

# UniEco Turbo Expander

**UniEco**  
*Unite the Best, Eco the World*

## Turbo Expander

Application for Energy Saving  
and Energy Recovery



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## High Speed Turbine Experts

32 years of experience  
in world class turbine Technology

Innovative | Pragmatic | Integrity | Trustworthy



*“At UniEco, we are about to provide our customers with the best turbo-expander solutions and enable our customers reaching their goals.”*

UniEco specialized in High-speed Turbine Technology on Energy Saving and Energy Recovery, for Turbo Expander Design, Manufacturing, Sales and Services. Developed with world-class of Turbo Expander technology, UniEco products can find their applications in Cryogenic Process such as Air Separation, Natural Gas Liquidation, Hydrocarbon Recovery, Industrial Tail Gas Recovery, Ethylene Cold Box, as well as Power Generation through Gas Pressure Letdown, Organic Rankine Cycle (ORC), Compressed Air Energy Storage (CAES) and other Energy Recovery applications.

UniEco established its Turbo Expander Manufacturing Facility in China since 2011. The plant area is 4000m<sup>2</sup> so far, with Design Engineering Center, Turbo Expander Assembly Lines, Rotor Dynamic Balancing, Turbo Expander Testing Cell, Spare Parts Warehouse and other related facilities. The key components such as rotors, impellers, bearings, seals, are designed and manufactured in US, while the package manufacturing and final assembly are processed at factory in China. UniEco Turbo Expander Manufacturing Facility has passed ISO9001 quality certification by SGS.



- Design & Engineering Center
- Package Assembling Lines
- Rotor Dynamic Balancing Room
- Turbo-expander Testing Cells
- Parts Warehouse
- Overhaul and Repair Workshop



## *“Forged Impellers with 5-Axis Machining for Superior Quality”*



- Fully closed impellers for expander with efficiency 85~89%
- Semi-opened impellers for booster with efficiency 78~83%
- 3D Computational Fluid Dynamics (CFD)
- Finite Element and Structural Dynamics Analysis (FEA)
- Rotor Dynamic Analysis (Lateral and Torsional)

EXPAND EFFICIENCY  
AND BOOST PRODUCTIVITY

**With Safety & Reliability**



### High Overall Efficiency

**In-house Design and Engineering Capability with Advanced design toolkits & reliable database to achieve the high overall efficiency and superior performance.**

The turbo expanders are fully developed by UniEco global R&D team, with advanced design toolkits and reliable database of NIST (National Institute of Standards and Technology, US). The rotor dynamic and bearing design are solved by UniEco's in-house design software DyRoBes, which has become one of the industrial standards for rotor dynamic and bearing design analysis in the world. DyRoBes has also been widely used by the US governmental organization such as FAA, NASA, US Air Force, US Navy, as well as the international companies such as Boeing, GE, GM, Northrop Grumman, Honeywell, Siemens, Atlas Copco, Air Products, John Crane and so forth.

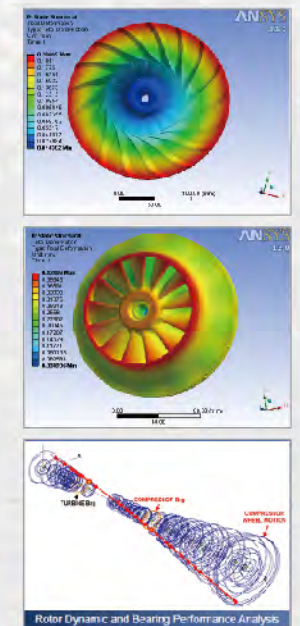
### Premium Customer Benefit

**The mode of U.S Design + Global Sourcing + Local Assembly can benefit our customers with high quality products, reasonable price, shortened delivery time, as well as quicker feedback on service and spare parts demands.**

The key rotating components such as rotor assembly, bearings, seals, are designed and manufactured in U.S. These components are thoroughly checked by Non Destructive Examinations, Over-speed Tests, 3D measuring and Dynamic Balancing before shipment, to make sure that every Turbo Expander can 100% meet or even exceed the expected efficiency.

### Innovative Engineered Solutions

**We are innovative and agile to provide Engineered Solutions that can meet a wide variety of demanding requirements and specifications.**





# Core Components

- Advanced design toolkits and reliable database to achieve the superior performance of key rotating components.
- 4 U.S Patents on bearing and 20 Chinese patents on package.
- Unique bearing design helped to reduce mechanical lose and improved package efficiency.
- Low pressure lube oil system simplified the package design and improved reliability.
- Packages are designed, manufactured and inspected according to appropriate standards and protocols. API 617 also available.
- Engineered Solutions can meet a wide variety of demanding requirements and specifications.

## H-shape Plug-in

Rotor assembly, Bearings and shaft seals are installed inside the H-shape housing, which have simple plug-in design, minimized the downtime for spare parts replacement.



## Inlet Nozzle Guide Vanes

Pneumatic adjustable remote-controlled inlet nozzle guide vanes, with unique design for each machine, to achieve premium efficiency over wide operating conditions.



## Shaft and Pinions

The Main Shaft and Pinions are machined into Polygon type, ensuring the solid connection, at the same time, making it much easier for disassembly and re-assembly.



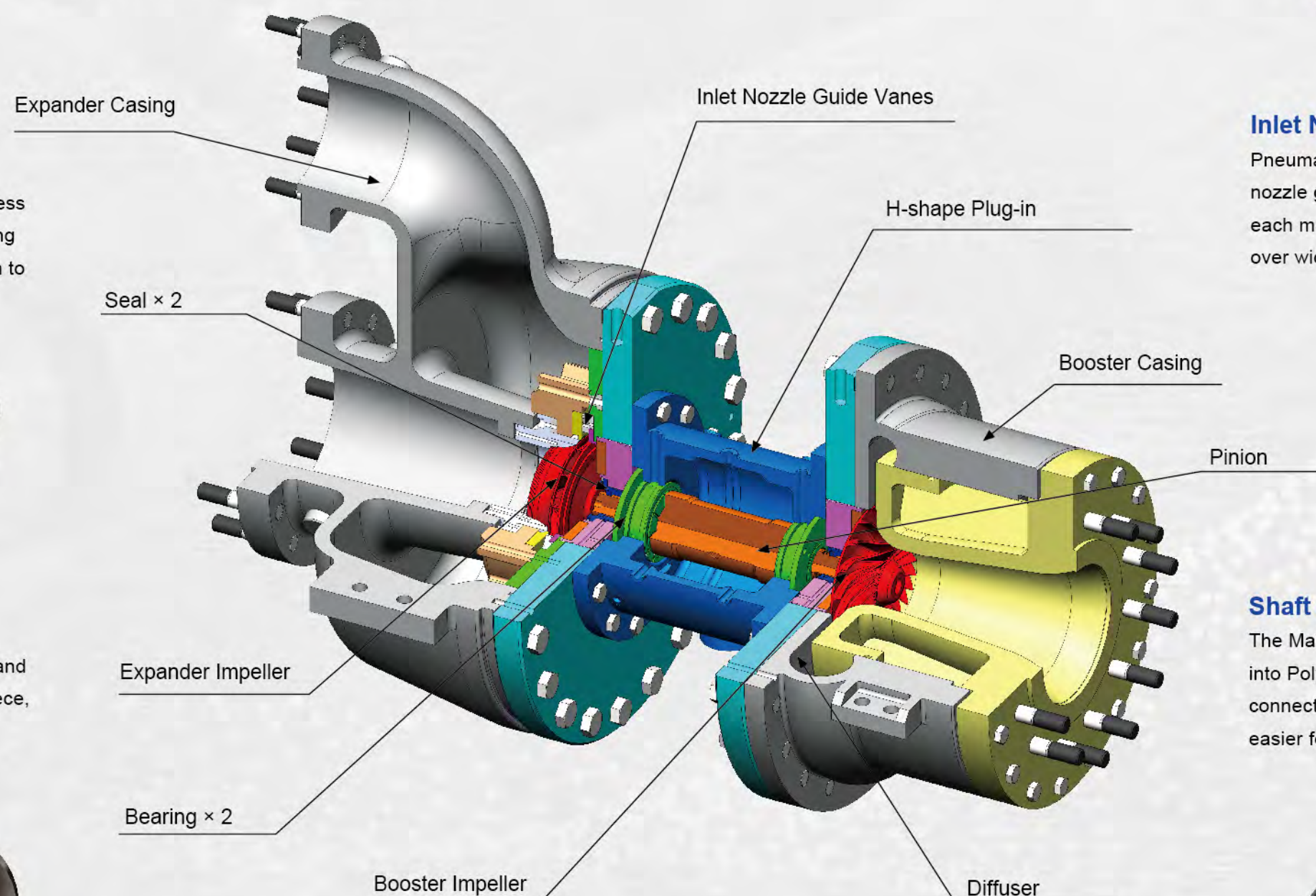
## Shaft Seals

Fully floating carbon ring seal minimized process gas leakage and prevent lube oil from migrating into the process. Dry gas seals can be chosen to meet high demand on reducing leakage.



## Bearings

Completely non-contact hydrodynamic radial and thrust bearings are simply designed in one-piece, assured longer life and maximum efficiency.





# Diversified Experiences

*Expand Efficiency and Boost Productivity with Safety & Reliability*



## Turbo Expander & Booster - TEB Series

- Single unit and Dual unit (warm and cold)
- Provide Refrigeration for Air Separation, Natural Gas Liquidation, Hydrocarbon Recovery, Industrial Tail Gas Recovery, Ethylene Cold Box, and other Cryogenic Process.
- Gas including Air, Nitrogen, Hydrogen, Natural Gas and other Hydrocarbon Gases.
- Flow rate: 4,000~120,000 Nm<sup>3</sup>/h (up to 120,000 Nm<sup>3</sup>/h ASU)
- Pressure Range: 0.2~7.0 MPa, Pressure Ratio up to 21:1
- Temperature Range: -260~200°C
- Expander Efficiency: up to 89%
- Refrigeration Power: 100~3,000 kW
- Shaft Speed: 10,000~80,000 rpm
- Impeller Size: 80~550 mm (one piece forged closed impellers)

## 3000 LOX:

installed in China Mainland



## 200TPD LOX and LN<sub>2</sub>:

installed in Taiwan



## 2000 LOX and LN<sub>2</sub>:

installed in Egypt



## 1000 LOX and LN<sub>2</sub>:

installed in Thailand



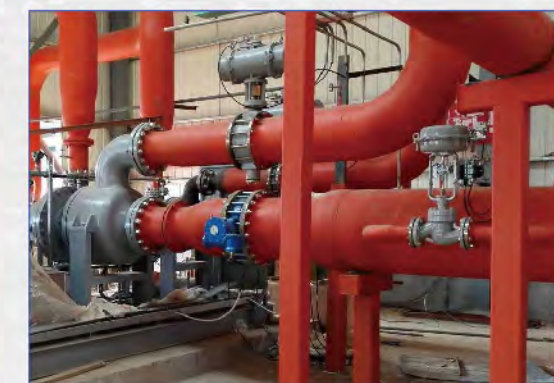
## CH<sub>4</sub> recovery from 44,000Nm<sup>3</sup>/day Ammonia exhaust gas:

installed in China Mainland



## CH<sub>4</sub> recovery from 400KTA Ammonia Plant:

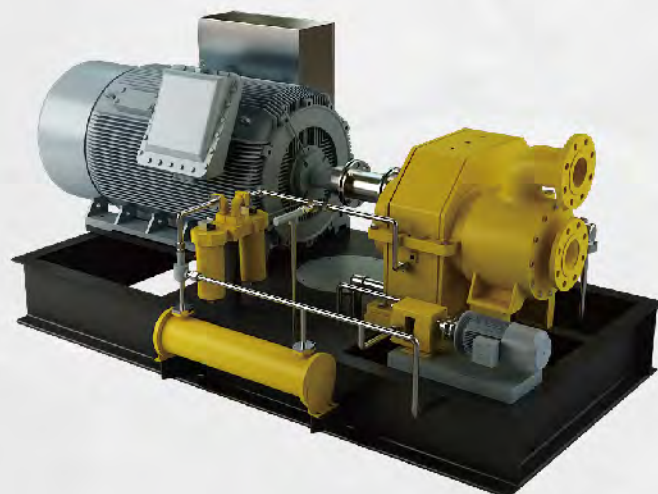
installed in China Mainland





# Diversified Experiences

## Turbo Expander & Generator TEG Series



- Single stage and Multi stages
- Recovering and Generating Electricity from Gas Pressure Letdown, Compressed Air Energy Storage (CAES), and other Energy Transferring Process.
- Gas including Air, Nitrogen, Hydrogen, Natural Gas and other Gases.
- Flow rate: 4,000~120,000 Nm<sup>3</sup>/h
- Pressure Range: 0.2~7.0 MPa, Pressure Ratio up to 70:1
- Temperature Range: -260~200 °C
- Expander Efficiency: up to 87%
- Power Generation: 50~8,000 kW
- Speed: 5,000~30,000 rpm
- Impeller Size: 80~550 mm (one piece forged closed impellers)

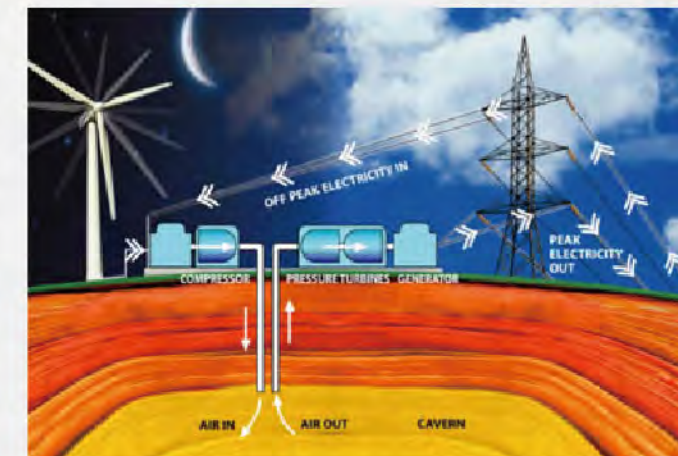
## Generating Electricity from Gas Pressure Let-down

The kinetic energy is usually wasted during gas pressure reduction process, for example, the Nature Gas Pipeline pressure reducing in receiving terminals. Our Turbo expander can be used to replace the pressure reduction valves, to convert kinetic energy into electricity and cryogenic energy. During this process, not only generated additional electricity that was normally produced through coal combustions, but also obtained free cold energy that can be utilized for cooling, refrigeration, CO<sub>2</sub> liquefying, Low temperature crushing of wasted tyres and rubbers, cryogenic drying of medicines and so on.

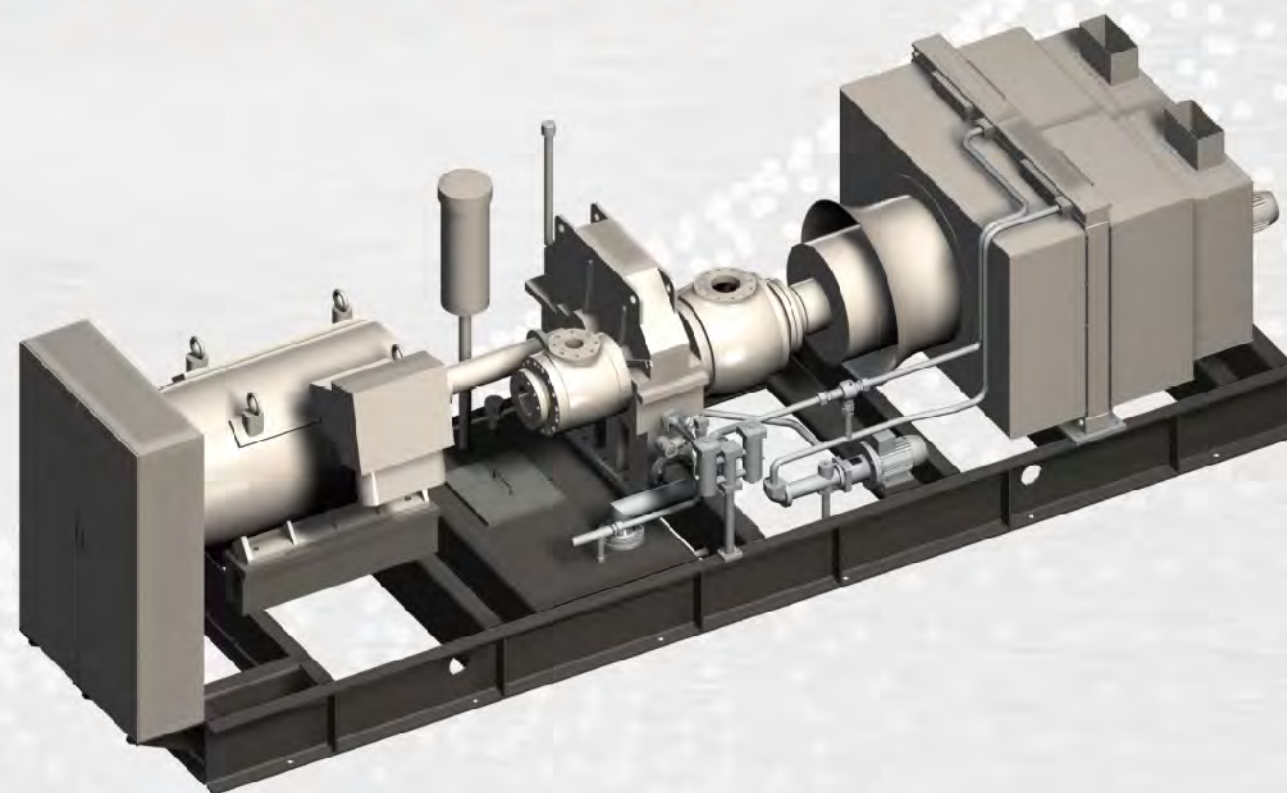


## Generating Electricity from Compressed Air Energy Storage (CAES)

Compressed-Air Energy Storage (CAES) is presently one of the most potential energy storage technologies in the world. The power of wind or solar energy can be used to compress air to high pressure and stored during the low load period of the power grid, during the peak load period of the power grid, the high pressure air can be released to drive turbine for power generation. Below picture is UniEco Turbo Expander Generator developed for a demonstration CASE system funded by Canada government.



## Generating Green Electricity and Producing Free Cold Energy





# Diversified Experiences

## Generating Green Electricity and Producing Free Cold Energy

### ORC system with Turbo Expander & Generator



- System Configuration with Turbo Expander + Generator + Evaporator + Condenser + Pumps + Piping & Valves + Controls
- Recovering and Generating Electricity from Waste Heat, LNG Cold Energy and other Energy Transferring Process through Organic Rankine Cycle.
- Waste Heat Sources including hot liquids (90 °C and above), low pressure steam and hot gases (250 °C and above).
- Water cooled or Air cooled.
- ORC fluid can be R245fa, R134a, propane, butane or Mixed Refrigerants typical for LNG process.
- Expander Efficiency: up to 87%
- Power Generation: 50~8,000 kW

**2×1200kW Hot Water ORC system (water cooled):**  
installed in China Mainland



### Customized Industrial Turbo Expander Solutions

We are an innovative design and manufacturing company of world class quality turbo-expanders & accessories to maximize energy recovery and create a greener energy system in various industries.

Industrial waste heat is huge. Our Turbo expander can recover these waste heat to generate power through Organic Rankine Cycle (ORC). Compare to screw type, turbo expander is superior in higher efficiency, better reliability, as well as bigger output power.



**1×650kW Hot Water ORC system (air cooled):**  
installed in China Mainland

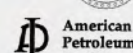
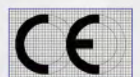




# Accountable Capability

## Industrial Standards:

- Safe Areas and Hazardous Areas
- AISI, ANSI, ASME, ASTM, AGMA, IEC, etc.,
- API 617/613/614/670/670 available
- ASME/PED/CE Mark/ATEX available



## Accountable Capability

On-time Spare Parts Supply and Customer Assurance with Trouble-free Operation

## Test Plan Including:

- 2 hours mechanical run and mechanical test
- Impeller over-speed test
- Casing hydro test
- Rotor balance test
- Lube system cleanliness test
- Control panel functional check
- Coolers hydro test
- Final visual inspection



## Available Services

- |                                |                           |                             |
|--------------------------------|---------------------------|-----------------------------|
| • Onsite Installation Advisory | • Equipment Commissioning | • Overhaul / Reconditioning |
| • Rotor Dynamics Re-balancing  | • Troubleshooting         | • 24/7 Support Hotline      |
| • Performance Optimization     | • End-user Training       | • Spare Parts Supply        |

**We work with worldwide customers from a broad range of industries.**

## Full Lifecycle Support:

UniEco is about building lasting relationship with our customers. We provide world class after sales services to support our customers running our products at the design performance level.

