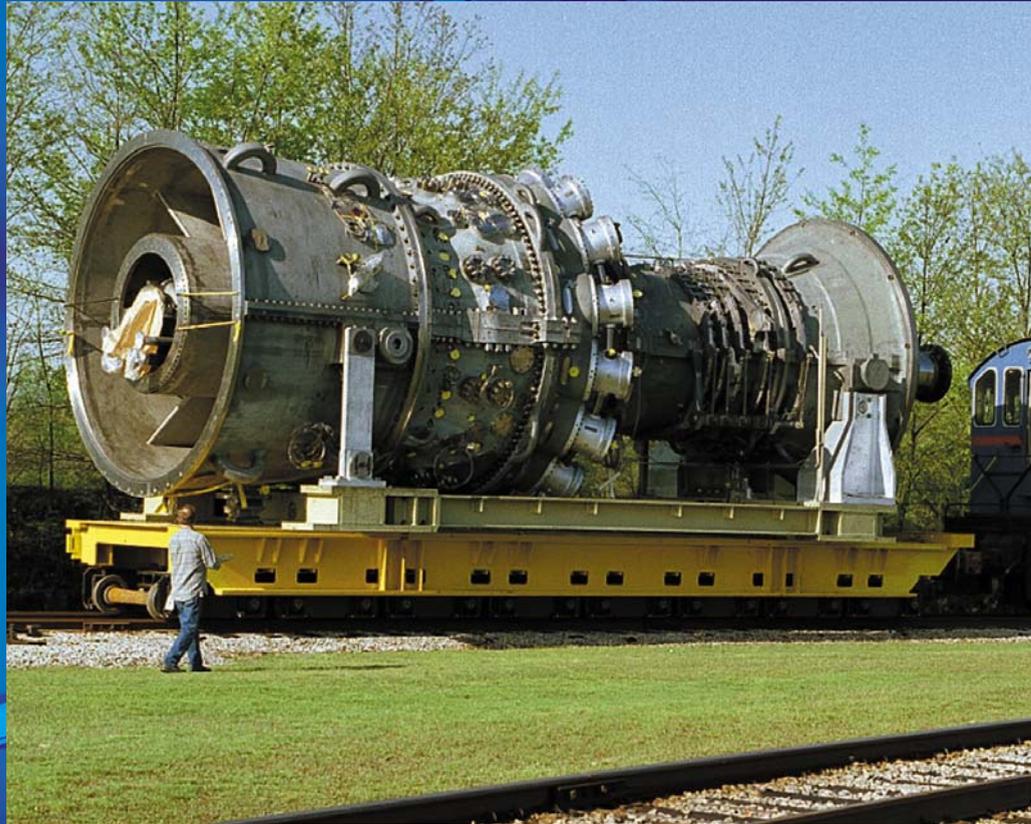


Brush Seals



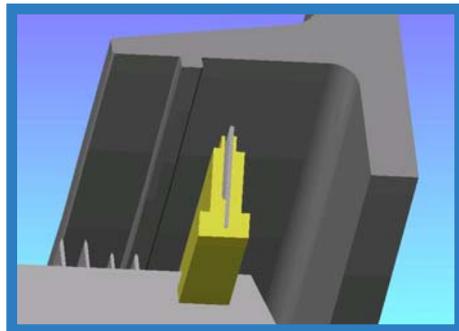
Power Generation
Mechanical Drives
Compressors

CROSS



Brush seals are now established as a proven technology, in gas and steam turbines, for power generation and mechanical drives. This sealing method can also be applied to turbo compressors.

When correctly matched to the operating conditions of the machine, they make a significant contribution to increased efficiency. They can reduce leakage in strategic areas of the machine, leading to increased output and improved heat rate.



A brush seal contains many thousands of fine wires, which form an effective barrier to flow, while accommodating shaft excursions, thermal movements and misalignments, which would instantly reduce the efficiency of a labyrinth seal.

As the longest established brush seal supplier to the power generation industry, Cross have built up an impressive record of service in the field.



Working closely with the major OEM's worldwide the breadth of our experience in brush seal design and manufacturing technology is second to none.

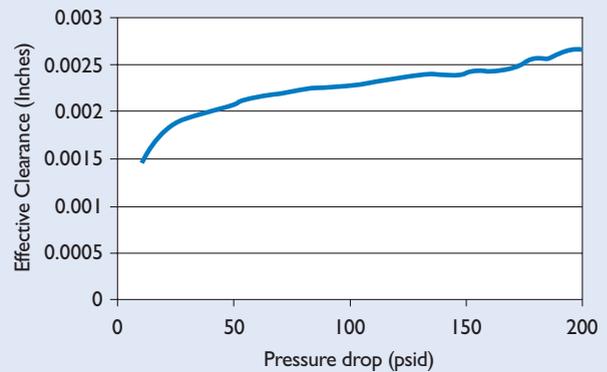
Brush seal technology originated in the aerospace industry, where performance and efficiency are paramount. Cross have been involved in aerospace brush seal development since the early days and our brush seals are in service today in both military and commercial aircraft gas turbines. This advanced technology has now been successfully transferred to the power generation industry.



Operating Conditions

| | |
|--|------------|
| Maximum shaft surface speed | 1260ft/sec |
| Maximum temperature | 600°C |
| Maximum pressure drop per single stage | 300psi |

The seal shown in the graph to the right is capable of a 0.125" transient radial closure. Dynamic sealing performance is typically better than static.



Typical static ambient sealing performance of a high Pressure Packing type Brush Seal

Brush seal performance

Cross have worked closely with GE Corporate Research and Development to provide enhanced performance across the range of GE gas turbines. As a result, Cross brush seals are providing performance improvements in GE frame 3, 5, 6, 7 and 9 machines.

(Contact GE Energy Services for more detail)

An example

GE 7EA performance improvement (Output/heat rate)

High pressure packing seals +1.0%/-0.5%

No 2 bearing seals +0.3%/-0.2%

Interstage seals +1.0%/-0.5%

Cross brush seals are contributing to increased efficiency, both in new equipment and as part of performance upgrade packages on existing equipment. Our seals have now been in service in field applications for many thousands of hours, demonstrating the sustained performance benefits of brush seals, when correctly matched to the conditions they will encounter.





The Company

Cross Manufacturing Company have specialized in the design and manufacture of sealing products for over seventy years.

The company was founded on the ability to produce high quality sealing rings from wrought alloys. This process has been constantly developed and now provides heat resisting seals for the aerospace, power generation and automotive industries.

In recent years Cross engineers have played a key role in the introduction of brush seals to the aerospace and power generation industries.

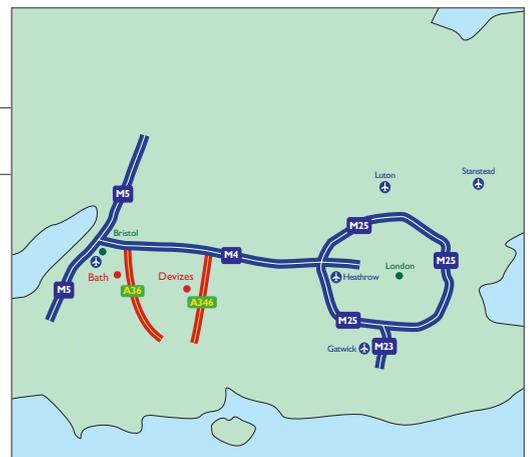
Operating from two sites in the West of England, totalling some 140,000 square feet of floor area and employing over 250 people, Cross provide a responsive and reliable service to customers the world over. With continuing investment in facilities, equipment and test and development capabilities, Cross are strongly placed to match the growing world demand for brush seals.



Devizes Plant



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