# Qpinch Thermochemical Heat Transformer

Push2Heat
Heat upgrading technologies

## Technical details

- **Scale:** 0.5 to >10 MW /unit
- **Heat source:** wide range of liquid and condensing media; waste heat temperatures starting at 80°C
- **Temperature lifts** between 40°C and 100°C
- **Heat sink:** process heat out with temperatures up to 210°C
- **Thermal efficiencies** around 50%
- **Electrical COP of 25** resulting in low OpEx
- **Operational flexibility** (both temperature setpoints and output capacity can be varied withing the same unit);
- **Turndown ratio:** 1:10 at constant efficiency

The current **commercial QTHTs** are located in the petrochemical cluster at the port of Antwerp, Belgium. Two of them are integrated into **chemical plants**, recovering waste heat from **distillation overhead streams** and **reactor cooling water**. Additionally, **Qpinch** operates an **industrial-scale testing facility** at its own premises. The units, with a capacity between **1 MW and 2 MW,** can upgrade waste heat between **90°C and 140°C** to process heat between **140°C and 185°C**.

## Expected impact

**1MW output capacity corresponds to:**

- 14 kton CO2 neutral steam
- 1.85 kton CO2 slavings
- 0.5 M€ OpEx savings

**Considered prices:**

- 30 €/MWh gas
- 60 €/MWh electricity
- 100 €/ton CO2

## Technology provided by

QPINCH

## Technology overview

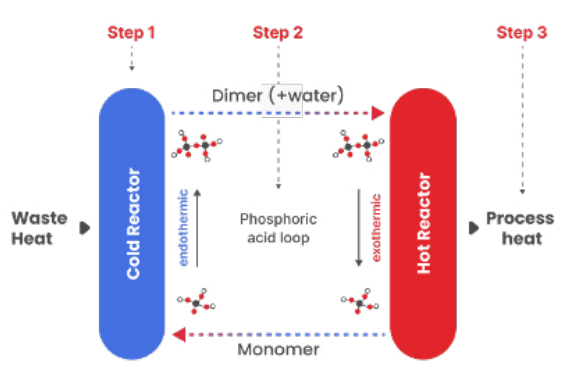
The **Qpinch thermochemical heat transformer (QTHT)** is a **thermally driven** heat upgrade technology designed to convert **waste heat into carbon-neutral industrial heat**. It is engineered for **MW-scale projects** with **temperature lifts** of several tens of degrees, the QTHT is suitable for implementation across all thermal processing industries. This **heat recovery technology** primary relies on waste heat at **low to intermediate temperatures,** with a limited amount of electricity used for circulating the **working fluids**. The **temperature lifts** in the QTHT are achieved through a **physicochemical process** with **phosphoric acid**. The core reaction involves the **endothermic dimerization** of phosphoric acid and the reverse, **exothermic hydrolysis** of the dimer, releasing heat at high temperatures. By leveraging this **reversible chemical reaction, low-grade waste heat** can be transformed into **process heat**.

**Step 1: Capturing waste heat.** Currently large amounts of residual energy are released into the atmosphere, directly or via cooling. Qpinch can absorb waste heat of 80°C and higher.

**Step 2: Transforming waste heat.** A physicochemical reaction transforms the captured low temperature waste heat to high temperature process heat. No electricity is needed to drive the temperature lift.

**Step 3: Delivering new energy.** 50% of the residual heat is recovered and transformed into process heat with temperatures up to 210°C on a MW scale.

### System Diagram




## PUSH2HEAT in a nutshell

PUSH2HEAT is an EU-Funded project that aims at addressing the technical, economic, and regulatory barriers that prevent heat upgrading technologies to be widely deployed. It is doing so by scaling up four different heat upgrading technologies to optimise their efficiency and economic performance. In addition, it is focusing on integrating them into the relevant industrial sectors such as the paper and chemical industries.

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## Glossary

- **Physicochemical process:** A blend of physical and chemical methods used to attain the required temperature increases.
- **Endothermic dimerization:** A chemical reaction where molecules combine, absorbing heat in the process.
- **Exothermic hydrolysis:** A chemical reaction where a compound breaks down into simpler substances, releasing heat.

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