

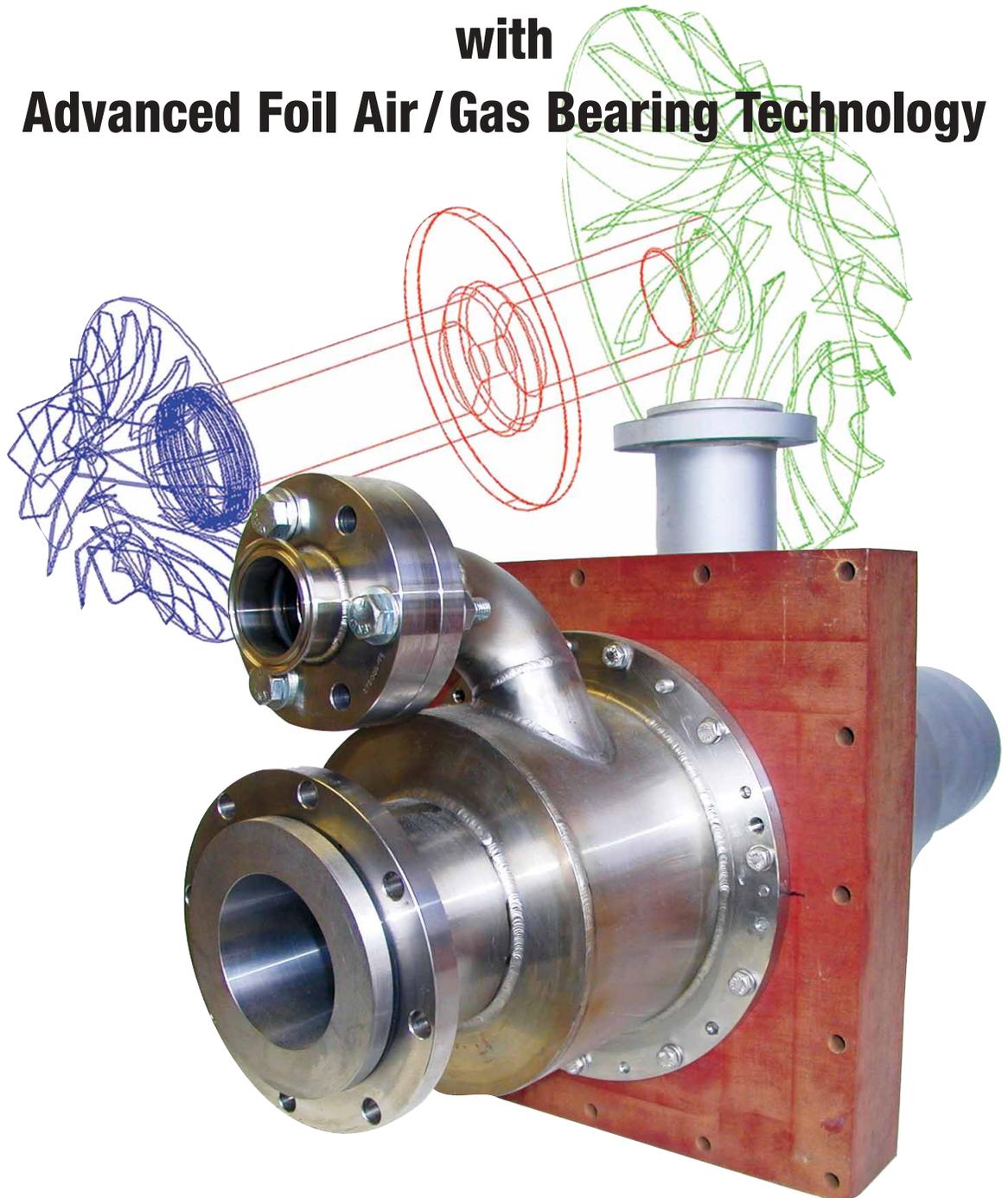


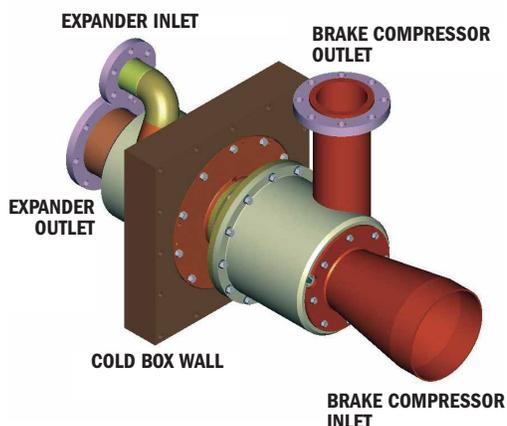
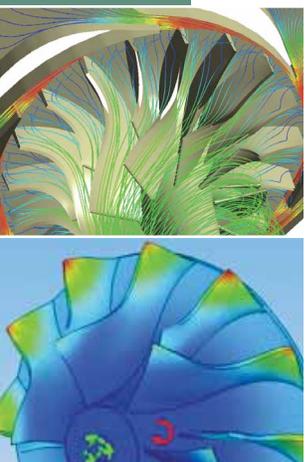
Turboexpanders

Compressor Loaded • Generator Loaded

with

Advanced Foil Air/Gas Bearing Technology





R&D Dynamics Corporation designs, develops and manufactures a complete range of high speed **oil-free turboexpanders** supported on **foil air/gas bearings**. Turboexpanders are essential components in many systems such as:

- Air Separation
- Gas Liquefaction
- Cryogenic Refrigeration
- Waste Gas Energy Recovery
- Oil/Gas Processing
- Power Generation
- Hydrogen Economy
- Pressure Letdown

R&D Dynamics Corporation's proprietary designs are based on over 40 years experience with aircraft air cycle machines, the heart of the environmental control system which maintains pressure and climate in aircraft cabins.

These machines have demonstrated very high reliability. Two configurations are available:

TurboEx® models are compressor loaded

TurboAlt™ models are generator loaded

Sizes range from 1 to 400 kW with flows ranging from 200 to 80,000 lbs/hr. Many different gases are possible.

Both **TurboEx®** and **TurboAlt™** use advanced foil air/gas bearing technology which work on hydrodynamic principle and does not require an external supply of pressurized gas. Other turboexpanders use hydrostatic gas bearings which require an external supply of pressurized gas.

TurboEx® and **TurboAlt™** provide high reliability, high efficiency and completely oil-free operation.



Turboexpanders with Advanced Foil Bearings Provide:

HIGHER RELIABILITY - Foil bearing machines have fewer parts to support the rotating assembly and require no lubrication system. Similar machines for aircraft have demonstrated very high reliability.

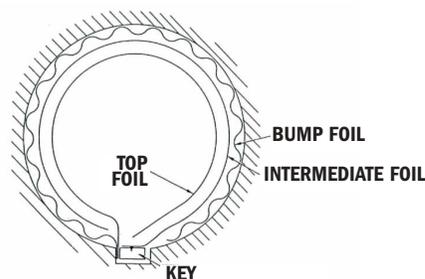
HIGH SPEED OPERATION - Foil bearings allow operation at optimum speed of turbine achieving improved aerodynamic efficiency.

COMPACT SIZE - The ability to operate reliably at high speed allows turboexpander designs to be very compact.

ENVIRONMENTALLY FRIENDLY - Foil bearing machines are completely oil-free. There is no chance of contaminating either the process gas or surrounding environment.

NO SCHEDULED MAINTENANCE - Foil bearings do not require lubrication. Since lubricants do not need to be checked or replaced, operating costs are lower.

WIDE TEMPERATURE RANGE - Foil bearings do not encounter the problems lubricants typically cause: breaking down at very high temperatures and becoming too viscous at low temperatures.



How Foil Bearings Work

In a journal bearing the shaft is supported on foils. As the shaft rotates, a wedge is formed due to the radial displacement of the shaft. Hydrodynamic action draws the working gas into the wedge where it is locally compressed. The pressurized section provides support for the shaft while the layers of foil provide the compliant features of the bearing. As the shaft speed increases a hydrodynamic film of air/gas is produced that forces the shaft to lift off and become airborne eliminating any contact between the shaft and the bearing.

Performance Focused Engineering

Power Recovery

Turboexpanders can be either compressor or generator loaded. Generators are shaft mounted eliminating the need for gearboxes. In some cases, load compressors can be integrated with the system to capture energy that would otherwise be lost.

Testing and Design Capabilities

All turboexpanders are qualification tested to verify adherence to strict design criteria. Turbine and compressor performance is measured using approved procedures and standards. Vibration and shaft displacement are monitored during qualification testing to ensure long life and high reliability.

Bearings

All turboexpanders come equipped with state-of-the-art foil gas bearings. R & D Dynamics Corporation has many years experience building high speed turbomachinery supported by foil bearings. Bearings are designed and manufactured in-house using proprietary design methods. All foil bearings are tested on journal and thrust bearing test rigs.

Finite Elements Analysis (FEA)

All turboexpander designs are evaluated using FEA software. High rotational speeds inherent in turboexpanders demand careful attention to stresses in the rotating assembly. In addition, rotor dynamics must be properly handled to prevent unwanted shaft critical speeds. Heat transfer analysis is used to minimize heat loss from the system.

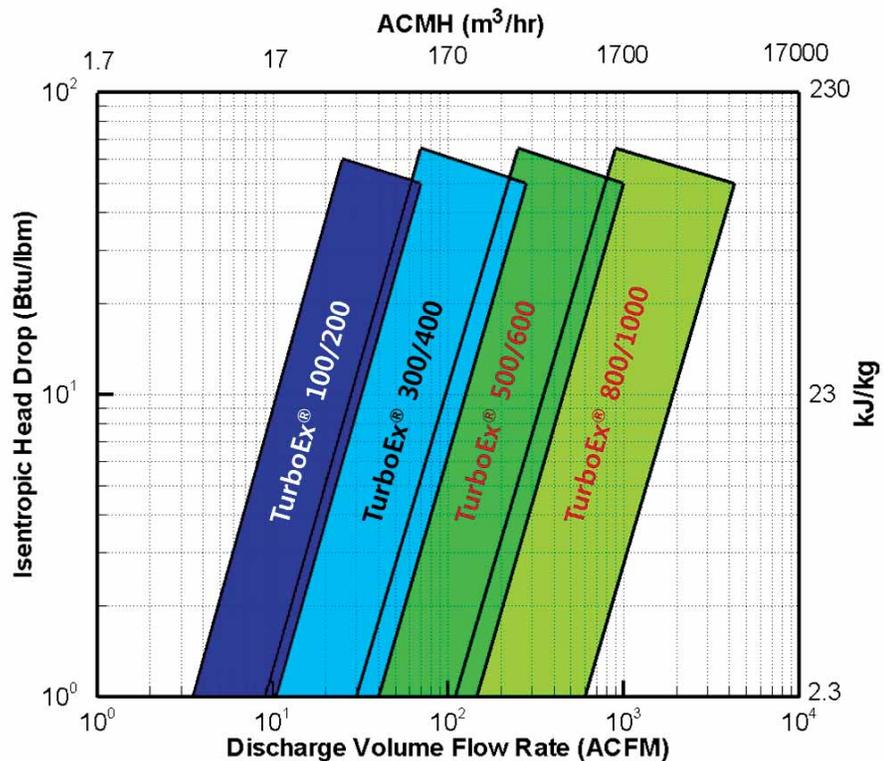
Computational Fluid Dynamics Analysis (CFD)

R & D Dynamics Corporation applies CFD to design a highly efficient flow path through the turbine rotor and nozzle plate, and to select the proper vane profile to reduce the effect of erosion and deposition. CFD allows predicted performance to be correlated with field data.

Turboexpander Sizing

R & D Dynamics Corporation offers a complete range of small to midsize turboexpanders. Existing designs are used whenever possible with modifications made to optimize the unit for your particular application.

MODELS	POWER (kW)
TurboEx® 127	1 to 7
TurboEx® 215	5 to 20
TurboEx® 330	15 to 50
TurboEx® 411	25 to 75
TurboEx® 540	45 to 115
TurboEx® 630	60 to 160
TurboEx® 800	100 to 250
TurboEx® 1000	150 to 400





Manufacturing

R & D Dynamics Corporation applies state-of-the-art Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) facilities.

High efficiency centrifugal compressors, turbines and fans are manufactured in-house using CNC Lathes and 5-axis Milling Machines. Other parts such as shafts, foil bearings and seals are also manufactured in-house. Outside approved subcontractors are used for specialized processes such as heat treatment and plating.

Quality

R & D Dynamics Corporation is ISO 9001:2000 / AS9100 certified and registered.

The inspection system is approved by FAA (Federal Aviation Agency). Inspection equipment includes computer controlled Coordinate-Measuring Machine (CMM) in temperature and humidity monitored room.



E-mail Us

In order to design and manufacture a turboexpander for your needs, please e-mail mktg@rddynamics.com with the following information:

- GAS TYPE
- INLET PRESSURE
- INLET TEMPERATURE
- OUTLET TEMPERATURE
- OUTLET PRESSURE
- POWER OR FLOW

Customer Satisfaction



Registered to
AS9100
(with ISO 9001)

We believe in total customer satisfaction and quality management.

We believe in going the extra 'mile' for our customers.

We will work with you to meet your needs in every possible way.

Your Success Is Our Success.®

Please call, write, e-mail or fax your requirements.

We Are Here To Help You.™

For further information contact:

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