QPINCH

Heat Transformer
Carbon Neutral Industrial Energy from Waste Heat

The untapped potential: How to deal with waste heat

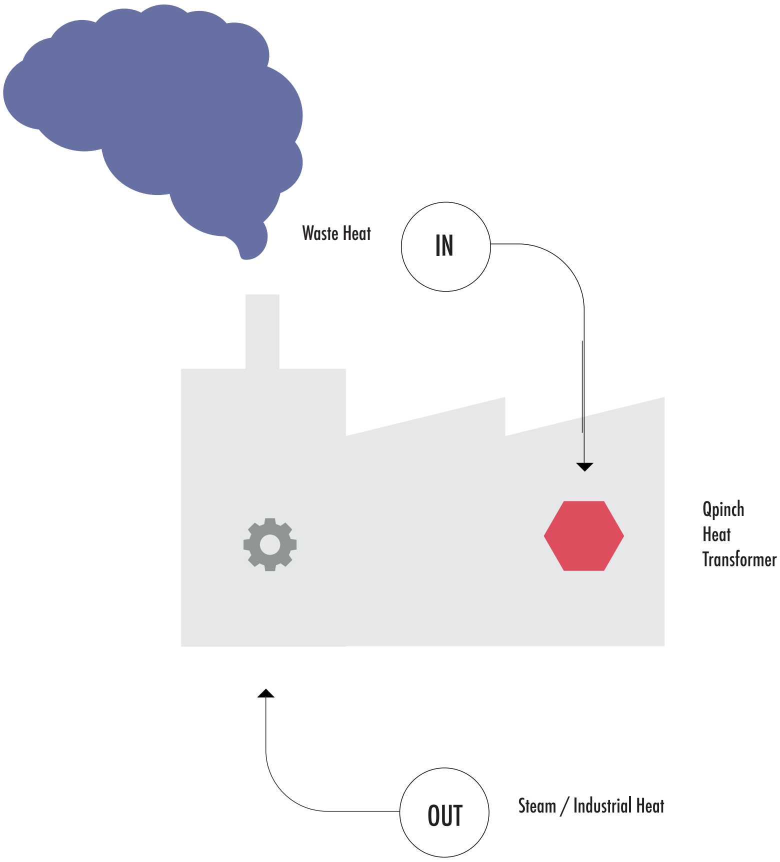
Contrary to general public belief, the bulk of our energy is consumed while generating heat, not electricity. This is particularly true for process industries, where heat is pervasive in the processes that produce the feedstock for the industrial sector as well as finished products for the consumer market. The International Energy Agency pointed out in its Energy Efficiency Market Report 2016 that "energy efficiency is the energy resource that all countries have in abundance."

The Oil & Chemical industries, which are by far the largest industrial consumers of primary energy used for process heat, account for the biggest reservoir of waste heat.

Faced with substantial higher gas prices compounded by regulatory limitations and probable increases in carbon taxation in the foreseeable future, industrial companies have much to gain from energy efficiency and its financial upside. This is especially true for commodity businesses where energy accounts for a sizeable part of the overall production cost.

What if we could access this untapped potential?

Converting waste heat into process heat



50-100 °C
High temperature lift

When recovering the energy in waste heat, the primary challenge lies in sufficiently raising its temperature. This often involves a significant energy increase to bring it back into the required high temperature zones where it is of value.

Low OPEX
1 unit of electricity = 30 units of heat

Operational cost should to be kept to a minimum. Existing solutions that consume a lot of electrical energy come with an important fixed fee/reservation cost to connect to the grid, high costs associated with their consumption, as well as maintenance costs.

1-50 MW
Scalable technology

The sheer amount of waste heat available – and obviously the need for massive levels of process heat – is such that solutions need to be on the megawatt-scale to have a noticeable impact on the financials of a plant. This requires solutions from one to multiple megawatt per unit.

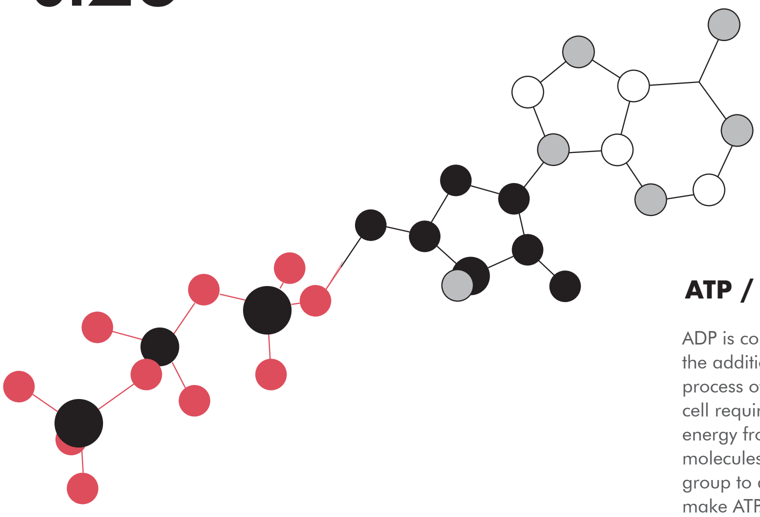
8300
Operational hours

The installation is assembled to meet the petrochemical industrial operational requirements.

All living cells, including deep sea organisms are using ATP/ADP cycles to survive

Scaling up the principles from microscopic to industrial size

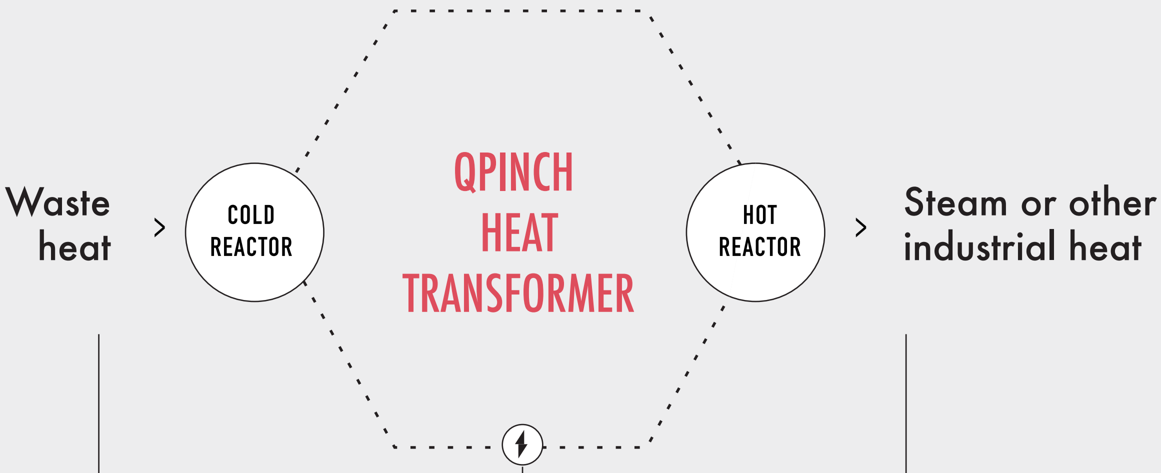
Qpinch does not rely on legacy technological concepts and their inherent limitations. Instead, we looked at how nature captures and releases energy in all living cells. This process, the ATP-ADP cycle, was our inspiration in designing our breakthrough heat transformer. By scaling up the principles from microscopic to industrial size and using inorganic chemistry, we provide a solution for the recovery of much of the energy that is now lost in industrial processes.



ATP / ADP Cycle

ADP is continually converted to ATP by the addition of phosphate during the process of cellular respiration. As the cell requires more energy, it uses energy from the breakdown of food molecules to attach a free phosphate group to an ADP molecule in order to make ATP.

How it works



Waste heat* energy is captured in the cold reactor

The heat causes an endothermic polymerization reaction which captures and stores this energy for use in the hot reactor.

*organic vapors, steam, condensate and hot liquids

Closed loop between cold and hot reactor

Transferring the phosphates and water between the cold and hot reactor and back only requires very little energy – between 2 and 4% of output duty. This means Qpinch can produce megawatts of process heat with little Opex and without requiring much electrical infrastructure.

Reverse reaction is used to create process heat

The reverse – exothermic – reaction is used to create heat of much higher temperature than the original waste heat. Worthless heat is converted into valuable new process heat resulting in important fuel and emissions savings.

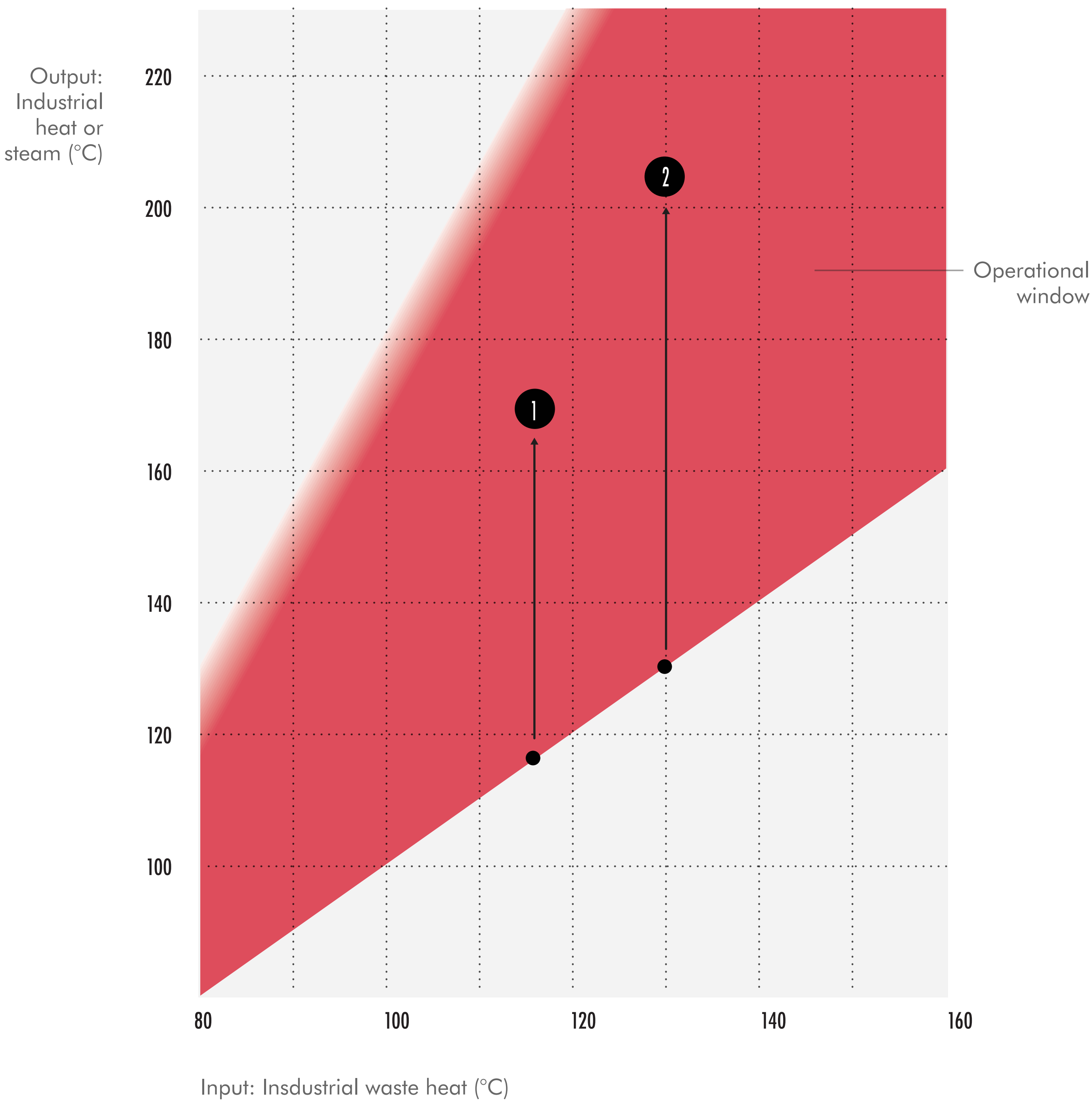
Business cases

Delivering financial and CO_2 savings on a large scale

Type of waste heat	Waste heat input		Process heat (steam) produced with Qpinch		Yearly CO_2 savings (tonnes)	
Chemicals						
Process steam	116 °C	12 MW	165 °C	6 MW	13 200	1 displayed next page
Water (cooling)	97 °C	12 MW	155 °C	6 MW	13 200	
Water (cooling)	123 °C	71 MW	164 °C	36 MW	79 200	
Water (cooling)	142 °C	14 MW	153 °C	7 MW	15 400	
Steam and condensate	Var. sources	16 MW	175 °C	8 MW	17 600	
Condensate	90 °C	20 MW	133 °C	10 MW	22 000	
Product vapors	130 °C	41 MW	205 °C	21 MW	46 200	2 displayed next page
Refinery						
Steam and condensate	Var. sources	19 MW	182 °C	10 MW	22 000	
Product vapors	115 °C	124 MW	180 °C	63 MW	138 600	

Technology window

Recovering residual heat from 75 °C / 167 °F and up



Roadmap to success

1

Explore Business Case Identification (BCI)

Together with the customer, Qpinch identifies the business case, how to implement the technology and assess the financials and potential CO_2 savings.

3 months

2

Conceptual Design Package (CDP)

The technical and economic feasibility of the project are identified. The focus lies on process design of key equipment and perfect integration with the existing customer processes. The customer's standards are checked for compliance with Qpinch.

6 months

3

Basic Engineering (FEED)

Process, E&I, civil & steel, piping, 3D & mechanical disciplines: Preparing an engineering pack ready for EPC. Technical issues and SHEQ are tackled in order to detail and optimize the total investment cost.

12 months
client in charge

4

Engineering Procurement Construction (EPC)

For the Execution phase the customer chooses its preferential EPC partner. Qpinch will assist where desired.

20+ years

5

Operate – No Opex

Qpinch will train operators and startup the installation. We also continuously follow up and optimize to obtain maximum performance.

Open innovation collaboration with Borealis

Borealis' open innovation collaboration with Qpinch on a full-scale commercial unit is an important step forward in the Borealis journey to reduce CO_2 emissions and to make its operations more energy efficient and sustainable.

The heat recovery unit will be located at an existing Borealis low-density polyethylene (LDPE) plant in Antwerp/Zwijndrecht, in Europe's largest petrochemical cluster. With operations scheduled to begin in the second half of 2019, the unit will be the largest set-up to date, and will be the first ever application of this new technology on a commercial scale in a polyolefin plant.

Read the press release online: www.qpinch.com/news

If you have megawatts of industrial waste heat, contact us through our online contact form or give us a call.

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