



**TURBODEN TECHNOLOGIES
OPTIMIZED FOR GEOTHERMAL
RESOURCES**



OVER 40 YEARS OF A VIABLE SUSTAINABILITY

Since 1980, Turboden S.p.A. is a pioneer in the **energy transition**, offering technological solutions to industries and utilities for heat and power generation.

The strength of being part of **Mitsubishi Heavy Industries group**, together with the vast technical expertise in the carbon mitigation, the capability to be flexible throughout the project lifecycle, make Turboden a dependable partner for **optimised solutions to decarbonize processes**.

Having established itself as a **world-leading company in sustainable power production**, with 450 Organic Rankine Cycle (ORC) plants in more than 50 countries, Turboden is one of the major technology partners for energy efficiency and sustainability.

OUR MISSION

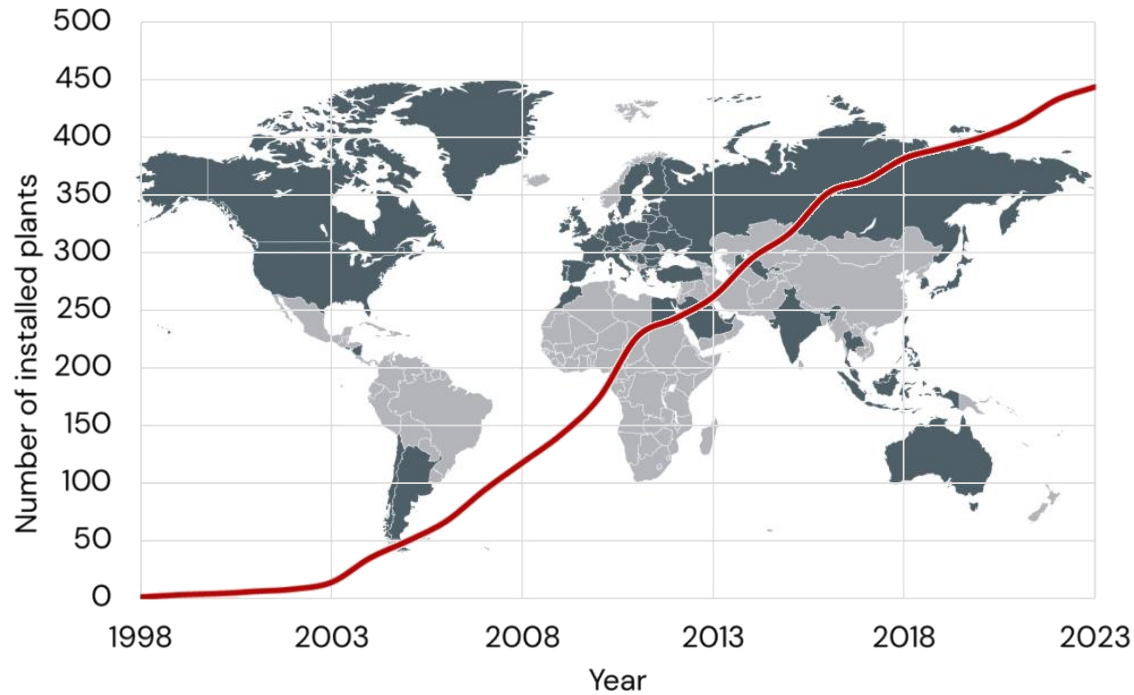


We provide unique, reliable and advanced technologies founded on our core proprietary turbomachinery, with the aim of maximizing the value of renewable resources and energy efficiency.

OUR VISION

To accelerate the transition to a world powered by low-carbon technologies.






 <p>Largest plant in operation 29 MWe</p>	 <p>Largest plant under construction 120 MWe</p>	 <p>Overall capacity installed 1,050 MWe</p>
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GLOBAL AND PROVEN EXPERIENCE

Worldwide presence in
50+ countries

Around
460 plants




GEOTHERMAL
POWER GENERATION

20 units, 247 MWe



HIGH TEMPERATURE
POWER GENERATION*
+ COGEN

442 units, 810 MWe



HEAT GENERATION





2 units, 18 MWth

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

[Discover more about Turboden references](#)

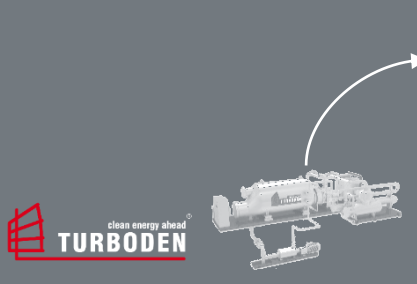
MHI AT A GLANCE











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

*On the FY2022 average JPY/USD exchange rate.

DIVERSE PRODUCTS



<p>ENERGY SYSTEMS</p> 	<p>PLANTS & INFRASTRUCTURE SYSTEMS</p> 	<p>LOGISTICS, THERMAL & DRIVE SYSTEMS</p> 	<p>NUCLEAR ENERGY SYSTEMS</p> 	<p>MACHINERY SYSTEMS</p> 	<p>INTEGRATED DEFENSE & SPACE SYSTEMS</p> 	<p>COMMERCIAL AVIATION SYSTEMS</p> 	<p>ENGINEERING SOLUTIONS</p> 
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TURBODEN MILESTONES



1960s - 1970s

Prof. Mario Gaia makes experience in the field of ORC at Politecnico di Milano.



1980

Prof. Mario Gaia founds Turboden.



1998

1st ORC biomass plant delivered.



1990s

Turboden enters geothermal, waste heat recovery and solar markets.



2000s

Turboden becomes leader in Europe with its biomass plants.



2010s

The size of the turbomachines increases more and more, from 1-2 MW up to 10-20 MW.



2013

MHI acquires the majority of Turboden.



2019

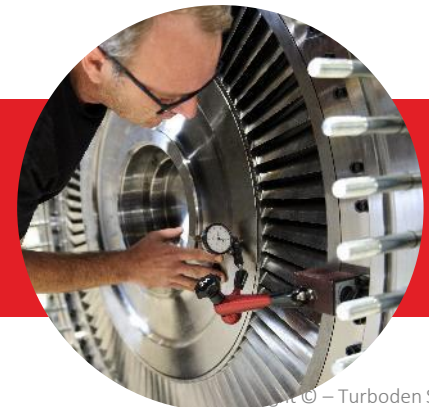
Turboden launches new products, LHP and EXP.



2020

Turboden celebrates 40 years of activity.

TODAY, with ORC systems, large heat pumps and gas expanders, Turboden provides technological solutions for heat and power generation towards decarbonisation of industries and district heating networks.



OUR PRODUCTS

Designed for decarbonisation.



ORC SYSTEM



LARGE HEAT PUMP

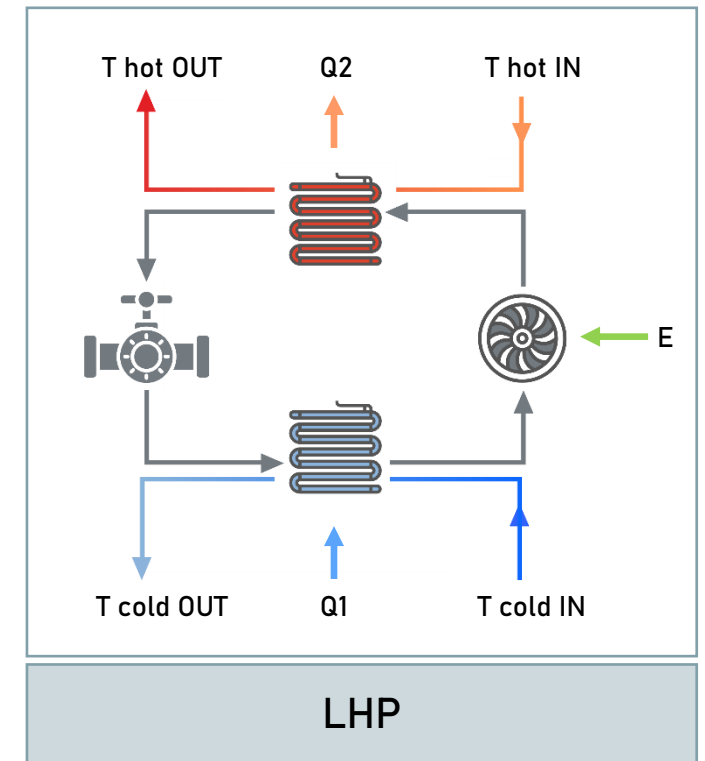
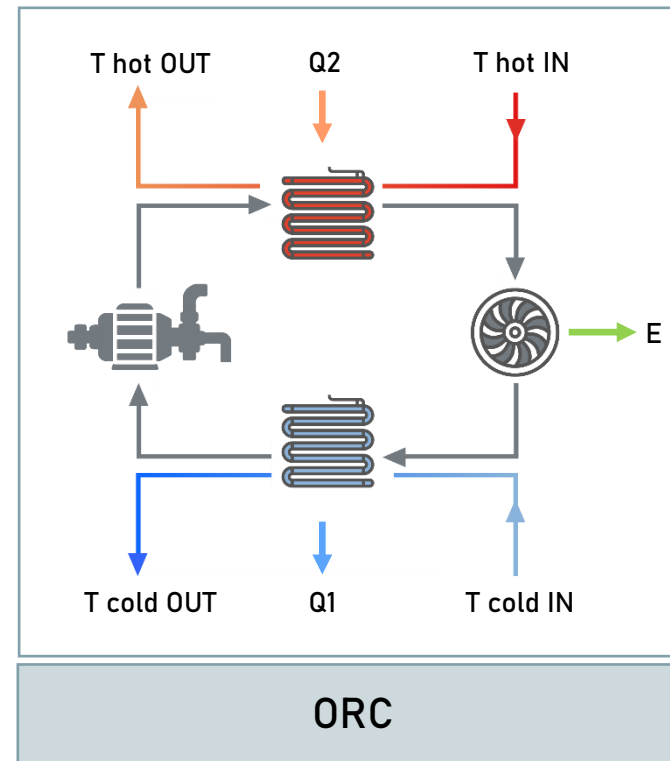


GAS EXPANDER

INNOVATION ROOTED IN STRONG ENGINEERING CAPABILITIES

WHY TURBODEN?

- Wide and in-depth knowledge in thermodynamic cycle design.
- Deep experience with a wide range of working fluids, including natural refrigerants.
- In-house tailor-made turbomachines (Turboden and MHI Compressor Corporation).
- Full-spectrum projects, from engineering to management and service.
- Key components selection and design (e.g., heat exchangers).
- Capability to manage large complex projects and processes integration.
- Binary cycles can be combined with traditional single flash steam plants



ABILITY TO MANAGE THE COMPLEXITY OF LARGE PROJECTS

Thermodynamic process and control philosophy designed by Turboden

Possibility to control the power plant remotely

Process characteristics and related equipment defined according to project needs

Air Cooled Condenser designed and manufactured in-house

Key components fully-designed in-house

Multi-stage axial turbine (Turboden proprietary design)

Wider working fluid portfolio: hydrocarbons, HFCs, HFOs

Operation in remote areas: off grid capability (island mode) and automatic operation

Plant integration capability



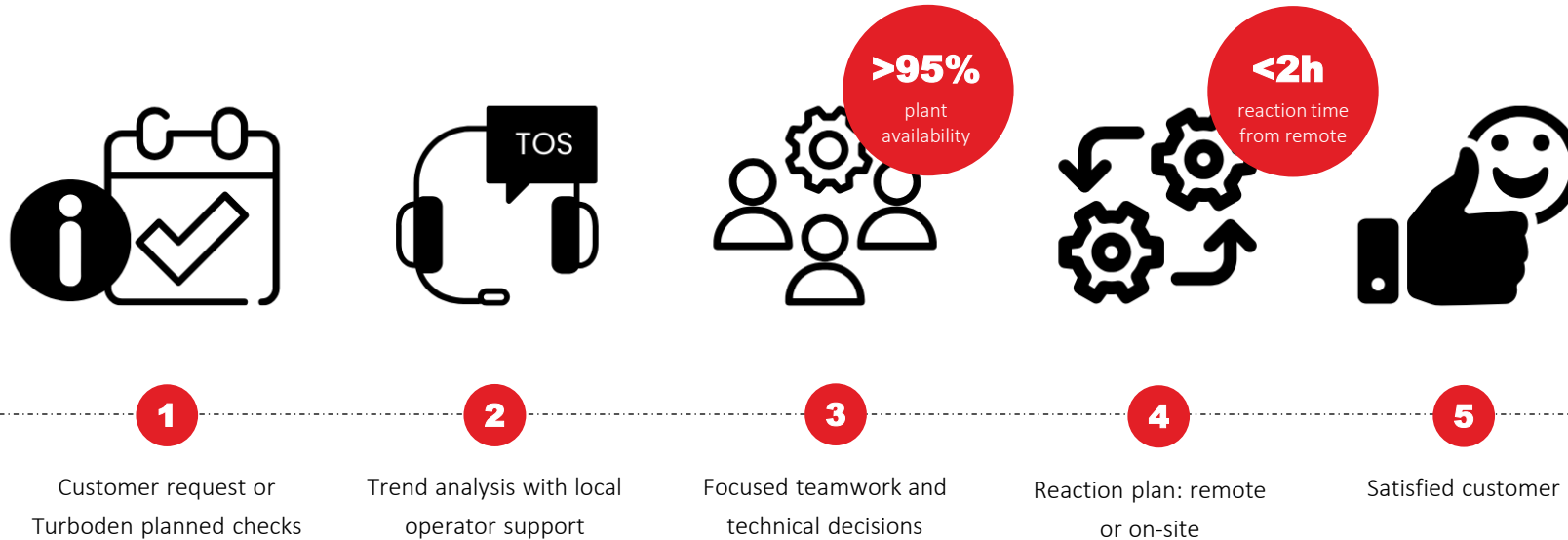
Large-scale (up to 40 MWe per single shaft)



High temperature (output temperature from 100°C beyond 200°C)

DEDICATED AFTER-SALES SERVICE

Qualified staff is exclusively dedicated to the customer assistance, both from remote and on-site, with the aim of optimizing the management of the plants. The customer can choose the most suitable service package thanks to the wide range of services offered.



COVERAGE

1 main office in Brescia, 3 service subsidiaries and 3 international service partner companies.

ASSISTANCE

- Turboden 24/7 for troubleshooting and remote consultancy.
- Turboden software for automatic performance monitoring and operation parameters control.

CUSTOMISED SERVICES

- dedicated staff for remote technical support.
- dedicated staff of fields technicians for on-site planned maintenance, predictive maintenance, unplanned and extraordinary maintenance.
- dedicated spare parts warehouse.
- availability guarantee.

SELECTED PROJECTS



SWM - StadtWerke München
Dürrnhaar (Munich), Germany

5.6 MWe
Liquid brine: 138 °C
In operation since 2012



SWM - StadtWerke München
Kirchstockach (Munich), Germany

5.6 MWe
Liquid brine: 138 °C
In operation since 2013



SWM - StadtWerke München
Sauerlach (Munich), Germany

5 MWe + 4 MWth
Liquid brine: 140 °C
In operation since 2013



Kyushu Electric

Sugawara, Japan

6 MWe
Liquid brine + steam: 142 °C
In operation since 2015



GKT Traunreut

Traunreut, Germany

4.1 MWe + 12 MWth
Liquid brine: 118 °C
In operation since 2016



Geo Power Energy Development

Velika Ciglena, Croatia

17.5 MWe
Liquid brine + steam: 170 °C
In operation since 2018



Cyrq Energy

Animas (NM), USA

14 MWe
Liquid brine: 155 °C
In operation since 2018



Geothermie Holzkirchen

Holzkirchen, Germany

3.4 MWe + 10 MWth
Liquid brine: 152 °C
In operation since 2019



Energy Development Corporation

Palayan, Bac-Man, the Philippines

29 MWe
Liquid brine: 170 °C
In operation since 2024



LaGeo

Berlin, El Salvador

8 MWe
Liquid brine: 172 °C
Under construction



Eavor Erdwärme Geretsried

Geretsried, Germany

8.2 MWe
Closed loop system
Under construction



Fervo Energy

Cape Station, Milford (UT), USA

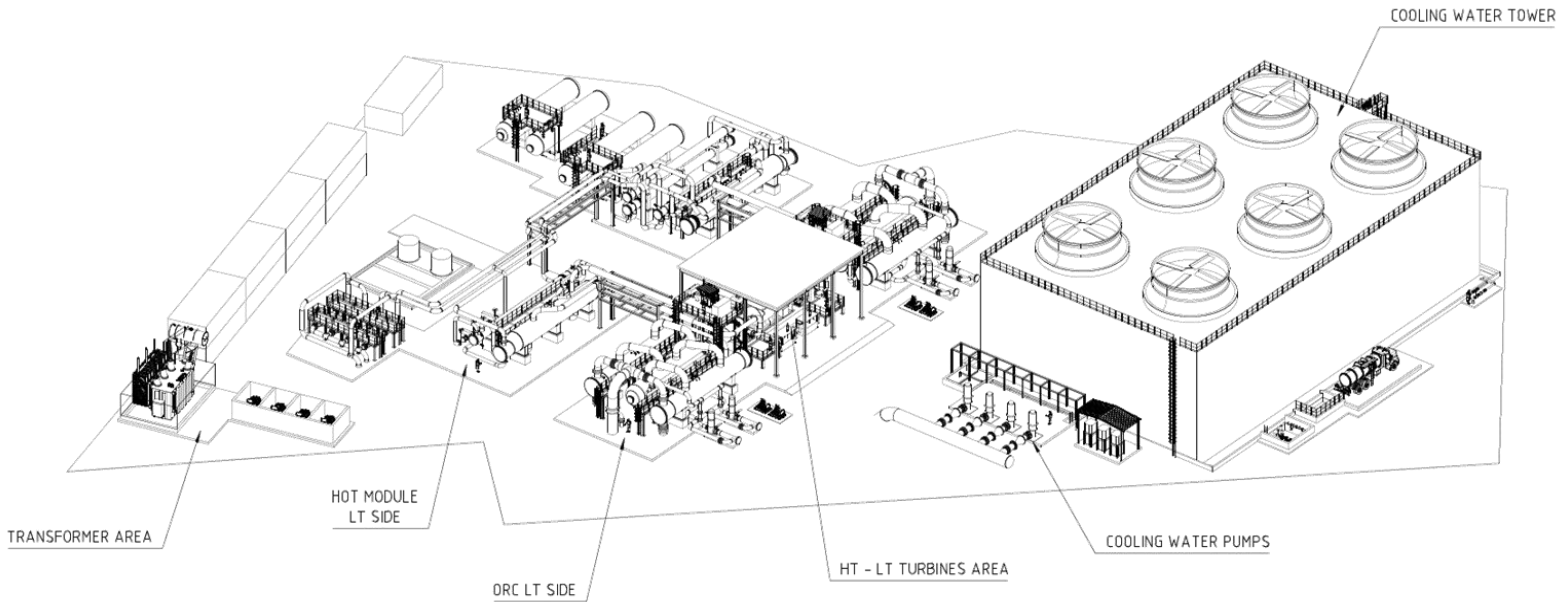
120 MWe
EGS system
Under construction

**MORE
PROJECTS
ON WEBSITE**



Photo: 29 MW Turboden geothermal power plant in Palayan – The Philippines.

CASE HISTORY: EDC PALAYAN



In Bac-Man geothermal field, operated by BGI (100% subsidiary of EDC), the customer wanted to enhance the 140 MW current capacity by installing a **29 MW ORC binary plant** inserted along the brine re-injection line (bottoming application). Project in operation since Q1 2024. JCM grant awarded.

PROJECT FEATURES

- Two-pressure level ORC cycle, using hydrocarbon working fluids
- Water-cooled with cooling towers
- Acid dosing system for scaling inhibition

SCOPE OF SUPPLY

- Engineering
- Procurement
- Technical advisory for erection
- Commissioning
- Start-up services / training



FIND OUT MORE

