ENERGY EFFICIENT SYSTEMS

Recover & recycle your waste heat

- Absorption Machines - Heat Pumps & Chillers
- Thermal Energy Storage Solutions
- Special Heat Exchangers

CNIM
Innovate and Act

Italy 65 MW Turnkey Waste-to-energy Plant with 500kt combustion capacity per year
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CNIM GROUP
A trusted partner for turnkey installations

Over 60 years of turnkey plants & equipment

As a specialized European provider with a well-established portfolio of proprietary technologies, CNIM's solutions have been successfully deployed around the world for more than 60 years.

CNIM has provided 281 turnkey waste-to-energy conversion lines and over 250 biomass plants and boilers, for use either by local authorities or designated operators.

On the equipment side CNIM has provided more than 400 LAB® Flue-gas treatment systems and over 150 MW of absorption machines in 26 countries.

CNIM Key figures (2016)

€ 540 million turnover

55 % export revenue

2,500 Employees

CNIM, commited to reducing greenhouse gas emissions and to energy savings

CHP
& Power Plants

Infrastructures

Process Industries

Oil & Gas

Maritime

Finland - 10 x 3.5 MW District Cooling System

DON'T WASTE YOUR HEAT, CREATE VALUE FROM IT.

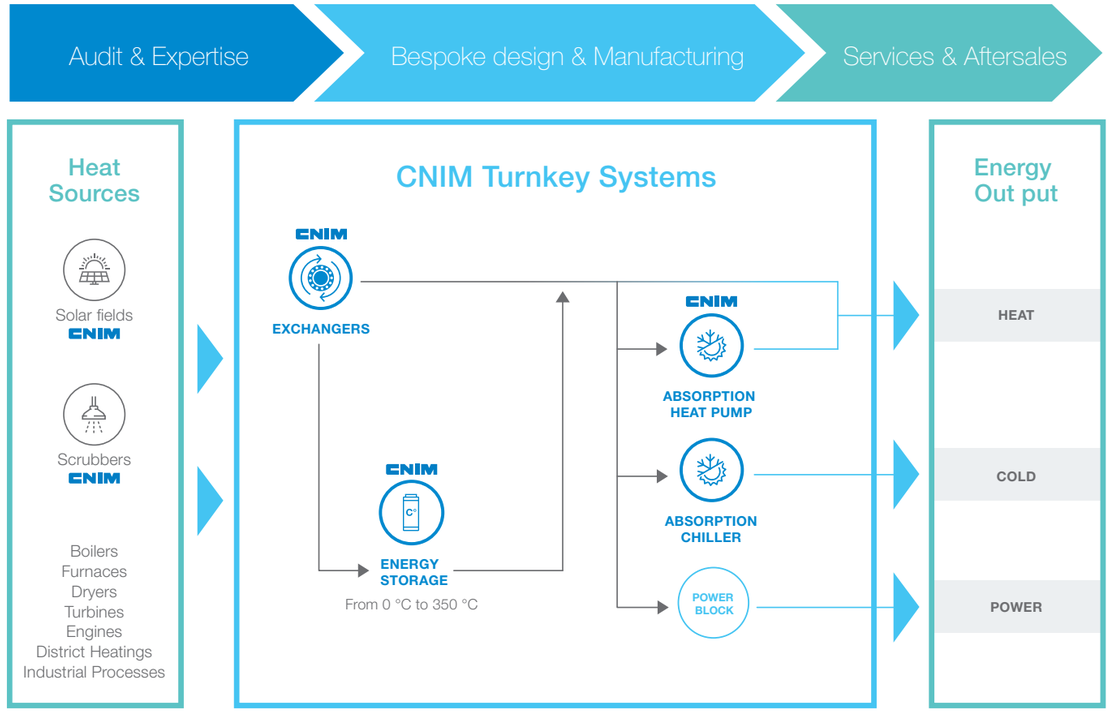
CNIM Energy Efficient Systems recover waste heat from various sources, including boilers, engines, turbines and furnaces.
To integrate those systems within its clients facilities, CNIM offers audit & expertise, bespoke design & manufacturing, and worldwide aftersales.

Compliance with environmental laws

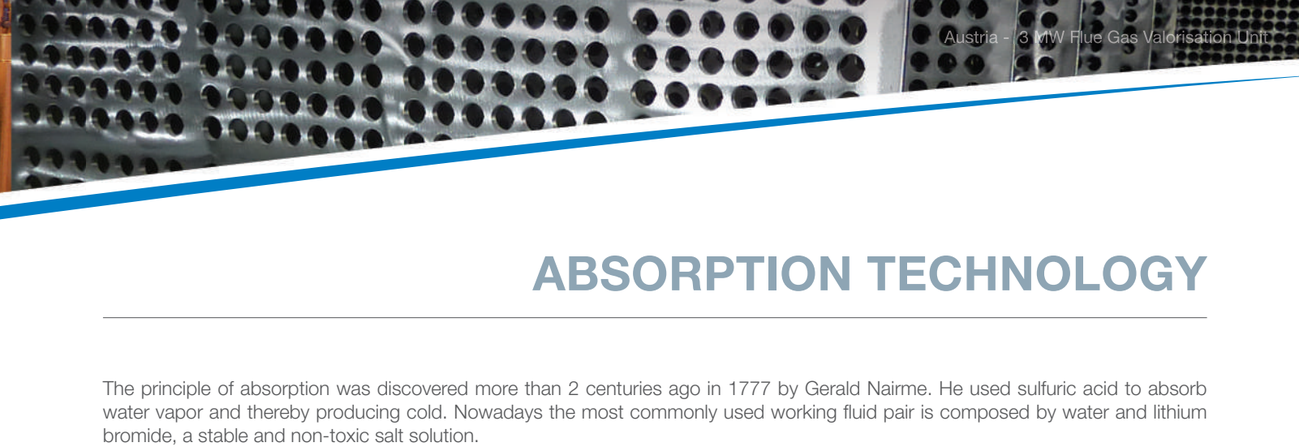
CNIM believes that **every drop of fuel** should be 100% used, and used carefully, to induct **long-term environmental footprint reduction** of facilities and installations.

Better profitability

To improve competitiveness, **increasing energy efficiency** of your process and facilities, CNIM helps you **cutting down operating costs** – through fuel savings.



Sweden 7 MW District Heating AHP driven by steam and flue gas recovery of a Waste-to-Energy Plant



Austria - 3 MW Flue Gas Valorisation Unit

CNIM ENERGY EFFICIENT PRODUCTS

30 years of experience by your side

- High quality standards (Llyod's, Bureau Veritas, PED, ASME)
- Adapted to very demanding environments (ATEX, maritimized units)
- Long life time & Low operating costs
- Tailored solutions

ABSORPTION CHILLERS

Cold production down to 0°C using recovered energy

> 70°C Energy source
Custom designed process
Single Effect High COP up to 0.84 designed for low temperatures
Double Effect with higher COP up to 1.4 depending on conditions

ABSORPTION HEAT PUMPS

Elevation up to 100°C from low grade heat

High COP of 1.8
Large units available up to 20 MW
High District Heat temperature (up to 100°C)

SPECIAL HEAT EXCHANGERS

High added value & complex machining

Liquid/Liquid: Plate Heat Exchangers
Gas/Gas: Tubular or Plate Heat Exchangers
Gas/Liquid: Finned Tube Exchangers

THERMAL ENERGY STORAGE

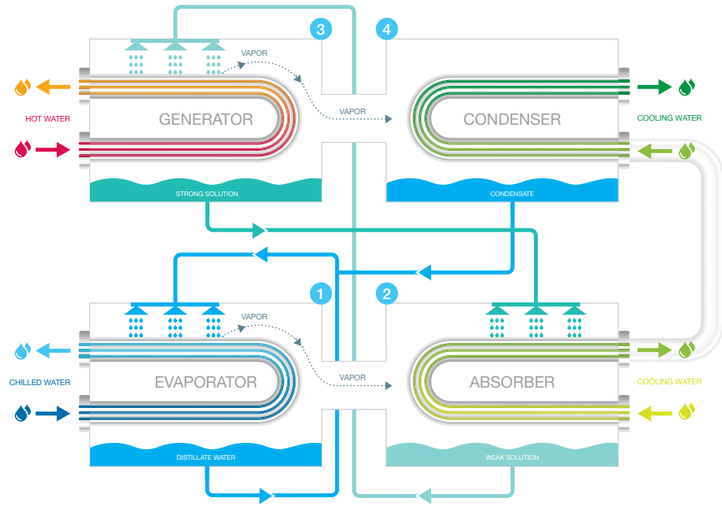
Heat storage solutions, with large scale working temperature

Down to 0°C Cold Water Storage
Up to 180°C Hot Water Storage
Up to 240°C Steam Accumulator
Up to 350°C Thermstock® Oil Storage

ABSORPTION TECHNOLOGY

The principle of absorption was discovered more than 2 centuries ago in 1777 by Gerald Nairme. He used sulfuric acid to absorb water vapor and thereby producing cold. Nowadays the most commonly used working fluid pair is composed by water and lithium bromide, a stable and non-toxic salt solution.
Absorption Machines use thermal energy (steam, hot water,…) as their primary energy source. Mechanical or electrical energy is only required for a couple of small pumps, dedicated to the circulation of the internal fluids, which usually consume about 1% of the cooling load.

1. In the evaporator, the liquid refrigerant is colder than the incoming water: it captures the heat from it until it evaporates.
2. In the absorber, the refrigerant vapour is captured by the LiBr solution. It returns to the liquid state and dilutes the LiBr solution (which then loses its absorption capacity). The heat of absorption is released in the LiBr solution, which in turn transfers it to the cooling fluid.
3. In the generator, the heat source transfers its heat to the dilute LiBr solution. The refrigerant picks up the heat and evaporates again. The newly concentrated LiBr solution is reinjected into the absorber.
4. In the condenser, the refrigerant vapor issued from the generator gives its heat to the water which arrives in the exchanger. Thus, the refrigerant liquefies and returns to the evaporator. It captures again the heat from the water, evaporates and thus starts the loop again.



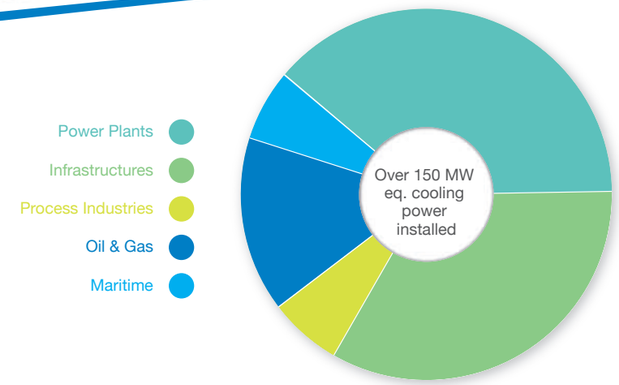
Absorption machines, a green & economic alternative to conventional compression machines

- RECYCLE WASTE HEAT
- LOW POWER CONSUMPTION
- NO VIBRATIONS
- DISCREET
- ENIVRONMENT FRIENDLY

Germany 3.6 MW Diesel Engine driven Absorption Chiller for an international airport

Malaysia 6MW, Ethylene Compressor Cooling System

« We act for a sustainable future,
a cleaner environment,
and energy savings. »



BUSINESS	SOLUTIONS	KEY PRODUCTS	ADDED VALUE	TECHNICAL SPECIFICATIONS
 CHP & POWER PLANTS	**PowerGen Enhancement**	▸ District Heating Absorption Heat Pump ▸ Turbine Air Cooling Absorption Chiller ▸ Steam Accumulator ▸ High Temperature Heat Storage	Designed to improve overall efficiency of the Plant. Our solutions recover heat from scrubbers, turbine outlets or geothermal sources to produce more energy at the right time.	**Steam driven machines** **Up to 10 MW* heat recovery @ 40°C** **(120 – 180°C)**
 LARGE BUILDINGS	**Green Cooling Systems**	▸ District Cooling Absorption Chiller ▸ Engine Driven Absorption Chiller ▸ Cold Storage	Providing cooled water in summer or the whole year round, theses solutions give you the best cost of energy when waste heat (from district heating or engines) is available.	**Hot water driven machines** **Up to 10 MW* cooling power** **(80 – 95°C)**
 PROCESS INDUSTRIES	**Industry Energy Saving**	▸ Pre-heating Absorption Heat Pump ▸ Process Cooling Absorption Chiller ▸ Steam Accumulator ▸ High Temperature Heat Storage	Achieve more energy autonomy and lower fossil fuel consumption with these solutions that recover waste heat from industrial ovens, dryers or other available sources.	**Steam, air, water or thermal oil driven machines** **Up to 10 MW* heat recovery @ 40°C,** **(120 - 500°C)**
 OIL & GAS	**O&G Productivity Enhancement**	▸ Condenser Cooling Absorption Chiller ▸ Turbine Air Cooling Absorption Chiller ▸ Compressor Cooling Absorption Chiller	Increase the efficiency by cooling key equipment of onshore or offshore Oil & Gas plants whilst using only the process heat available on site.	**Multisource drive: steam, water, process fluid** **Up to 10 MW* cooling power @ 0 - 50°C,** **(80 - 200°C)**
 MARITIME	**On-board Cooling**	▸ Anti-rolling & pitching Absorption Chiller ▸ Cold Storage	Respond to the intensified emission regulation and perform substantial fuel saving with these innovative solutions	**Steam, hot water , thermal oil driven machines** **Up to 5 MW cooling power @ 6 - 20 °C** **(90 - 200°C)**

*CNIM proposes also specific design with cooling capacity over than 10MW

CHP & POWER PLANTS

- Waste-to-Energy
- Biomass
- Geothermal
- Combined Cycle
- Reciprocating Engine
- Coal Fired

Improve the energy efficiency of your whole plant.

Reduce your plant's environmental footprint and comply with current and future **energy efficiency regulation.**

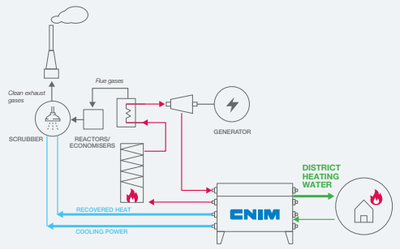
CASE STUDIES

Flue gas valorisation

Within a waste treatment plant, heat is recovered from wet flue gas treatment at ~40°C.

The absorption heat pump transforms this heat into higher temperature energy (~75°C) which is fed into the district heating network.

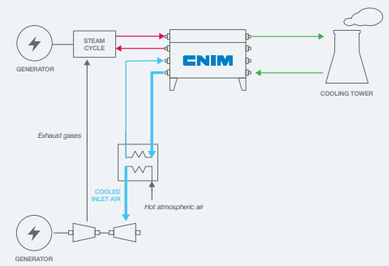
The heat pump is driven by high pressure steam from waste boiler or steam turbine bleed.



Cost efficient turbine inlet air cooling

Air cooling at a gas turbine inlet enhances efficiency and power output.

A very low temperature absorption chiller (2°C) produces chilled water which in turn cools the air in a direct heat exchanger. The chiller is powered with steam from the heat recovery system at the turbine exhaust.



INFRASTRUCTURES

- District Cooling
- Airports
- Hotels & Health centers
- Educational Institutes

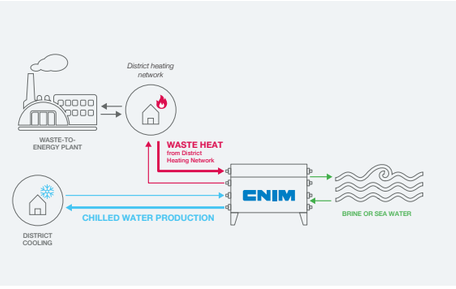
Minimize your CO^2 emissions to guarantee **a sustainable urban development.**

Implement energy efficiency of your systems to guarantee **long-term competitive energy costs.**

CASE STUDIES

Renewable cooling for smart cities

10 absorption chillers are feeding Helsinki district cooling network. They are powered by the residual heat of the district heating.

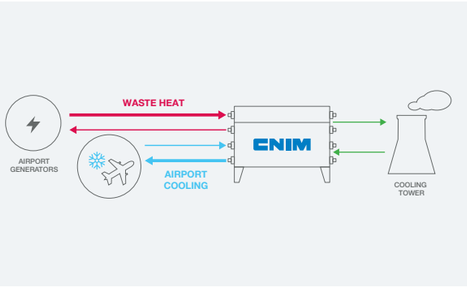


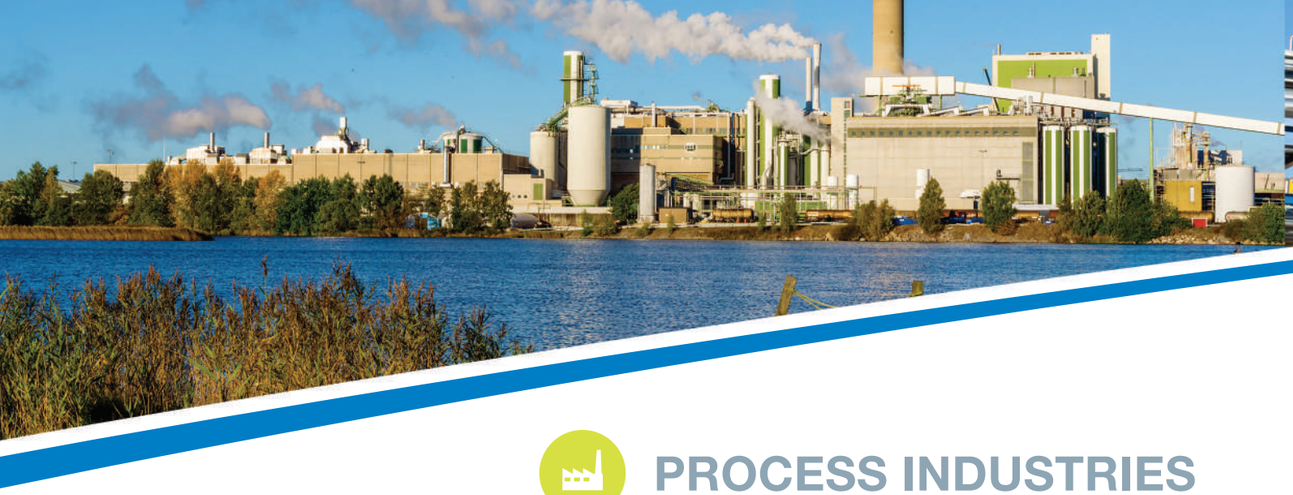
Engine driven green cooling

To increase its energy efficiency and to reduce environmental emissions, Cologne Airport installed 2 absorption chillers.

The environmental friendly chilled water produced is used for the airport cooling.

As other key infrastructures, Cologne Airport is participating to a sustainable urban development.





PROCESS INDUSTRIES

- Pulp & Paper
- Construction Materials
- Steel & Metals
- Agrifood

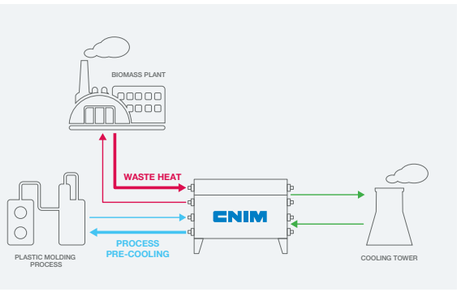
Transform the waste heat from various stage of your process into cost saving opportunities.

Get a green and economic approach to **preheat energy intensive processes or cool down (up to 0°C) key equipment**, without producing CO2.

CASE STUDIES

Efficient Pre-cooling

At a plastic plant, an absorption chiller using low cost, low temperature energy from a nearby biomass plant produces 2.4 MW cooling capacity at 8°C for the pre-cooling of plastic molding machines.

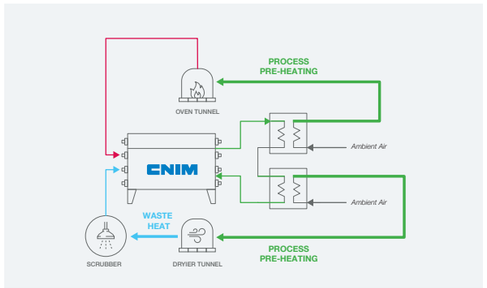


Low carbon furnace pre-heating

800 t CO^2 /year saved

Our waste heat recovery system (including scrubber, exchangers and absorption heat pump) captures heat contained in the hot air out of the cooling zone, to transfer it to the air at the entrance of the oven.

This preheating requires no fuel unlike conventional solutions. Energy efficiency reduces $C0^2$ and the operation costs.



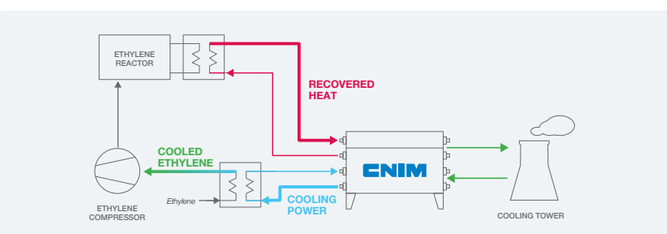
OIL & GAS

- LNG Production
- Refining
- Oleofins

Increase the **efficiency of your key equipment** (turbine, compressors,…) , recovering heat from different process whatever the transfer fluid is. As a result, you **cut down your operating costs and reduce your overall emissions.**

CASE STUDY

Free-energy ethylene cooling



MARITIME

- Navy Ships
- Passenger Ships
- Work boats & Platforms
- Cargo Ships

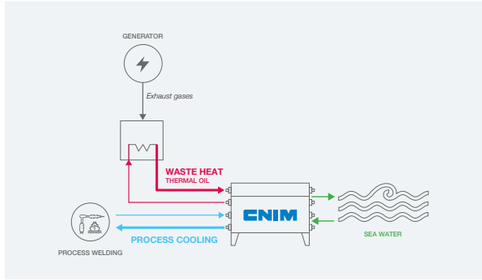
Cut down your needs of electricity, and **respond to the intensified emission rules and sustainable oil savings.**

CASE STUDY

Green & cost-effective ship

Simply driven by recovered waste heat from engines, our system produces chilled water for process cooling in a cost-effective and sustainable way.

The absorption chiller was designed for maritime application: intense corrosion prevention, high vibration resistance, proper functioning with pitch and roll, installation and minimum maintenance.



ENERGY EFFICIENT SYSTEMS

Recover & recycle your waste heat

CNIM Energy Efficiency

Systems

- Turnkey systems

Products

- Absorption Chillers & Heat Pumps
- Thermal Energy Storage Solutions
- Special Heat Exchangers

Services

- Audit & Expertise
- Worldwide Maintenance & Aftersales

To contact us:
energyefficiency@cnim.com

CNIM

Headquarters
35, rue de Bassano
75008 Paris - FRANCE
+ 33 (0)1 44 31 11 00
www.cnim.com