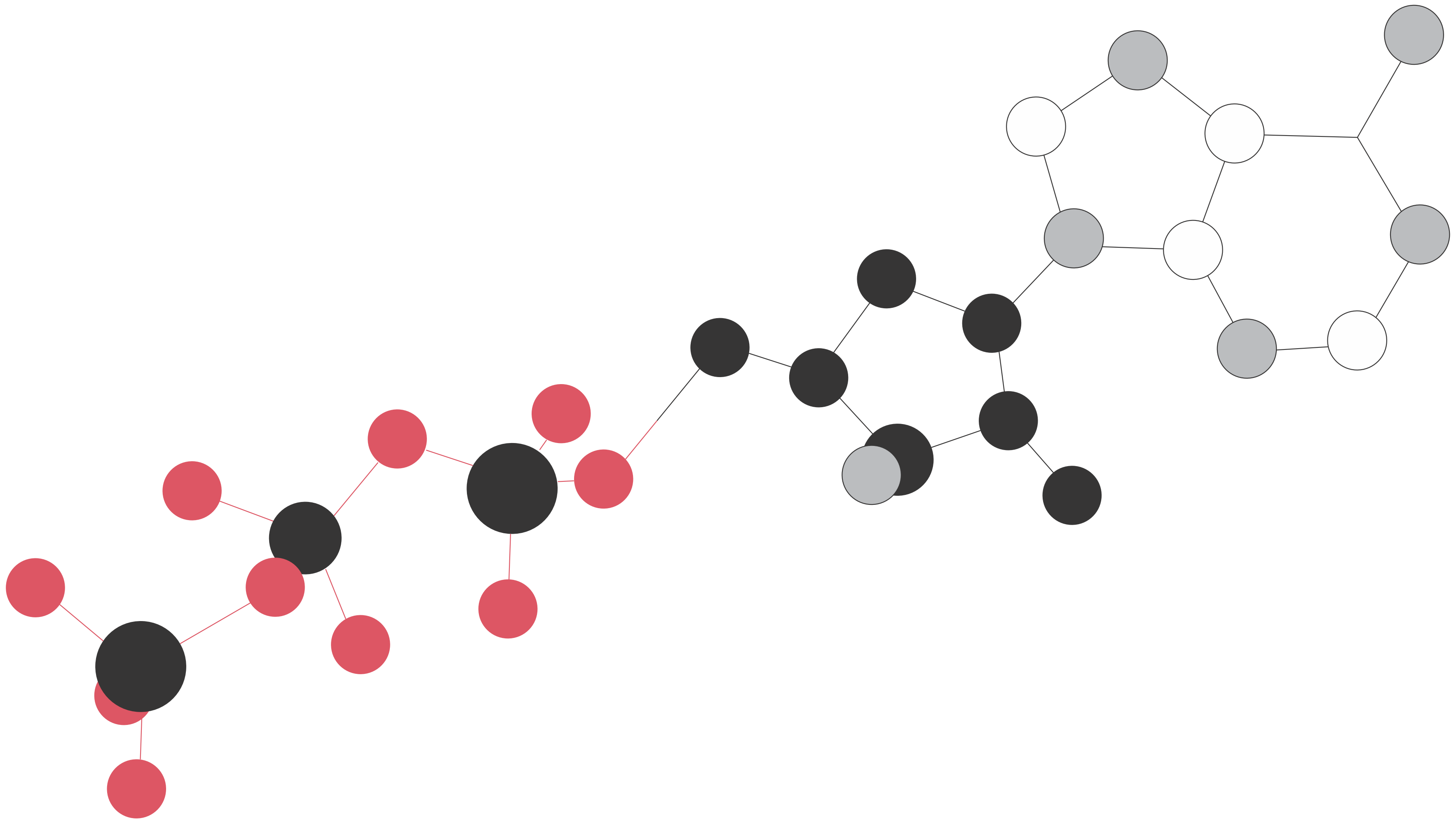
The 2050 challenge requires solutions on a similar scale. Again, conventional heat pump technology is not up this task.

Minimal Opex for maximum cashflows

Decarbonization will require large investments and, most likely, an increased Opex compared to a business-as-usual scenario.

Large-scale energy efficiency however produces immediate results – including an attractive Net Present Value – and it’s ready to be rolled out.

A breakthrough inspired by nature

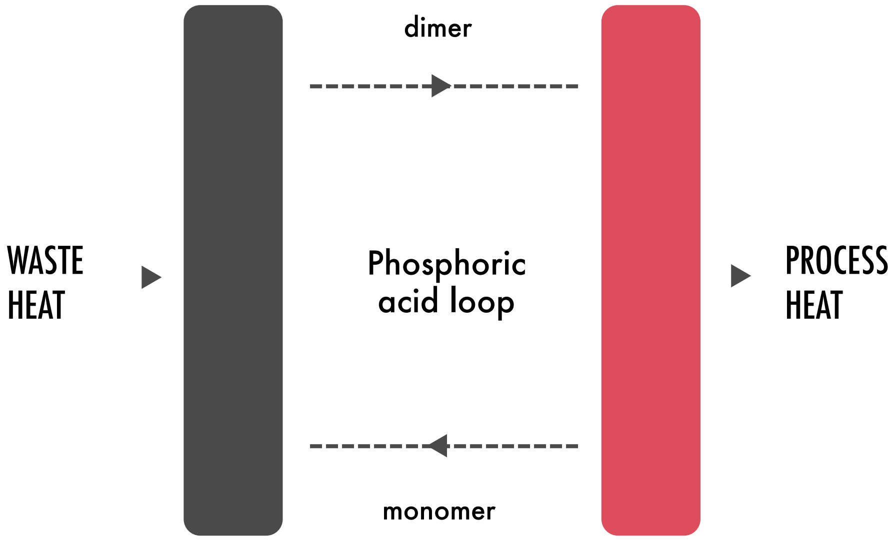


Nature's energy system

The elegant, yet highly efficient ATP-ADP cycle is used by all living cells.

This physicochemical reaction was our inspiration in designing a breakthrough heat transformer that recovers waste heat energy in petrochemicals. Our solution uses a similar but inorganic reversible chemical reaction to create high-temperature process heat.

A low-opex solution to generate high temperature heat



Qpinch uses a chemical reaction with phosphoric acid (PA) in a closed loop between two reactors.

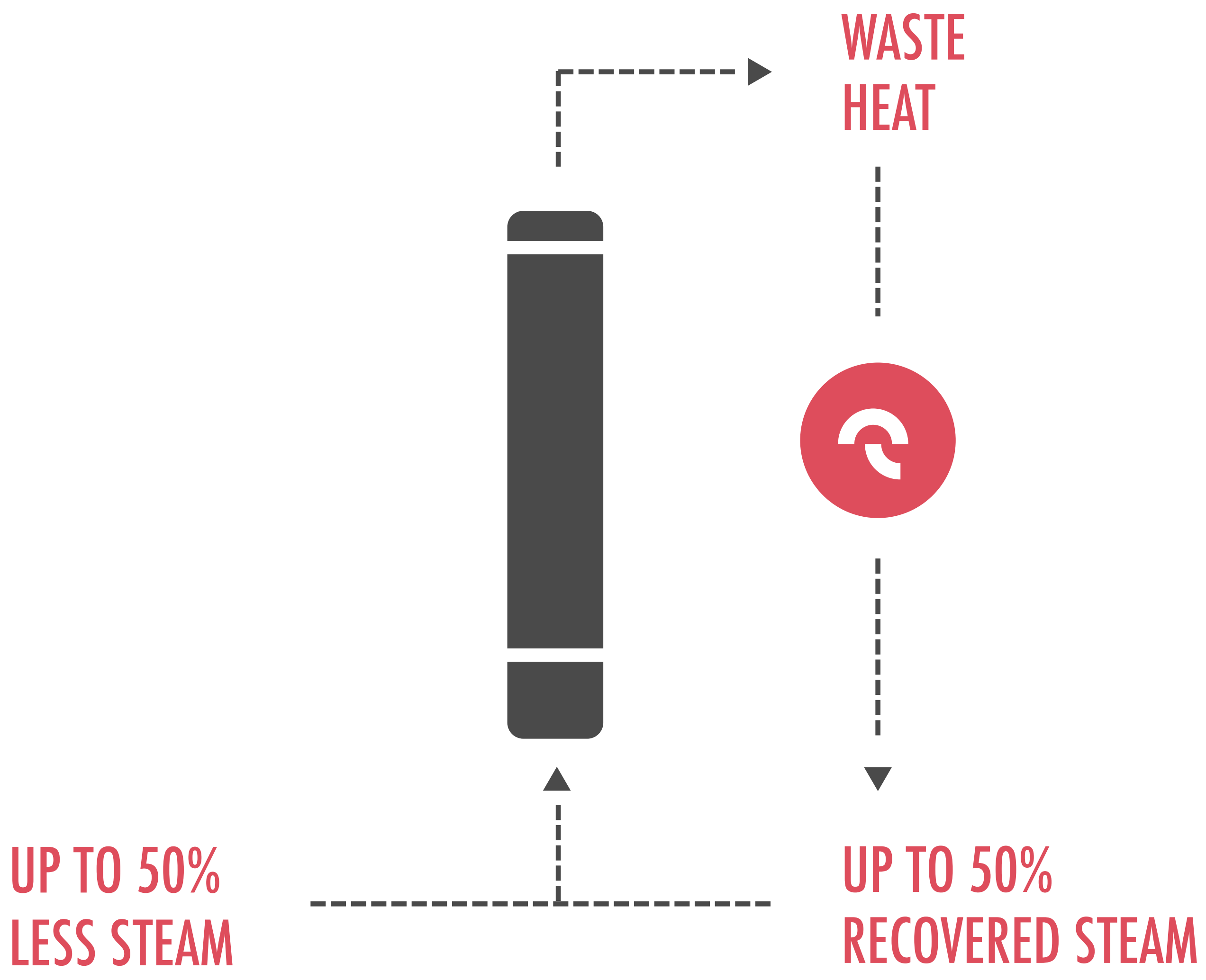
On the cold side, this phosphoric acid is exposed indirectly to the waste heat. The ensuing endothermic reaction causes the phosphoric acid to oligomerize (from monomer to dimer).

In the hot reactor the PA is forced to return to its monomer state, which causes an exothermic reaction at high temperatures. The PA is transferred back to the cold reactor and the cycle repeats.

Key Benefits and USPs

- ✔ No mechanical compression
- ✔ Temperature lifts of 50 – 100+ °C
- ✔ Highly scalable: 1 – 100+ MW
- ✔ High-availability of 8 500+ h
- ✔ Marginal Opex
- ✔ Low-maintenance
- ✔ Cooling and steam utility debottlenecking
- ✔ For brownfields and grassroots
- ✔ Small footprint

Example: Distillation Columns



Distillation columns are large emitters of waste heat that is now often cooled away through the plant utilities.

The Qpinch Heat Transformer recovers much of this energy which can be fed directly into the reboilers or may be of use elsewhere.

A simple solution with up to 50% less energy and emissions.

Converting waste heat to process heat

Waste heat sources

- Column overheads
- Effluents and product rundowns
- Exothermic reactor cooling
- Excess low or mid-pressure steam

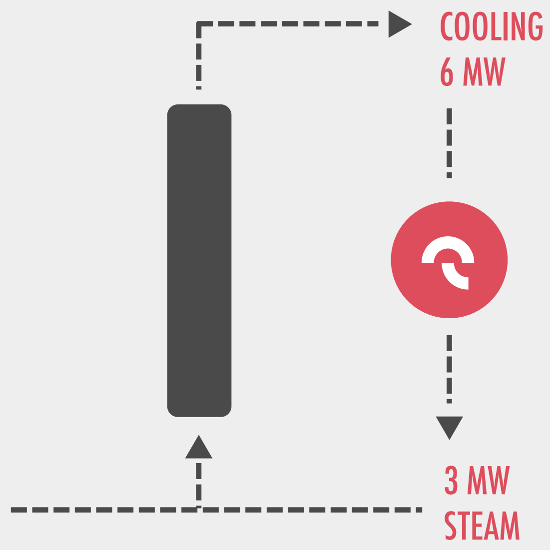
Heat sinks

+ Steam networks
+ Reboilers
+ Heating up of product streams
+ Reactors

Implementation

Stand-alone

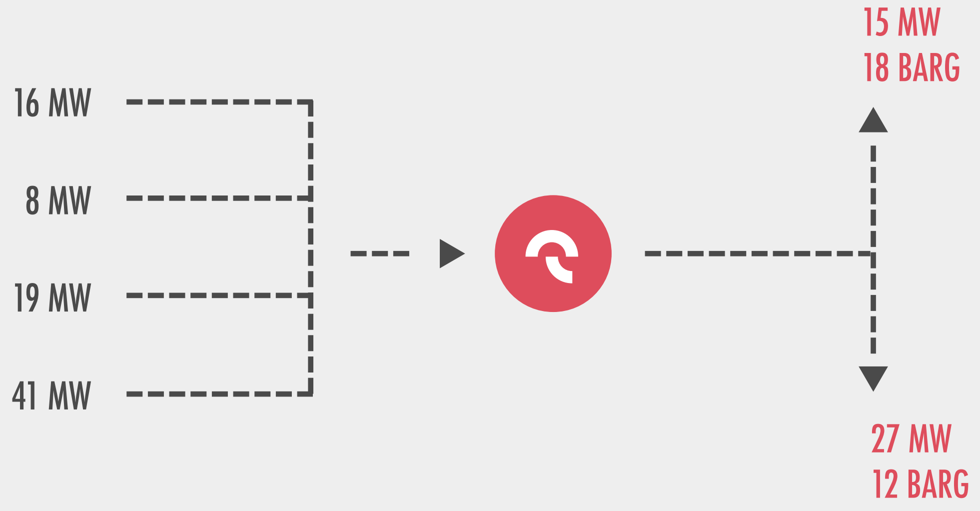
Example: Reactor cooling to steam



Qpinch can be implemented through stand-alone units to reduce the energy consumption locally or to produce heat for nearby processes or the steam network.

Qpinch as a utility

Example: Combining multiple waste heat streams to generate one or multiple large outputs of process heat



The Qpinch heat transformer handles fluctuations in input, variations in temperature and exploits concurrent waste heat sources. This makes it very suitable for large-scale deployment to produce large, sustained outputs. The reduction of primary heat consumption generates a similar large saving in the cooling utilities.

We’re committed to supporting your decarbonization efforts

Contact us

We welcome further questions about our solution and would be happy to review your business cases. Let’s discover the potential!

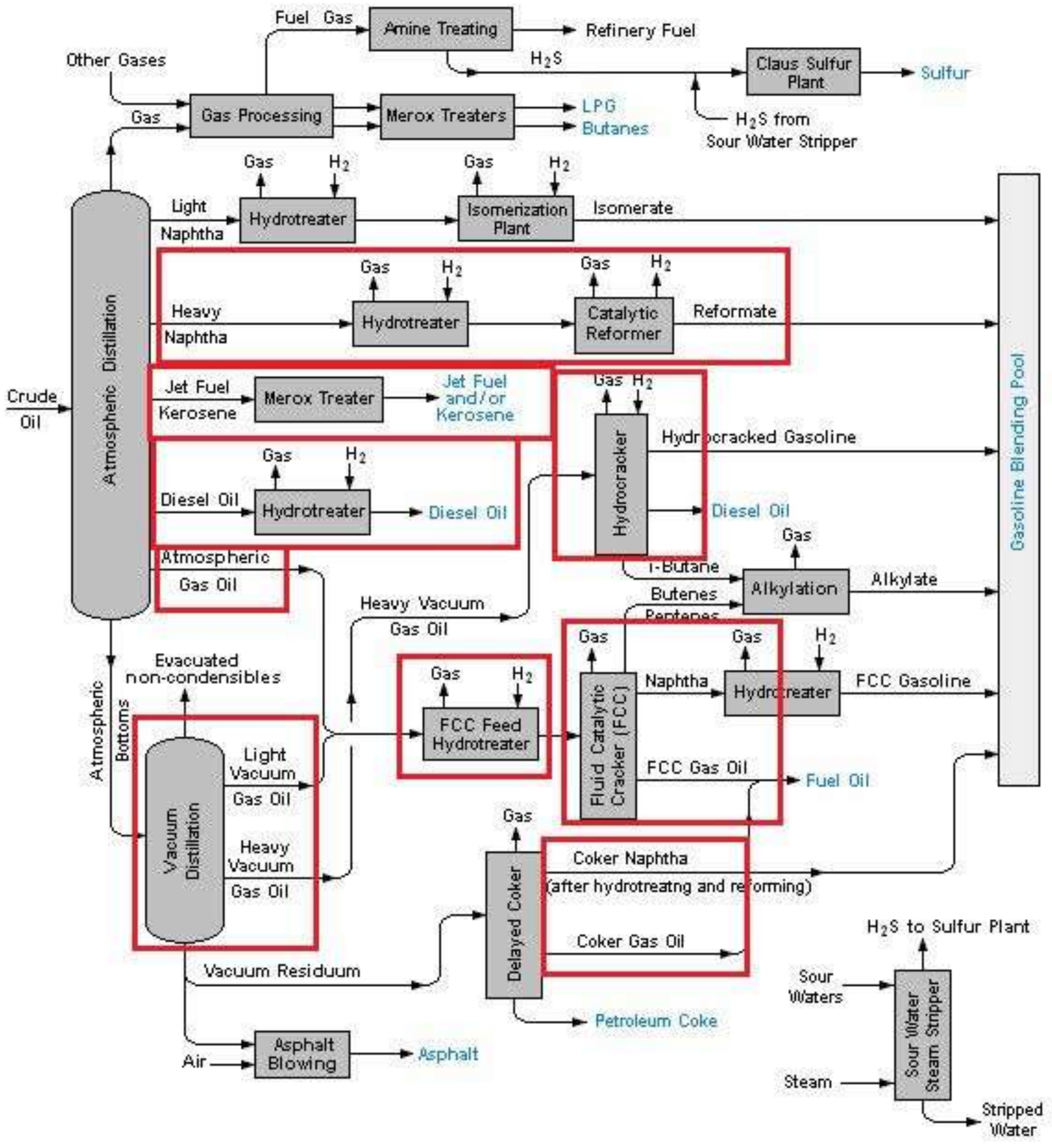
sales@qpinch.com

Business case examples from the petrochemical industries

The following business cases from refineries and petrochemicals illustrate the potential for converting waste heat into large-scale savings.

We welcome your questions and are happy to give feedback on specific cases.

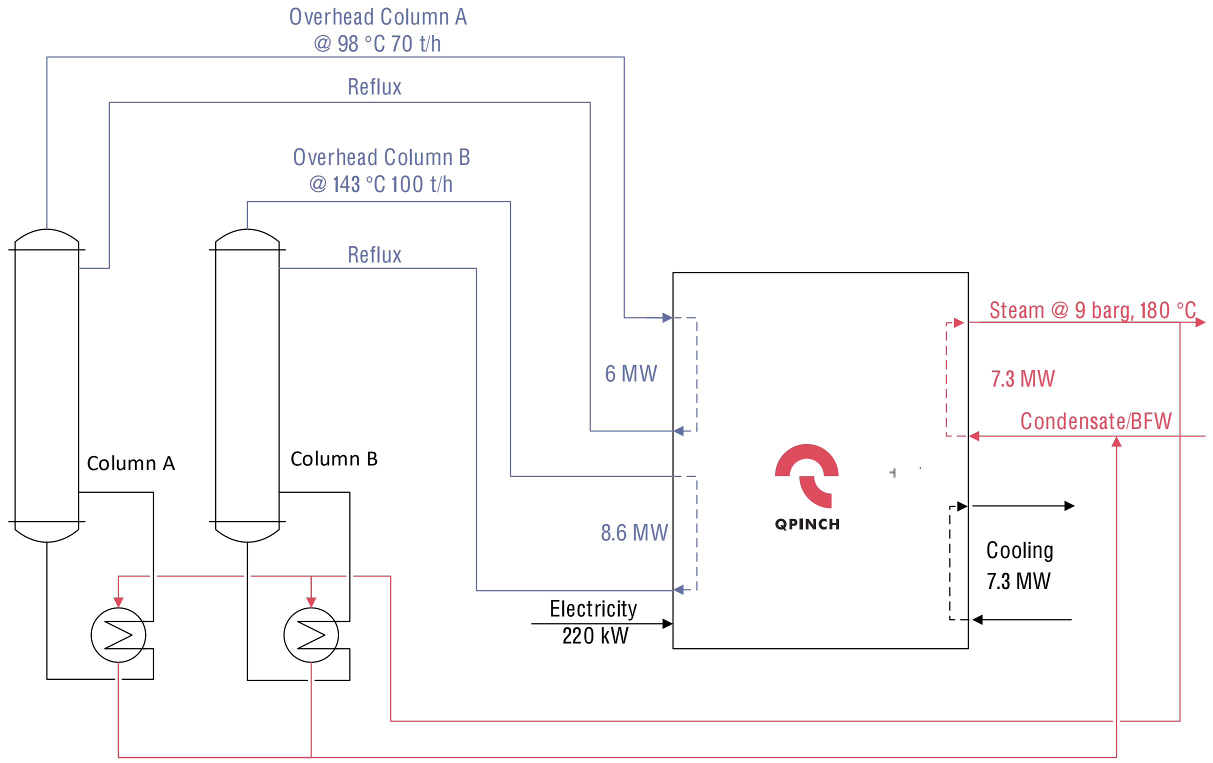
Much potential in refineries



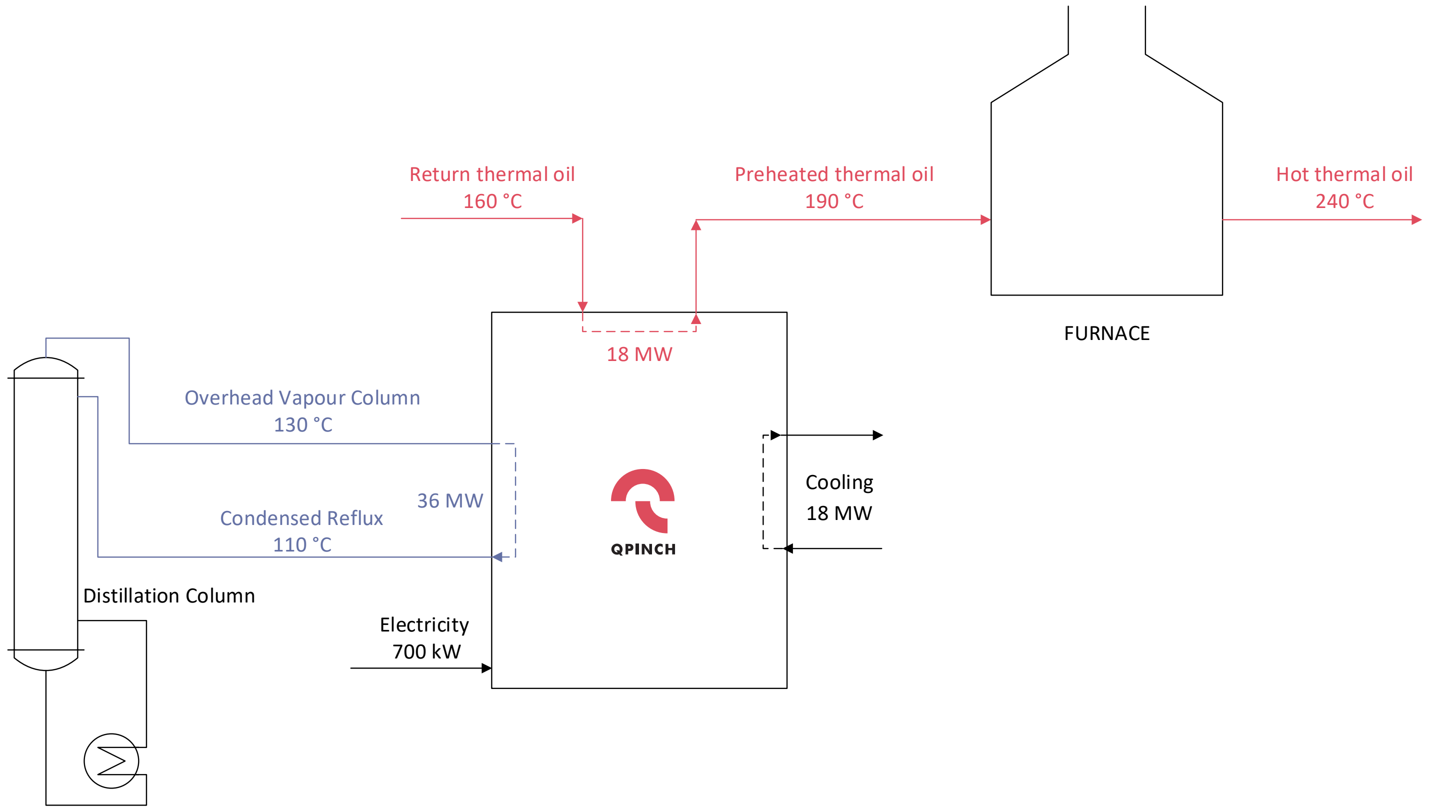
Takeaways

- Sources can be combined
- Flexible (variations in T, duty)
- Sensible and latent heat
- No limits on scale
- Debottlenecking of cooling

Stand-alone implementations

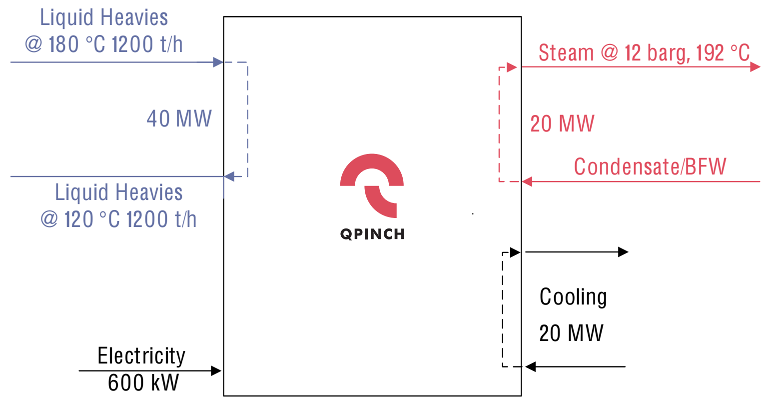


Column overheads

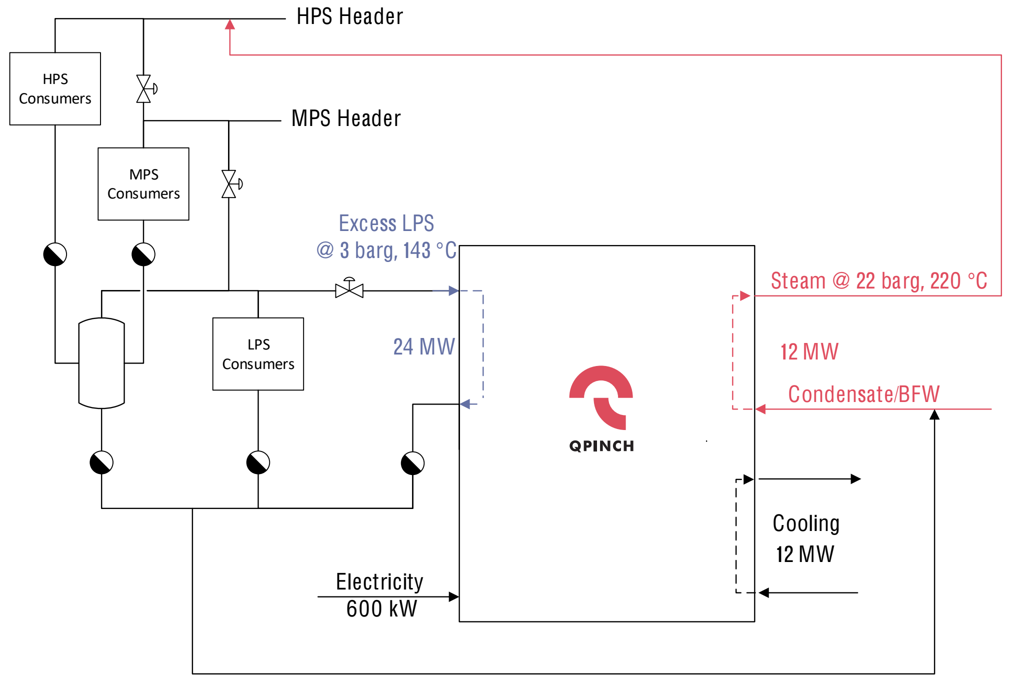


Heating up thermal oil loop

Stand-alone implementations

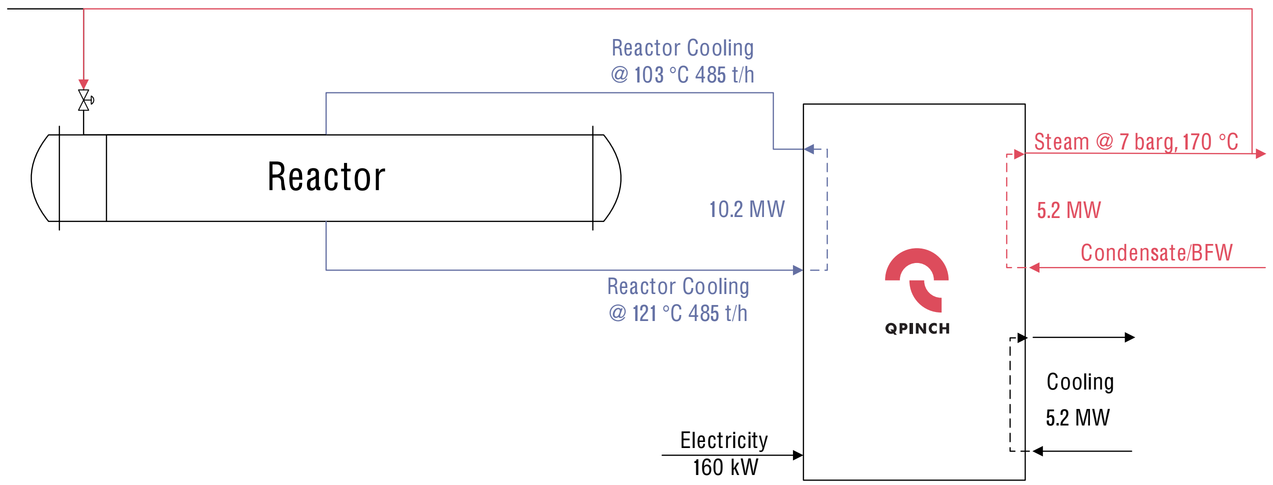


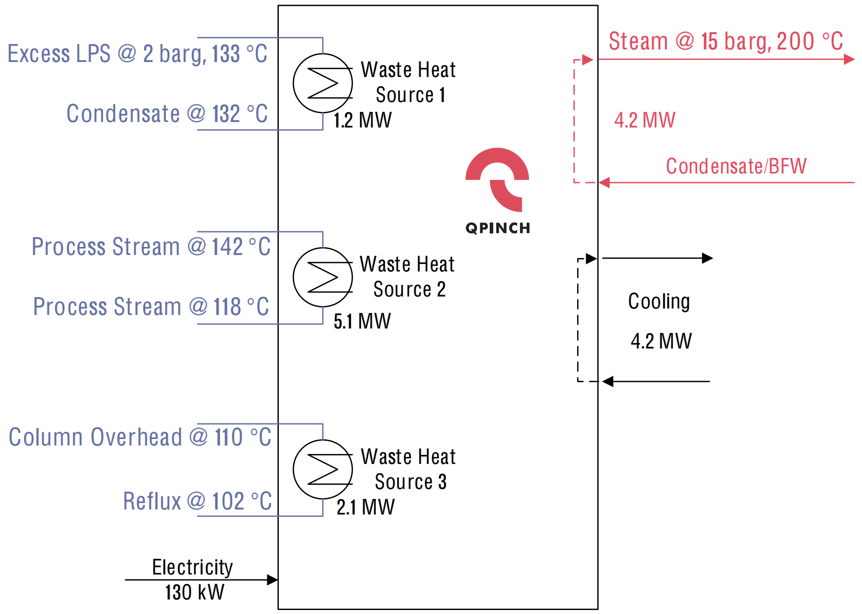
Product rundowns



Excess LPS to MPS

Stand-alone implementations

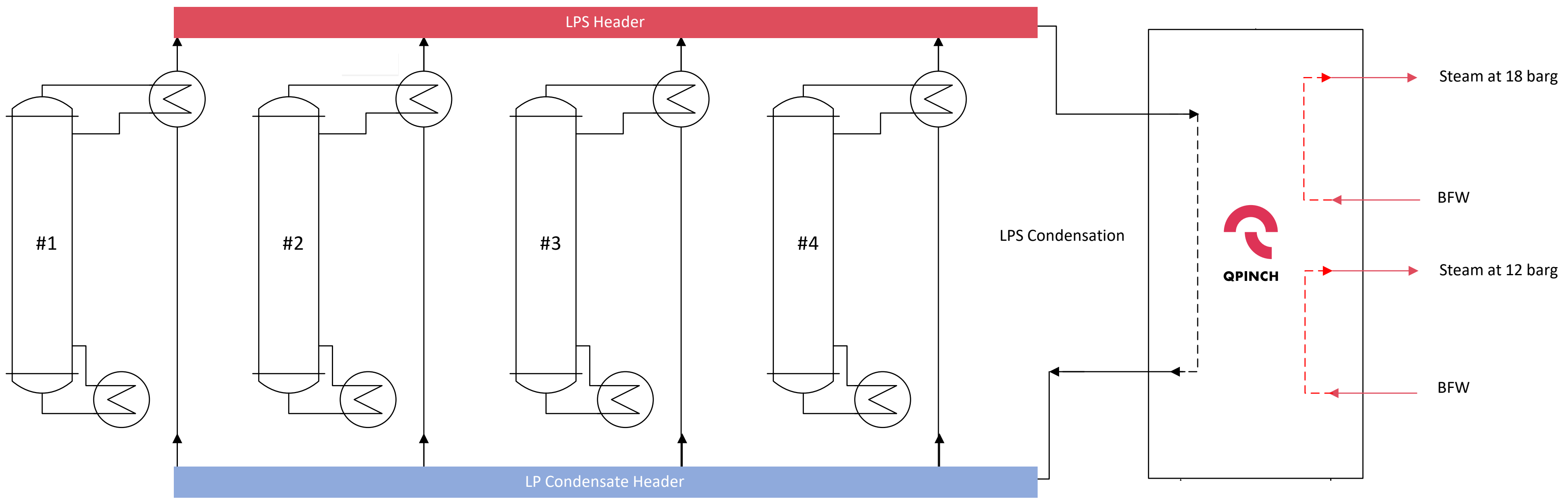




Exothermic reactor cooling

Small stream combo

Utility implementations



Centralizing waste heat streams