

Guardian® Packing Rings

Vortex Shedder® Seals

Turbine Components

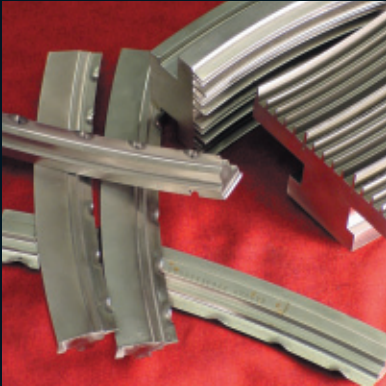
Custom Installation

Reverse Engineering



TURBO PARTS, LLC

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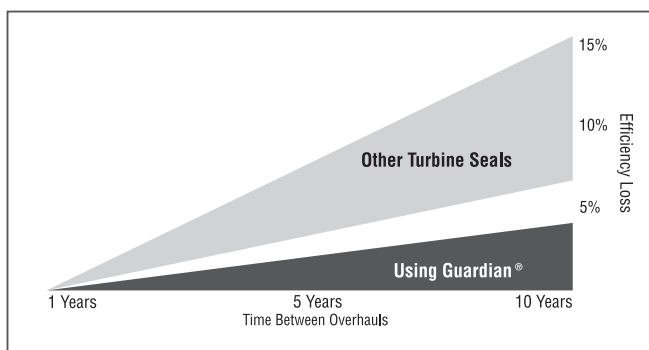
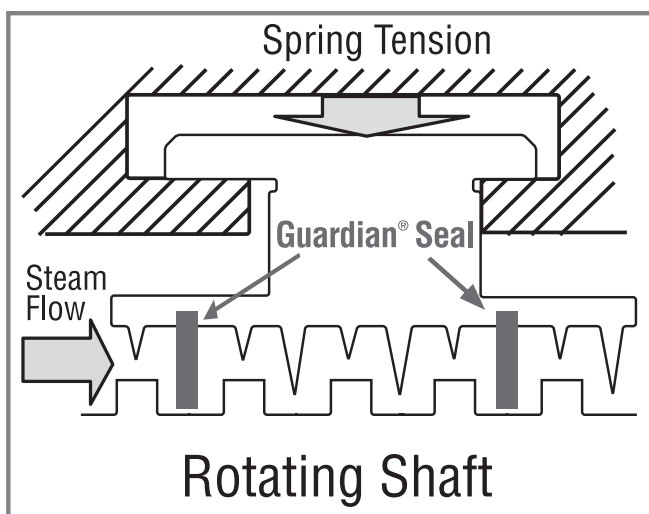


ADVANCED SEALING SYSTEM by Turbo Parts, LLC.



Guardian® Packing Rings Prevent Seal Damage While Maintaining Seal Efficiency

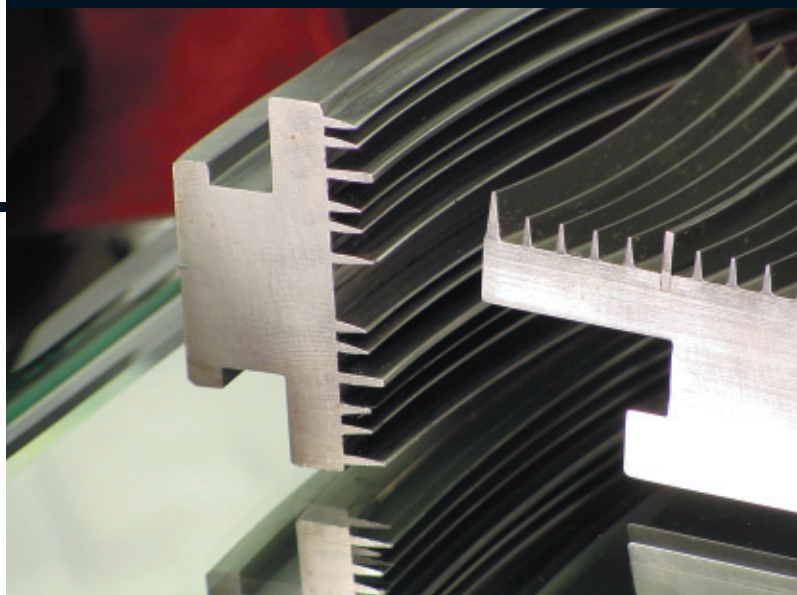
The Guardian® seal ring is considered to be one of the most advanced turbine seals on the market today. The body is made from 12Cr steel with inserted Guardian® posts made from a metal that is non-galling and has a very low coefficient of friction. The Guardian® posts are typically set with a radial clearance less than that of conventional teeth. In a transient event the Guardian® posts are meant to contact the rotor first, preventing damage to conventional teeth and to the rotor. Even in a hard rub condition, the conventional teeth and the rotor would only experience the effects of a light rub due to the characteristics of the Guardian® posts. Also due to the low coefficient of friction the concerns associated with heat-affected area and/or rotor cutting as seen with other seal designs would be greatly reduced or eliminated.



Guardian® Packing Extends Turbine Seal Life and Helps Maintain a Lower Heat Rate Longer than Conventional Packing.

Guardian® Packing rings can be installed in the HP, IP, LP turbine sections along with all gland seal areas in any steam turbine. Unlike some packing designs, Guardian® Packing rings maintain a positive radial seal during shutdown, turning gear, start-up, and unit operation. Positive radial sealing is a fundamental component to maintaining unit efficiency. Guardian® posts, used to maintain the integrity of the packing teeth, are constructed of a patented, non-galling, low coefficient of friction material.

Patent Number: 5,599,026



Custom Fit On-Site Installation Service

Turbo Parts offers custom installation of any packing ring or tip seal. Utilizing a mobile containerized machine shop, we are capable of on-site correction of the turbine seal itself for "out-of-round" conditions and/or minor axial position offsets that may be present in the stationary fits. Our specially trained crews provide the best quality installation available assuring the proper fit and function of the seal. Working with the alignment contractor the seals are set to the proper radial positions. Proper internal alignment is critical to prevent rubs for all turbine seals on the market today.

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The Vortex Shedder® Provides Improved Performance

The all 12Cr Vortex Shedder® Tip Seals work by creating vortices at the admission side of the seal. These vortices reduce the pressure drop, resulting in lower flow and less leakage across the seal. This translates to improved stage heat rate performance for the steam turbine.

Whether the steam path design is impulse, reaction or a combination of both, the Vortex Shedder® can have a significant improvement on the stage efficiency above original design.

Patent Number: 5,735,667



Mutual Benefits for both Guardian® Packing and Vortex Shedder® Seals

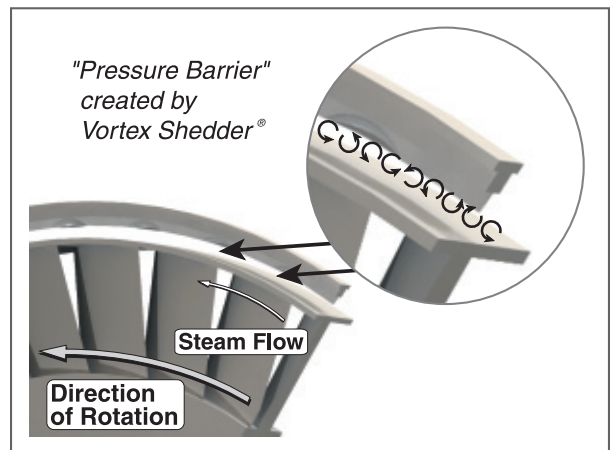
- Seals are made from 12Cr steel
- No modifications required to either the stationary fit or the rotor
- Replacement in kind for conventional seals
- Longer seal life with higher efficiencies
- Extends unit Heat Rate between overhauls
- Increased unit efficiency translates to lower EPA emissions per Megawatt/Hr
- Increased unit efficiency also means lower operating costs
- When combined as an integrated sealing system they are proven to increase overall turbine efficiency above design by 1.5% - 4.5%

Specific Benefits of the Guardian® Packing

- Works in any OEM Turbine
- Works in any labyrinth seal ring location or application
- Prevents and/or limits damage to seal teeth in any rub situation
- Reduces seal degradation
- Maintains OEM design clearances longer

Specific Benefits of the Vortex Shedder® Seals

- Reduces the pressure drop across the seal by creating a pressure barrier from the vortices
- Lower ΔP means less seal leakage
- Less leakage results in higher efficiency
- Increased unit output above design by as much as 4.5%



Manufacturing Excellence

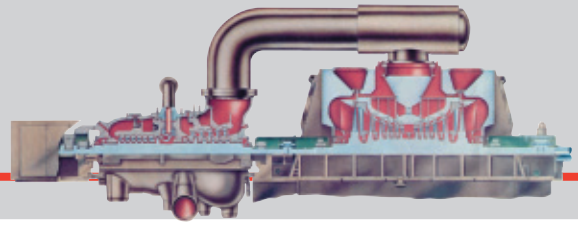
The Turbo Parts Manufacturing Facilities were designed and equipped for the sole purpose of turbine component manufacturing. Computer numeric controlled (CNC) machines are utilized in the manufacturing processes for turbine components. These machines increase accuracy, reduce the human error effect, and contribute to the repeatability of manufactured parts. Our drive is to provide the highest quality, best priced and quickest turnaround for turbine parts in the industry.

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STEAM TURBINE COMPONENTS BY TURBO PARTS



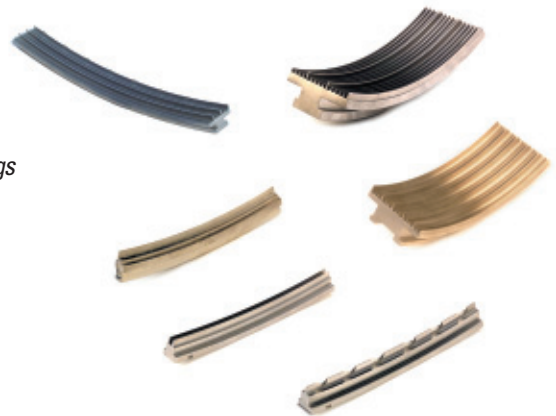
Valve Parts

- A. Stems, Disc, Seats
- B. Crosshead Assembly, Crosshead Bushings, Linkage Components
- C. Pressure Seal Head Assembly
- D. Bushings, Flanges, Valve Caps
- E. Bolts, Nuts, Studs, Washers, Spacers, Pins, Gaskets
- F. Stem Packing
- G. Cam Shafts, including Bushings & Bearings
- H. Gear Racks, Pinions
- I. Assembly & Repair Service for Valve Internals



Stationary Seals

- A. Patented Advanced Design
 - 1. Guardian® Packing Ring
 - 2. Vortex Shedder® Spill Strip
 - 3. Hybrid Seals
- B. Conventional
 - 1. Packing Rings, Labyrinth Rings, Gland Rings, Dummy Rings
 - 2. Packing Springs, Retaining Keys, Pins, Rivets, Screws
 - 3. Spill Strips, Steam Deflectors, Spring Back Seals
 - 4. "J" Strip, Caulking Strip
 - 5. Springs, Retaining Keys, Screws
- C. Complete Custom Fitting Installation Services
- D. Oil Deflectors



Rotating Steampath Components

- A. Reverse Engineered Blades
- B. Covers, Shrouds, Tie Wire, Balance Plugs, Set Screws
- D. Coupling Bolts, Nuts, Washers, Lock plates, Cover Plates & Screws



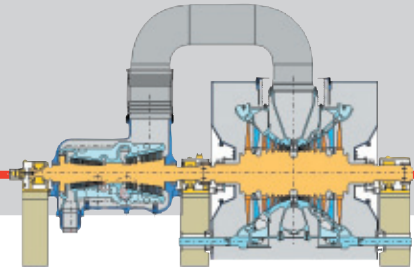
Stationary Steampath Components

- A. Nozzle Plates
- B. Nozzle Box Hardware
 - 1. Gibs, Keys, Spacers, Dowels, Bolts, Cover Plates, Lock Wires
- C. Diaphragm Hardware
 - 1. Centering Pins, Dowels, Joint Keys, Support Bars, Shims, Arch Springs, Screws
- D. Packing Casing Hardware
 - 1. Bolts, Dowels, Lock plates



Shells

- A. Horizontal Joint Hardware, Body Bound, Thru, and Tap Studs, Nuts, Washers
- B. Steam Flanges – Studs, Bolts, Nuts, Gaskets
- C. Seal Rings
 - 1. Main Steam Inlet, Vent Valve, Blow Down Valve, Cooling Steam
- D. Snout Pipes
- E. Access Flanges & Hardware



Exhaust Hoods & Inner Casings

- A. Support Shims, Keys, Gibs, Seal Rings, Gaskets, RTD's
- B. Atmospheric Relief Diaphragms (Aluminum or Copper)
- C. Studs, Bolts, Nuts, Washers, Gaskets
- D. Exhaust Hood Spray Nozzles

Bearings

- A. Sleeve, Ball, Roller
- B. Pump Bearings
- C. Cam Shaft Bearings, DU Bearings
- D. Pedestal Bearings
- E. Journal Bearings



Controls

- A. Servo Valves, Solenoid Valves
- B. Limit Switches, Pressure Switches
- C. Motors
- D. Speed Sensors
- E. Thermocouples, RTD's
- F. Wires, Cable



Front Standard Parts

- A. Hydraulic Cylinders
- B. Piston Rings
- C. Worm, Worm Wheels
- D. Oil Pump Seals



Auxiliaries

- A. Heat Exchangers, Coolers
 - 1. Gaskets
 - 2. O-Rings
- B. Hydraulic Power Unit Parts
- C. Filters, Filter Cartridges, Closures, Filter Regulators, Strainers

Generator Components

- A. Hydrogen Seal Rings
- B. Fan Blades and Vanes
- C. Brushes and Brush Holders
- D. Shaft Grounding Devices
- E. Oil Deflectors



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Rapid Response

At Turbo Parts, we maintain an extensive library of technical information relating to the turbine and generator components we manufacture. This rich resource of data, developed over several generations, provides our project managers with a strategic advantage when it comes to addressing the many exacting needs of today's clients.



Engineering Excellence

As a premier provider of turbine-generator components, Turbo Parts is well known for our ability to provide rapid response to clients requiring reverse engineering of components that are not currently in our archives. Reverse engineering is second nature to our technicians, draftsmen and other key personnel. Years of experience and many of the best "human-resources" in the industry have helped us build our reputation as a premier provider of reverse engineering services. In addition, our process-flow methods enable our production facility to respond quickly and efficiently to the demands of those clients who require immediate assistance. Expect to be pleased by our quality, consistency and the personal attention you receive from Turbo Parts, LLC. We are proud to provide our clients with an exceptional experience and outstanding craftsmanship.

Material Inventories



Turbo Parts maintains a large inventory of raw material and finished goods, allowing us to provide rapid execution of orders and consistently high quality turbine and generator components. Taking the details seriously has made Turbo Parts a recognized name in the power generation industry.

Turbo Parts is committed to supplying only the highest quality products available anywhere in the world. This commitment begins with the materials we use in the manufacture of our components. Every aspect of manufacturing, beginning with the material specification process, is guided by well-defined quality control procedures. We strive to provide high quality, zero-defect components by complying with the procedures and processes that have allowed us to become one of the most recognized names in the turbine-generator parts business.



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