CIXTEN

Carbon Dioxide To Energy

CO_2 driving decarbonization

Conversion of low temperature heat into useful energy

thermal enhancement

A new generation of heat pump to decarbonize industry

- **Useful heat** up to **250°C**
- **ΔT** up to **100°C**
- water / steam / air

WASTE HEAT FROM 60°C

COP_{elec} 5 TO 20

SUPERCRITICAL CO_2

ΔT 20°C to 100°C

USEFUL HEAT UP TO 250°C

www.cixten.fr

CIXTEN
Carbon Dioxide To Energy

Recovered heat production

Waste heat pump

WASTE HEAT IS :

THE LARGEST SOURCE OF UNUSED ENERGY IN THE WORLD

2860 TWh / year in the UE

Equivalent to the total heating and hot water demand of EU residential and tertiary buildings

OUR MISSION

Unlock the energy** potential of **low-temperature waste heat** to produce **useful**, competitive, low-carbon, and local **energy

EFFICIENT HEAT PRODUCTION

BASED ON TWO KEY PRINCIPLES

1. WASTE HEAT AS DRIVING ENERGY

The thermal machine developed by Cixten captures a fraction of the waste heat and converts it into mechanical energy, reused to run the thermal heat pump cycle. **Electricity consumption is reduced by a factor of 5 to 8** compared to traditional HP cycles.

Results :

- Significantly lower operating costs
- Heat produced at a cost lower than gas boiler

2. LEVERAGING THE EXCEPTIONAL PROPERTIES OF sCO_2

Supercritical CO_2 (sCO_2) is neutral, safe, and non-flammable. Thanks to its thermodynamic properties, it outperforms traditional working fluids:

- **High thermal conductivity**
- **High volumetric density**
- **High energy density**

Results :

- Excellent thermodynamic efficiency
- Compact and cost-reducing equipment
- Wide temperature range

HEAT PRODUCTION

Performance :

- **COP : from 5 to 20**
- **ΔT lift : +20 to +100°C** between the waste heat source and the useful heat sink

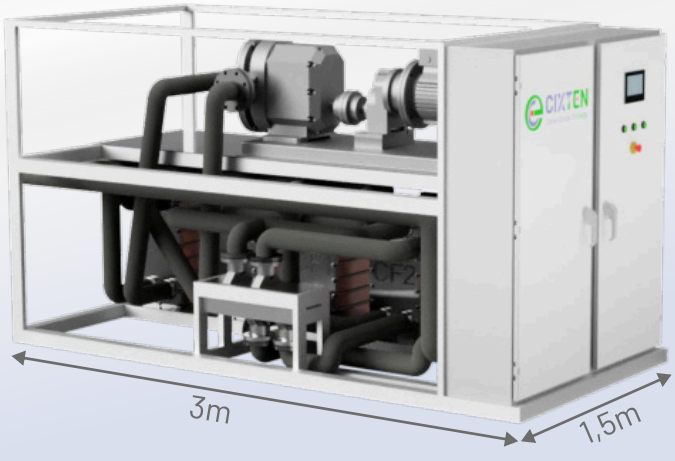
Useful heat production :

- **From 100°C to 250°C**
- **500 kW_{th}** on industrial pilot
  (up to 1 MW_{th} with direct exchange)
- scaling up to 1 MW_{th} for commercial machine

Waste heat source to valorize :

- From 60°C
- With at least 1.5 MW_{th} available

TRL7 INDUSTRIAL PILOT



EXPLOIT THE UNEXPLOITED

The most competitive energy is the one you already have

THP operation and benefits

THP Trithermal Heat Pump

What if your waste heat was worth more than your burned gas?

Cixten develops a next-gen HP with unprecedented performance

High-temperature heat (>120°C) is a key challenge for industrial decarbonization. By exceeding the temperature and performance limits of today's industrial heat pumps, Cixten's technology valorizes waste heat up to 250°C.

Combinaison of two cycles

Thermal upgrading through the combination of :

- A first **power cycle** that converts part of the heat into mechanical energy.
- A second **lift cycle** that uses this energy to raise the temperature of the waste heat source.

THP's patented trithermal architecture

Based on interaction of 3 thermal levels:

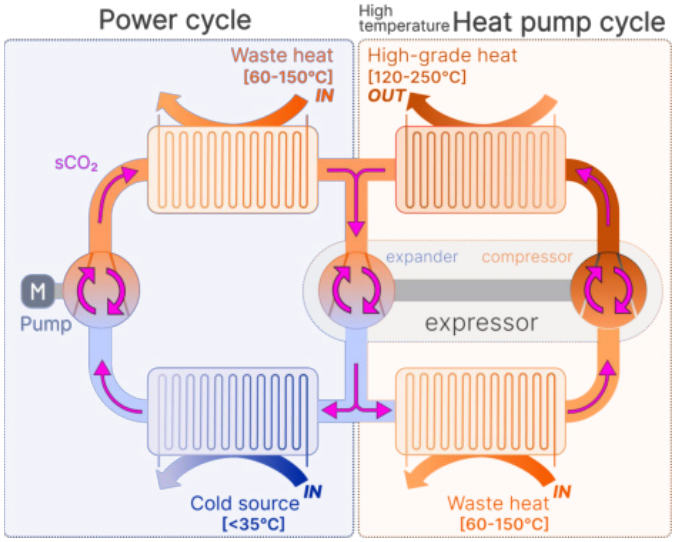
- The waste heat source powering both cycles
- A cold source <35°C to balance the cycles
- A heat sink producing between 100 and 250°C

X20 Achieves **up to 8× higher COP** than conventional heat pumps thanks to its **power cycle driven by waste heat**

Easy on-site integration due to low electricity consumption: **from a few dozen to around 100 kW**

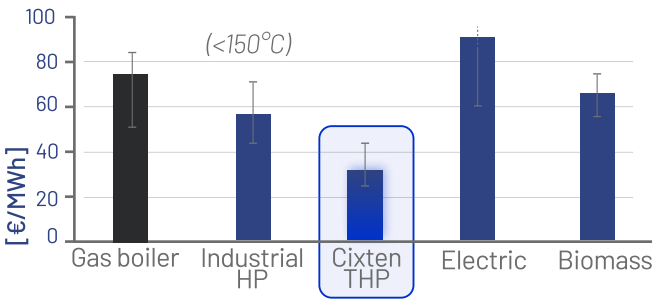
Up to 50% reduction in the client's process-related **GHG emissions**

THP architecture :



Economic comparison

LCOH of industrial heat production solutions (€/MWh) :



Note : Uncertainty intervals may reflect the impact of CAPEX-related subsidies

Comparison of the Levelized Cost of Heat (LCOH) of different low-carbon technologies with conventional heat production from natural gas boilers

Gas price : 40€/MWh
Annual heat production : 8 GWh
Amortization period : 15 years

THP stands out as the most cost-effective solution, offering a low Levelized Cost of Heat (LCOH) between €25 and €45/MWh. The savings from avoided natural gas consumption quickly compensate for the initial investment—making decarbonizing your heat supply cheaper than inaction.

BECOME A PIONEER

of a new industrial model of | performance
energy competitiveness
decarbonization

Cixten is looking for industrial partners to launch pilot projects

Feasibility studies & simulations

1. PRE-STUDY

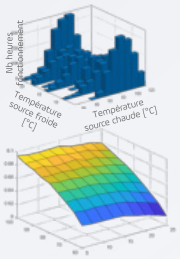
Rapid evaluation to identify waste heat recovery potential.

Target deployment on industrial site in early 2027.

2. FEASIBILITY STUDY

Structured study to secure commitment to a pilot project:

- Characterization of the heat source
- Integration study
- Equipment sizing
- On-site deployment study
- Techno-economic evaluation



OUR METHODOLOGY

- **Digital twin of our machine**
  to simulate onsite performance
- **Complete and objective approach**
  Integrated technical, economic, environmental, and regulatory analysis, with access to specialized external expertise when required.
- **Strategic guidance**
  Alignment with internal constraints and regulatory frameworks (EU certifications), and identification of relevant funding schemes

Technological advantages

Introduction of a power cycle	→ No equivalent heat per kWh of electricity consumed
Exceptional properties of sCO_2	→ Target heat: up to 250°C, ΔT up to +100°C
Partial load operation without COP loss	→ Reduced dependence on stability/ quality of low-temp heat

Pilot project

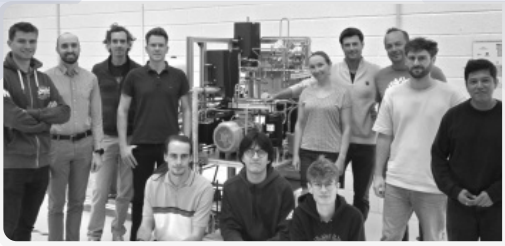
Waste heat :

- Temperature > 60°C
- Power > 1,5MWth
- Availability > 5000 h/year

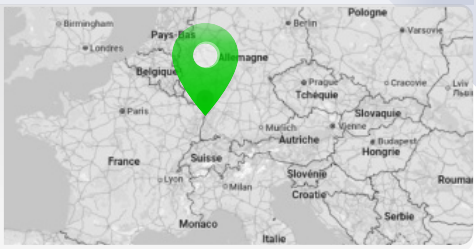
Useful heat need :

- ΔT lift : +20 to +80 °C between source and sink
- Thermal output ranging from 350 to 500 kWth.
- Synchronized with waste heat availability

CIX'TEAM



- Created in 2022 by 3 Franco-German cofounders
- 12-person team, 75% R&D
- Strong innovation DNA
- Headquarters : Alsace, FRANCE



Support & Networks

ADEME · bpifrance · Capital Grand Est · Crédit Mutuel · SEMIA Générateur de startups · Evolen'up · Grand Est · noria · CIC · Les Deep Tech · Résilian

Contact us

Want to valorize a waste heat source from 60°C to 120°C?

contact@cixten.fr