

**HIGH TEMPERATURE HEAT PUMP  
INDUSTRIAL PROCESSES DECARBONIZATION**

*2025 Industrial Process Emissions Reduction (IPER)  
Workshop Jan 29<sup>th</sup> 2025, Southwest Research Institute*

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**Turboden S.p.A.**

A Group Company of  **MITSUBISHI HEAVY INDUSTRIES**

## GLOBAL AND PROVEN EXPERIENCE

Worldwide presence in  
**50+ countries**

Around  
**460 plants**



HEAT GENERATION

2 units, 18 MWth



HIGH TEMPERATURE  
POWER GENERATION\*  
+ COGEN

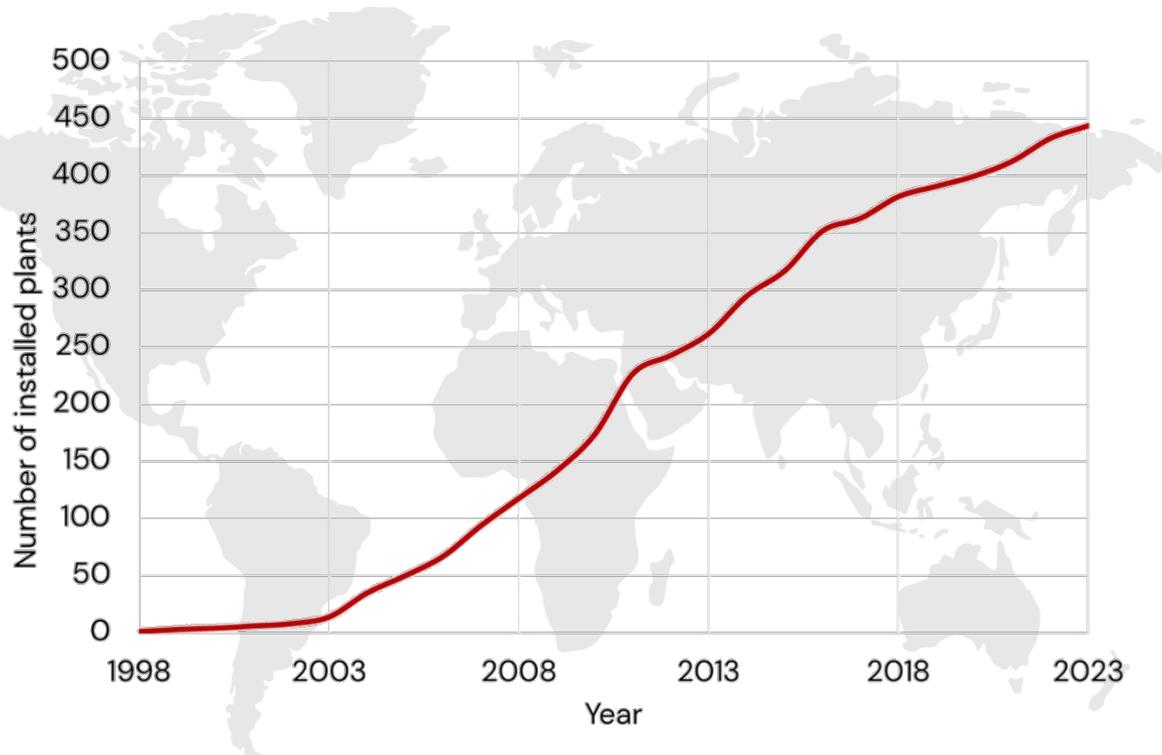
442 units, 810 MWe



GEOTHERMAL  
POWER GENERATION

20 units, 247 MWe

Last update: August 2024  
\* ORC and gas expanders included.



Largest plant  
in operation  
29 MWe



Largest plant  
under construction  
120 MWe



Overall capacity  
installed  
1,050 MWe

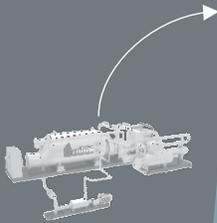
# MHI AT A GLANCE



FOUNDATION	EMPLOYEES	GROUP COMPANIES	SALES
<p><b>1884</b> over 130 years of history</p> 	<p><b>77,430</b> (Consolidated)</p> 	<p><b>260</b> (Consolidated)</p> 	<p><b>¥4.2TN</b> (\$31BN*) (FY2022, consolidated)</p> 

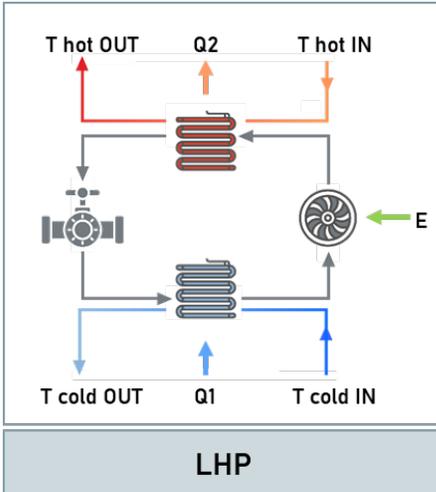
\*On the FY2022 average JPY/USD exchange rate.

## DIVERSE PRODUCTS

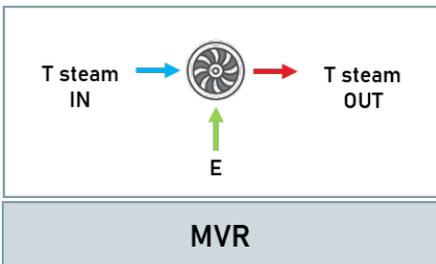


<p>ENERGY SYSTEMS</p> 	<p>PLANTS &amp; INFRASTRUCTURE SYSTEMS</p> 	<p>LOGISTICS, THERMAL &amp; DRIVE SYSTEMS</p> 	<p>NUCLEAR ENERGY SYSTEMS</p> 	<p>MACHINERY SYSTEMS</p> 	<p>INTEGRATED DEFENSE &amp; SPACE SYSTEMS</p> 	<p>COMMERCIAL AVIATION SYSTEMS</p> 	<p>ENGINEERING SOLUTIONS</p> 
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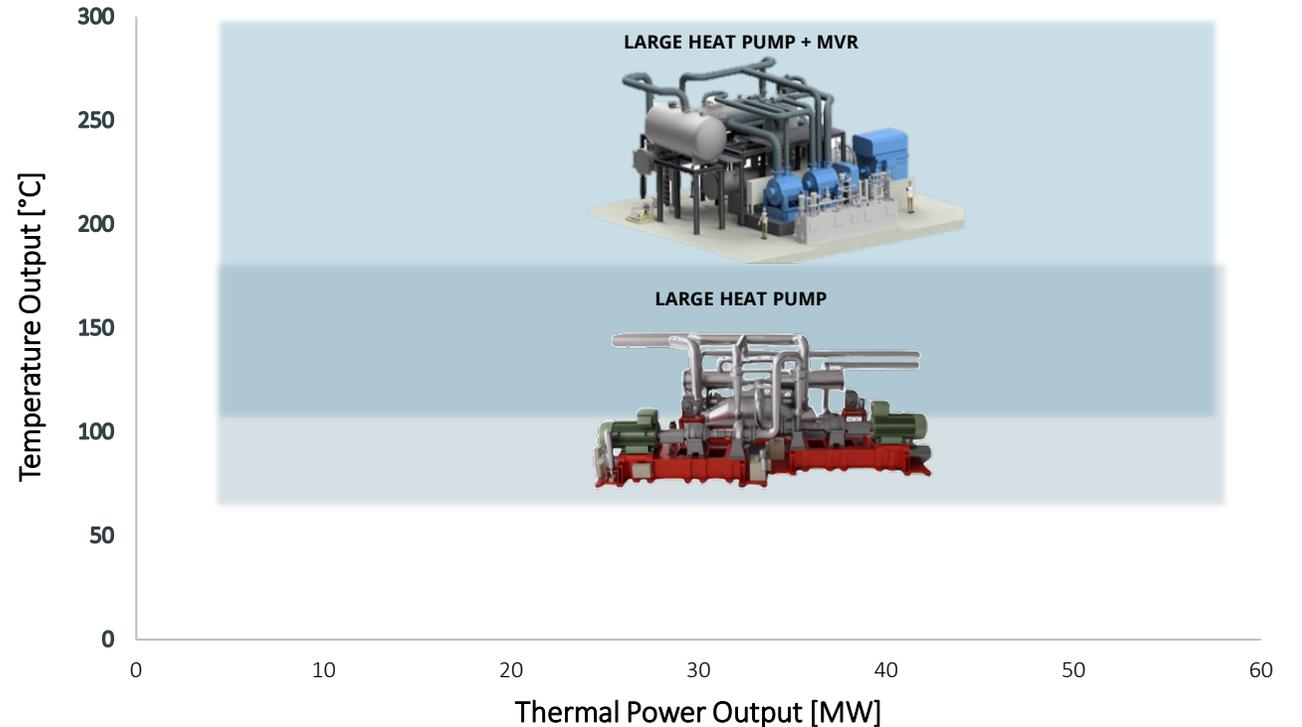
# A FULL-FLEDGED PORTFOLIO TO COVER LARGE SIZES AND HIGH TEMPERATURES



Large Heat Pumps (LHP) are utility-scale heating plant, designed to transfer large quantities of heat from a lower temperature source to a higher temperature heat user, such as district heating grid or industrial process.



Mechanical vapor recompression (MVR) system, acting as an open cycle water heat pump, increases both the temperature and the pressure of a water stream, to generate steam at specific conditions needed.



NOTE: capability to operate at high lift and at high output temperature, thanks to optimised solutions.



Large-scale (thermal power output from 5 MWth)



High temperature (output temperature beyond 200°C, including steam generation)



## DEPENDABLE PARTNER TO REDUCE CARBON FOOTPRINTS

Turboden delivers reliable heat-upgrade systems designed to decarbonize the following sectors:

- **industrial applications**, such as refinery & petrochemical, chemical & pharmaceutical, food & beverage, pulp & paper;
- **Carbon Capture Sequestration (CCS)**.
- **district heating networks**, exploiting multiple heat sources including cooling water from industries;

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# REFERENCE PROJECTS

## Steel Mill



In Operation

- **CUSTOMER:** ORI Martin SpA
- **LOCATION:** Italy
- **CONFIGURATION:** Thermal power generation from furnace cooling water to produce hot water for district heating
- **LHP THERMAL POWER OUTPUT:** 6 MW
- **FEATURES:**
  - Heat source: 75–70°C
  - Heat Sink: 65→120°C
  - Thermal power delivered: 6MWt
  - COP: 8,2–5 (depending on the operation)

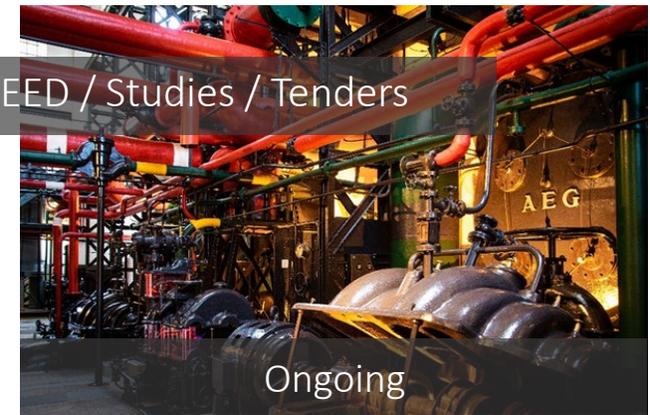
## Pulp&Paper



Under Commissioning

- **CUSTOMER:** Undisclosed
- **LOCATION:** Europe, Nordic
- **CONFIGURATION:** Steam generation from cold water cooling water to produce steam for process.
- **LHP THERMAL POWER OUTPUT:** 12 MW
- **FEATURES:**
  - Heat source: 17–8°C
  - Heat Sink: 100→175°C
  - Thermal power delivered: 12 MWt @4 bar steam
  - COP: 2

## FEED / Studies / Tenders



Ongoing

Several projects in different fields:

- CCUS
- Refineries
- Petrochemical
- Chemical
- Pulp & paper
- Process industry
- District heating
- Dairies
- Food & beverage
- Pharma



**FIND OUT MORE**



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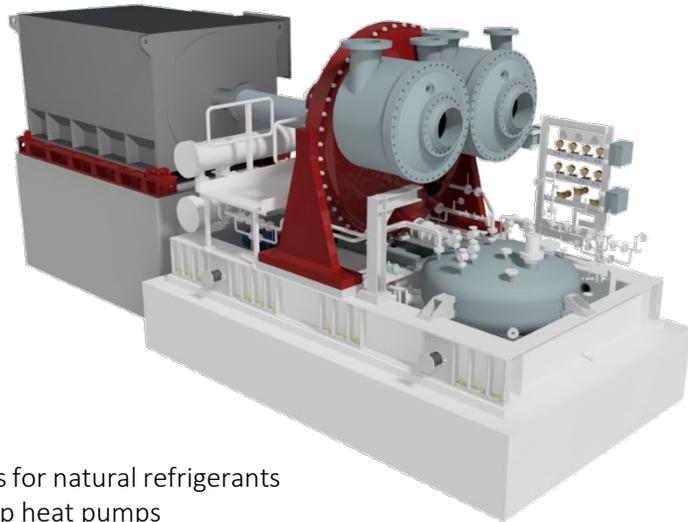
**BACK-UP**

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# TURBODEN COMPRESSOR PORTFOLIO

## TURBODEN LHP HERMETIC COMPRESSOR LINE\*



Compressors for natural refrigerants  
in closed loop heat pumps

\*Patent pending

- Heavy duty machine designed for continuous operation with reduced maintenance
- Power range: 300 – 18,000 kW
- Impeller diameter up to 1,500 mm
- Enhanced flexibility for optimal part load operation and quick process adaptation
- Maximum safety with no harmful fugitive emissions
- Availability of MVR for steam generation

## **MITSUBISHI HEAVY INDUSTRIES COMPRESSOR**



API617 beam type compressors

- Special Purpose API centrifugal compressor designed for critical process operation
- Power up to 50+ MW
- Impellers diameter up to 1,700 mm
- High reliability and availability
- DGS sealing system with leakage recovery system