

GE Oil & Gas

Turboexpander-generators



Turboexpander- generators

A turboexpander expands process fluid from the inlet pressure to the discharge pressure in two steps: first through variable inlet guide vanes and then through the radial wheel. As the accelerated process fluid moves from the inlet guide vanes to the expander wheel, kinetic energy is converted into useful mechanical energy – extracting energy from the process fluid and cooling it down. The mechanical energy is available to drive other process equipment – in this case, a generator.

Our turboexpander-generator designs respond to specific industry needs for increased capacity, reduced costs and maximized reliability in a wide range of applications, including:

- Oil & Gas processing Natural Gas Liquids (NGL) plants, Liquefied Petroleum Gas (LPG) recovery; tail gas treatment; Gas-To-liquids (GTL); Integrated Gasification Combined Cycle (IGCC)
- Liquefaction and purification of gases on air treatment plants
- Petrochemicals: hydrogen, nitrogen and ammonia purification; ethylene production
- Pressure Let Down (PLD) on pipeline
- Geothermal power generation (e.g. Organic Rankine Cycle, Kalina and direct steam)
- Waste-heat recovery (WHR) and Combined Heat and Power (CHP)
- Ocean Thermal Energy Recovery (OTEC)

Continually expanding capabilities

After more than 50 years of turboexpander design, GE now has about 1,200 units operating worldwide (over 150 coupled with generators) – and a proven record of delivering higher power levels, performing at extreme operating temperatures and achieving greater pressure ratios.

This success across the natural gas and hydrocarbon industries is a result of our continuous improvement in areas such as rotor and bearing design, efficiency optimization and control systems.



Excellence in design and testing

The GE Turboexpander Center of Excellence brings together GE specialists in design, manufacturing and testing to ensure continuous innovation of application-specific solutions.

We work in close cooperation with customer engineering and plant operation teams – and are therefore highly attuned to the challenges they face every day. In-depth performance data and myriad operating insights are continually fed back into our engineering processes so that our designs are always on the leading edge.

Our advanced testing facilities are completely equipped with real-time data acquisition systems and integrated analysis tools to provide a complete map of equipment performance. Our capabilities include tests and inclusion of feed gas preparation systems – for tests with virtually any gas mixture of interest to a customer. We also have the ability to perform full-load string tests with up- or downstream compressors.

GE turboexpander-generators are normally tested with low-pressure air in an open loop setup in accordance with ASME PTC10, Type 2.

Construction Modifications and Upgrades

Our Global Services teams provide a comprehensive range of specialized solutions designed to maximize plant productivity and return on investment.

We develop customized solutions for every installation and application. Whether your goal is to economically modify your process or to inject the latest technologies for increased productivity with minimal downtime, our approach typically minimizes impact on the turboexpander installation and piping.

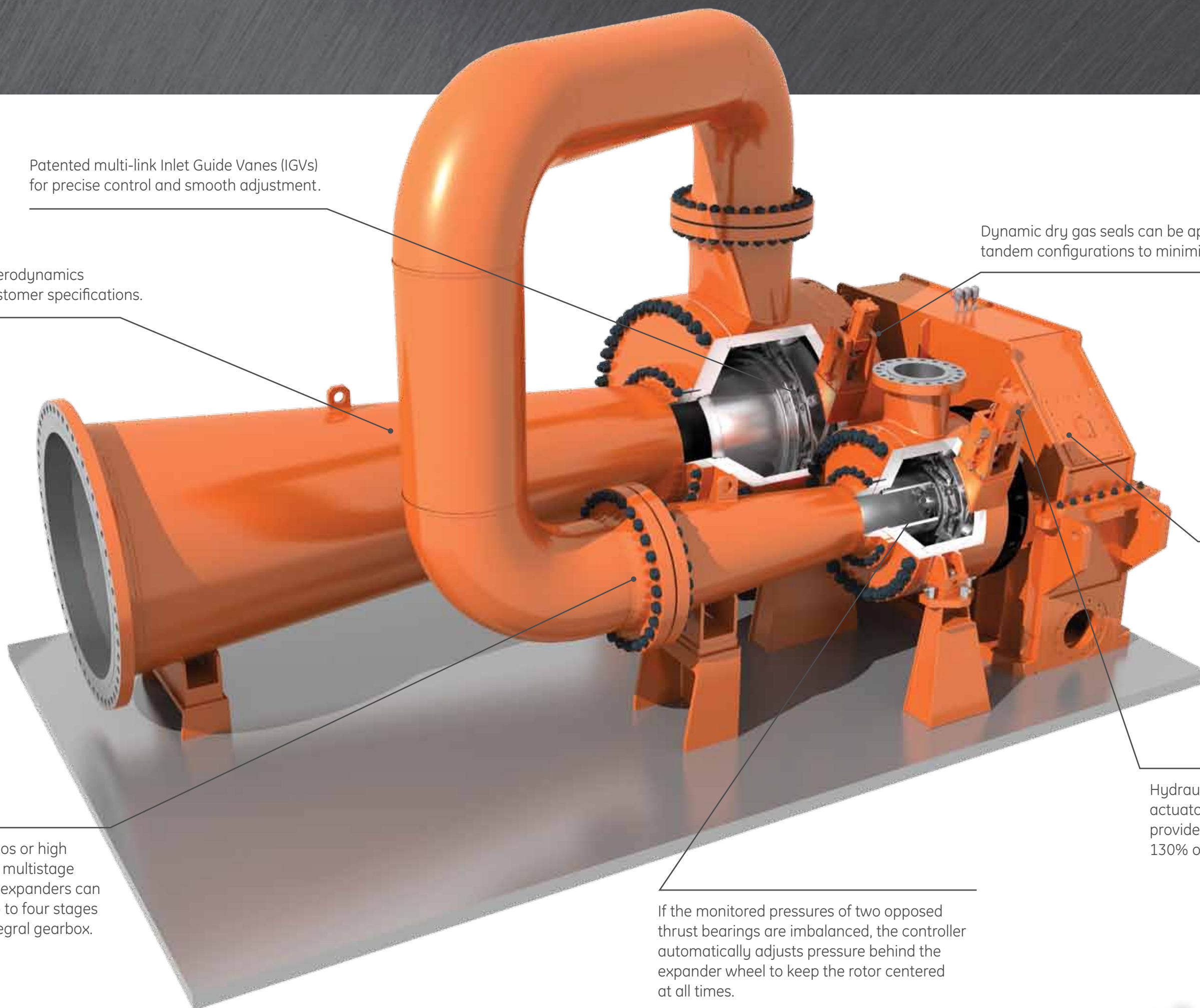
From engineering design to on-site installation, all work is performed to the highest standards by GE-trained specialists, with full support for the entire process provided by our network of facilities and resources.

Technologies for extreme challenges



Turboexpander-generators

With design features to increase performance and reduce maintenance downtime in extreme natural gas applications



Patented multi-link Inlet Guide Vanes (IGVs) for precise control and smooth adjustment.

High-efficiency aerodynamics customized to customer specifications.

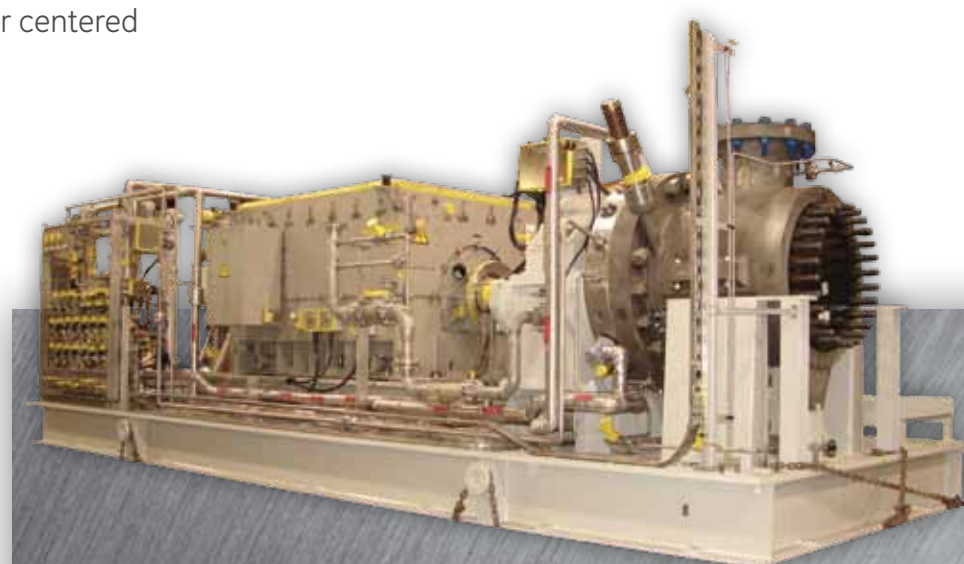
Dynamic dry gas seals can be applied in single, double or tandem configurations to minimize buffer gas leakage.

The expander wheels are mounted directly on the high-speed pinions, and the generator is coupled to the low-speed gear.

Hydraulic, pneumatic or electric actuators control the IGVs and provide precise control from 0 to 130% of design flow.

High pressure ratios or high flow rates require multistage arrangement. GE expanders can accommodate up to four stages on a common integral gearbox.

If the monitored pressures of two opposed thrust bearings are imbalanced, the controller automatically adjusts pressure behind the expander wheel to keep the rotor centered at all times.



Drive and speed options

GE also offers turboexpanders with direct drive or external gearboxes as required, with a common oil supply system for the complete package. The installed fleet ranges from 50 to 15,000 kW. When feasible, the direct-drive option eliminates the need for speed reduction, gearboxes and associated equipment.

GE's Turboexpander-generator capabilities	
Pressure	up to 3,000 psia (200 BarA)
Temperature	-450°F to 925°F (-270°C to 500°C*)
Expansion ratio	up to 14 per stage
Process fluid	All pure or mixed fluids including natural gas, petrochemical products, hydrogen, air, steam, etc.
Liquid	up to 30% of weight at discharge

Expander-Generator Frame Size Distribution							
Frame	Shaft power (kW)	Expander outlet flow max. (m ³ /h)	Available casing ratings				
			150	300	600	900	1500
20	1,600	4,000		●	●	●	●
25	2,000	5,500		●	●	●	●
30	4,800	9,000	●	●	●	●	●
40	6,500	16,000	●	●	●	●	
50	10,000	25,000	●	●	●	●	
60	15,000	36,000	●	●	●	●	
80	20,000	45,000	●	●	●		
100	25,000	70,000	●	●	●		
130	30,000	100,000	●	●			
160	40,000	150,000	●	●			
180	45,000	200,000	●	●			

* Movable IGVs available up to 300°C



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