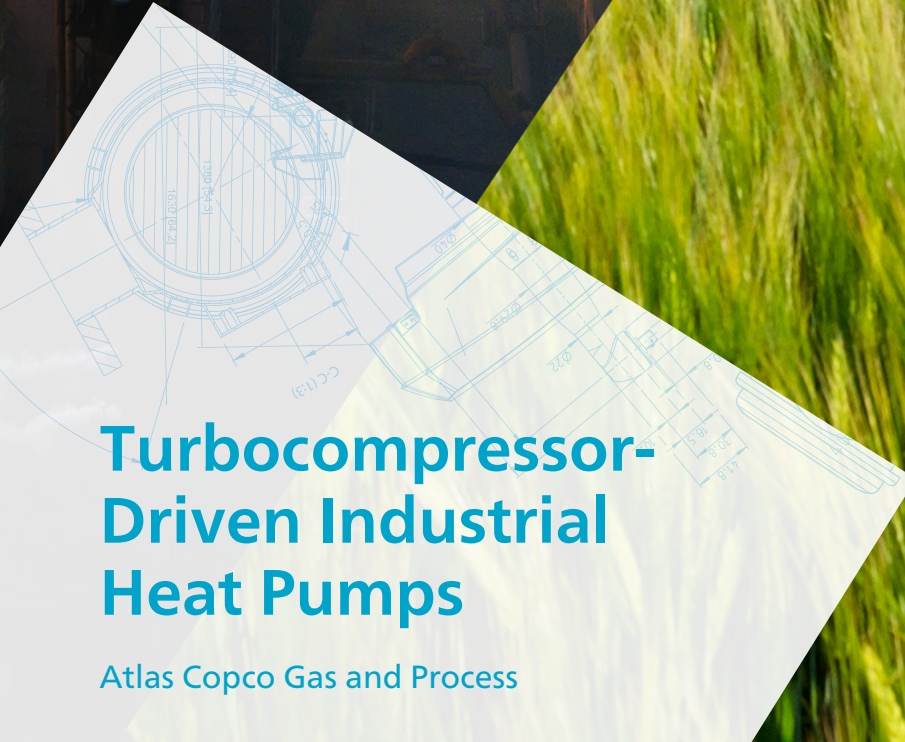


CUT THE  
**CARBON**

TRANSFORM • SAVE • CONTRIBUTE



## Turbocompressor- Driven Industrial Heat Pumps

Atlas Copco Gas and Process



Turbocompressor of a  
Transcritical Heat Pump

# Turbocompressor-Driven Industrial Heat Pumps

With the urgency to fight climate change and to end dependence on fossil fuels steadily growing, low-grade heat recycling has become a viable option to close formerly open energetic loops and enable a sustainable, circular economy. Industrial and high-performance heat pumps using turbocompressors support the upgrade of a waste or ambient heat source by increasing the temperature for further use in your process. Using the same principle of nearly every home refrigerator, Atlas Copco Gas and Process' high-efficiency industrial heat pumps handle process heat ranges between 10-50 MW (thermal) per unit and 80-300°C. With 100% oil-free compression, our turbocompressors are by design compatible with all commercially used refrigerants, including natural hydrocarbons and carbon dioxide.



Left picture: Integrally-g geared refrigerant compressor (using a natural refrigerant).  
Right picture: A heat pump / mechanical vapor compressor with direct steam compression cycle applied in a chemical plant.



Serving process heat range 10-50 MW (thermal) per unit and 80-300°C



Using ambient and process heat sources between 0-150°C



Tailored process designs for generation of steam, hot water and other heat transfer fluids



Supporting all commercial refrigerants used



Cooperation with selected European EPC partners

# Industries and applications served by our turbocompressor-driven heat pumps

Our integrally-gearred turbocompressors and Componders can be used in industries using either open loops (i.e., mechanical vapor recompression) or closed loops (i.e. typical heat pumps, using refrigerants), including:



Chemical



Food production & processing



Pulp & paper



General manufacturing



District heating

## Key benefits



### High degree of customization for your process

Integrally-gearred turbocompressors are highly customizable, they offer flexible sections and individual stage adjustment



### Know-how in industrial heat pumps

Among the pioneers in Europe and realizing some of the first installations, we have now built 30+ years of understanding and experience in the steadily growing sector of industrial heat pumps.



### Timely solution for low-carbon process heat needs

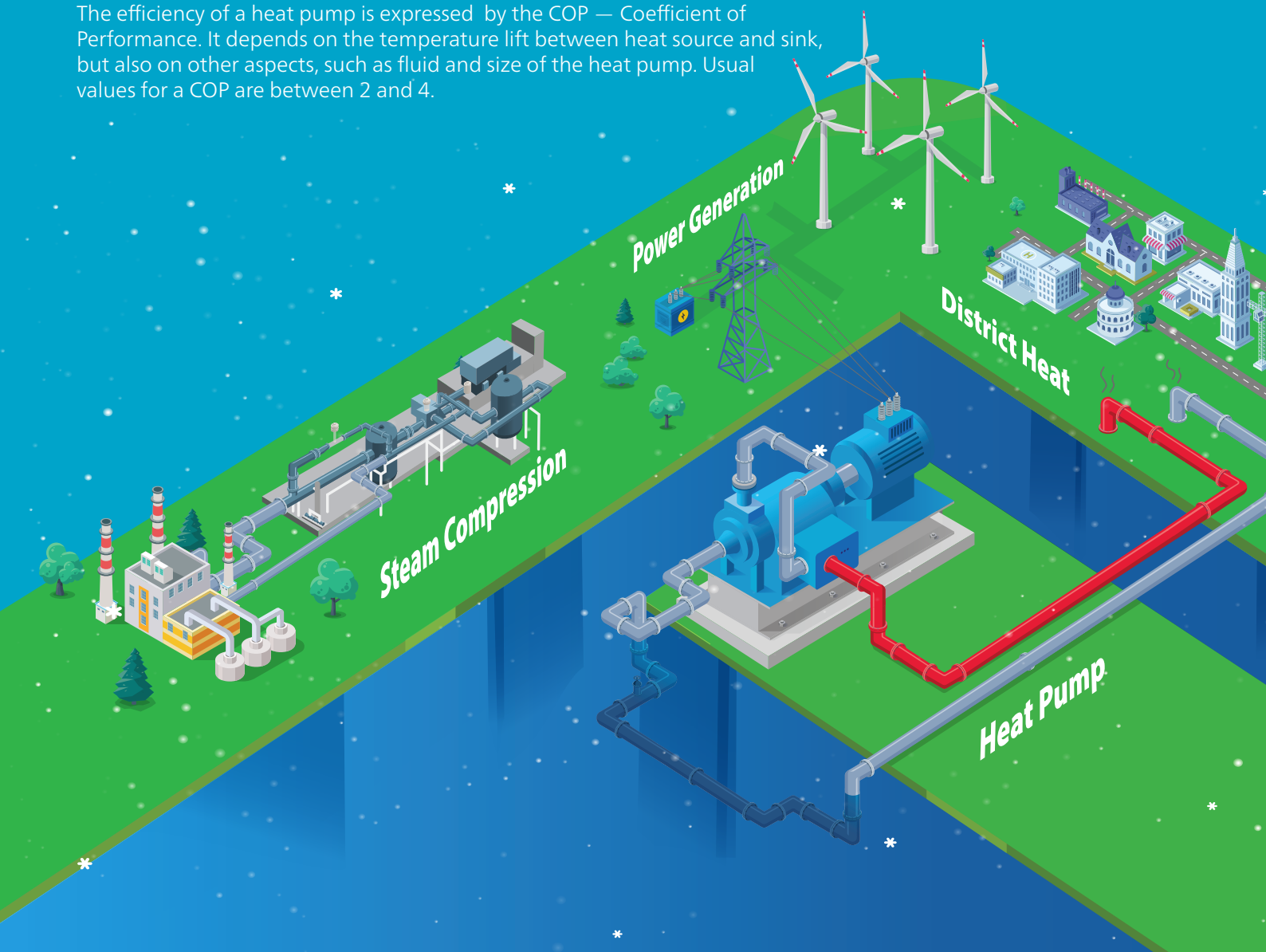
With increasing CO<sub>2</sub> and fossil-fuel prices, and a broader renewables footprint in the electricity mix, industrial heat pumps will be a key factor in achieving a more sustainable heat-generation approach in the future.

# Water and steam: Upgrading waste heat sources with electrical power

From process heat to space or district heating – these days, thermal heat makes up a significant portion of energy demand across Europe, with about two thirds of that heat being produced using fossil fuels. As a result, industrial process heat is responsible for about 20 percent of CO<sub>2</sub> emissions across Europe.

Industrial heat pumps help to upcycle low-temperature waste heat sources (such as river water, sewage water, process wastewater and warm drying air or steam). With the use of a fraction of the electric power to drive the heat pump (typical 20-40%), and with no CO<sub>2</sub> emitted, this upgraded waste heat can be re-used in a process with the lowest environmental impact possible.

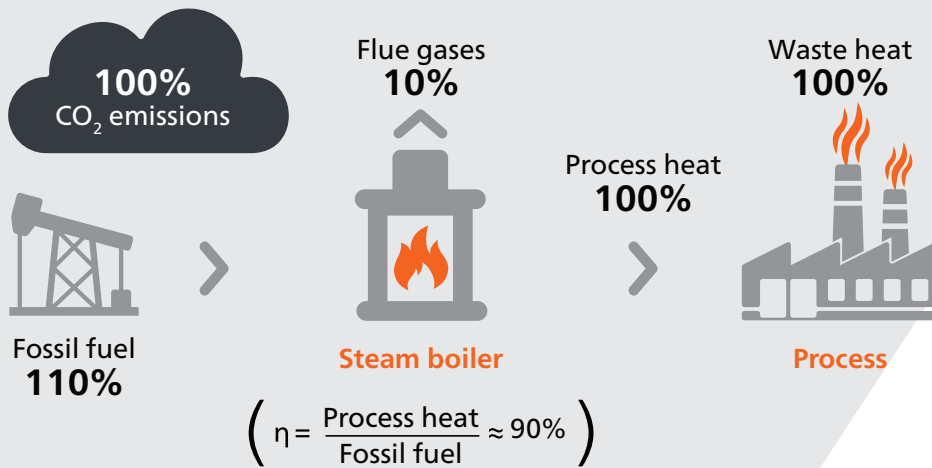
The efficiency of a heat pump is expressed by the COP — Coefficient of Performance. It depends on the temperature lift between heat source and sink, but also on other aspects, such as fluid and size of the heat pump. Usual values for a COP are between 2 and 4.



# A step towards carbon neutrality

## Heat transformation – Efficiency comparison – Fossil

### Fossil fuel driven

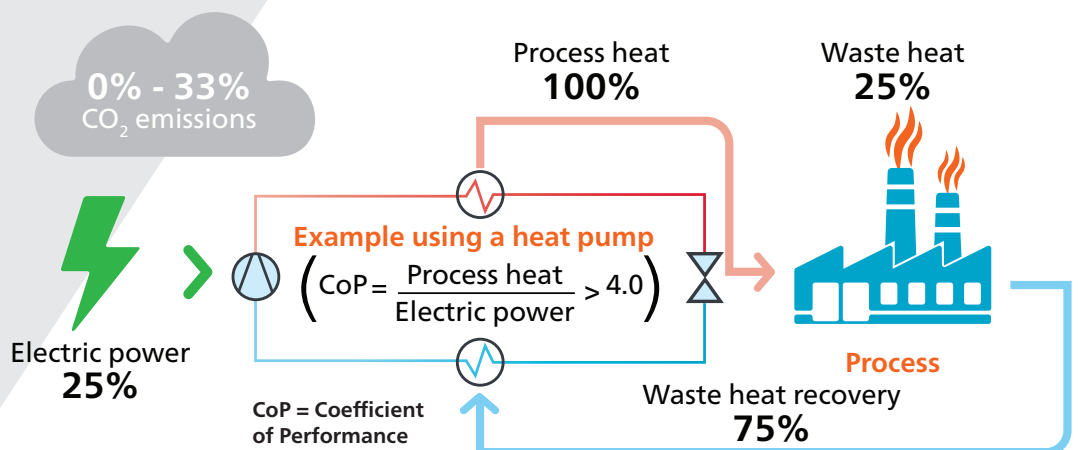


Valid for hydrogen as well if used as fuel gas.

Vs

## Heat transformation – Efficiency comparison – Heat Pump

### Heat pump driven





## Supporting your heat pump process need with our EPC partner

STRABAG Umwelttechnik GmbH is a subsidiary of STRABAG SE, a European technology group for construction services with over 74,000 employees, leading in innovation and capital strength. We combine STRABAG's broad and comprehensive expertise in contaminated site remediation, landfill construction and environmental plant engineering.

As a plant engineering business unit, we design and implement turnkey plants for our customers for biogas generation and utilization, waste treatment, and electricity and heat generation based on renewable resources or waste heat instead of fossil fuels. With more than 30 years of experience in planning, engineering, construction, delivery, installation and commissioning of numerous reference projects as well as related services in operation and our own planning and engineering capacities, we are able to guarantee the economic efficiency, functionality and, above all, operational reliability of the plants we build.

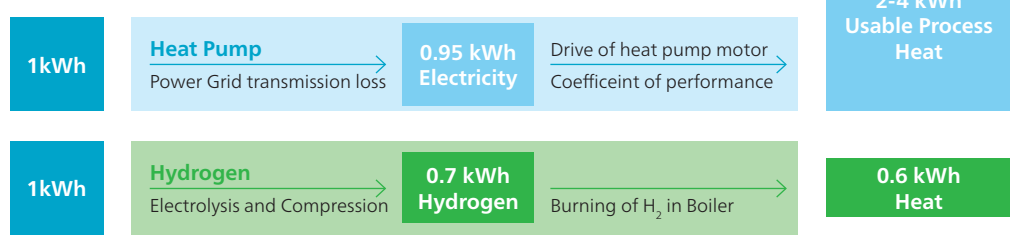
In the case of large industrial heat pumps, which we realize with our partner Atlas Copco, the plant technology know-how of our specialized engineering teams and the comprehensive construction technology and contractor expertise of a leading construction group are uniquely combined with the innovative strength and quality standards of one of the most renowned compressor and turbomachinery manufacturers.

# Heat pumps: Highly efficient reuse of heat via electricity

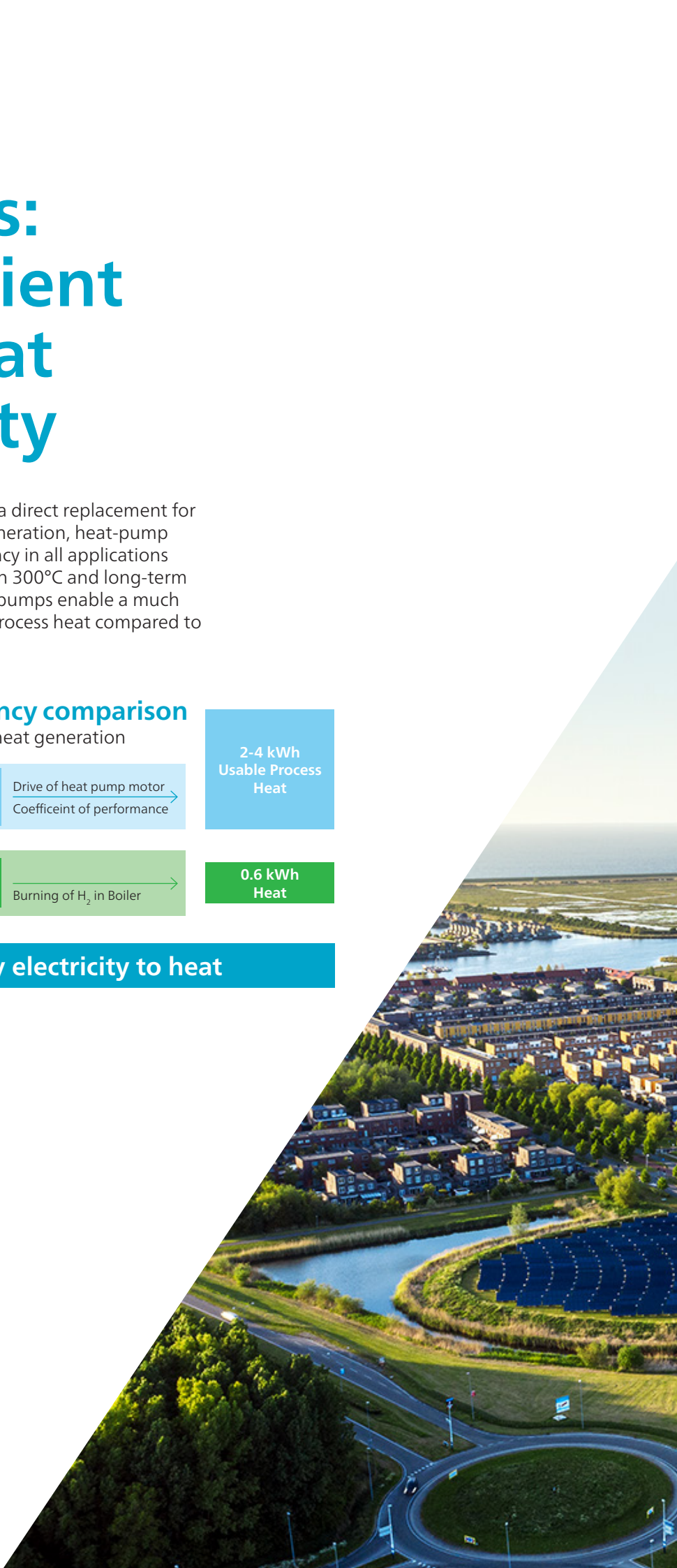
While sustainable hydrogen can be used as a direct replacement for fossil fuels in industrial- and district-heat generation, heat-pump technology excels in terms of energy efficiency in all applications that don't require temperatures greater than 300°C and long-term storage. With their superior efficiency, heat pumps enable a much higher conversion of electricity into useful process heat compared to hydrogen production and combustion.

## Heat transformation – Efficiency comparison

Example: Green electricity used for process heat generation



## Conversion efficiency electricity to heat





# Industrial heat pumps: leveraging existing plant infrastructures

In many applications, heat pumps can directly replace or supplement fossil-based steam and process-heat production or district-heating energy sources. In doing so, they can also play a significant role in cutting the carbon in industrial processes while reducing the dependence on heating fuels, such as natural gas or coal. Industrial heat pumps can be readily employed in many application scenarios by leveraging existing plant infrastructures (such as piping, existing steam-pipe networks and cooling water systems)

Atlas Copco Gas and Process designs heat-pump solutions with integrally-g geared turbocompressors (refrigerant compressors or mechanical vapor recompression), as well as integrally-g geared Componders.



