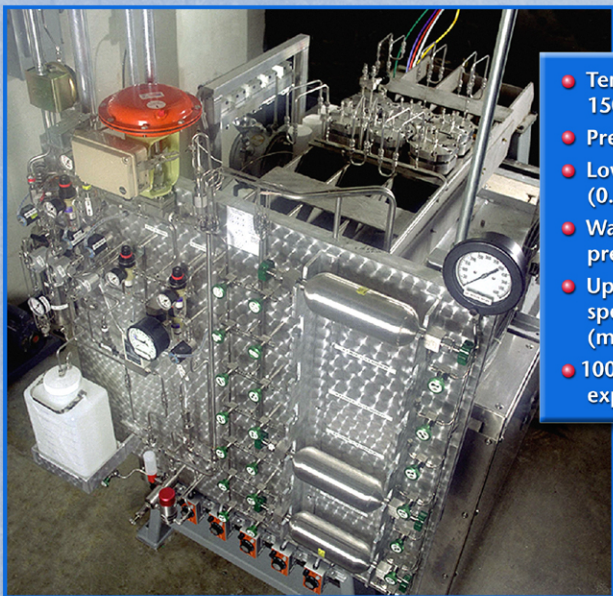


Environmental Test Center

A Staged Approach to Evaluation of Environmental Effects on Ceramics, Ceramic Composites and Coatings for Use in Turbine Hot Sections



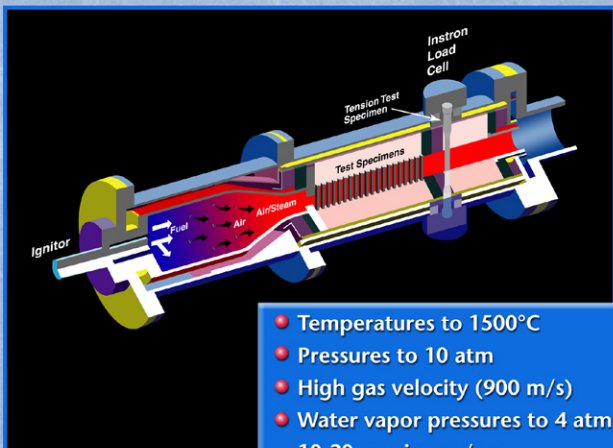
ORNL Low-Flow-Rate, High-Pressure (Keiser) Rigs

- Temperatures up to 1500°C
- Pressures to 30 atm
- Low gas velocity (0.1 m/s)
- Water vapor pressures to 4 atm
- Up to ~60 specimens/run (multiple tubes)
- 1000's of hours of exposure

Have the ability to expose ceramics and coatings in high-temperature, high-pressure, water-vapor-containing environments typical of turbines but cannot simulate volatilization rates

- accurately reproduce microstructural modes of environmental degradation and replicate damage rates
- assess basic protectiveness of environmental barrier coatings

Keiser Rig exposures provide a low-cost, high-throughput, extended-exposure-time method for first-stage evaluation/ranking of materials



Honeywell Engines High-Velocity Burner Rig

Will provide the ability to expose most promising ceramics and coatings at very high gas velocities typical for nozzles and turbine blades/vanes.

Will allow assessment of

- functional dependence of oxidation and volatilization on gas velocity at flow rates well beyond the current experimental database
- possible erosion modes
- stress-oxidation effects at high velocities

The higher cost exposure in the Honeywell High-Velocity Burner Rig will be used as the final material qualification before an actual engine test.

Expected operation in 2003

- Temperatures to 1500°C
- Pressures to 10 atm
- High gas velocity (900 m/s)
- Water vapor pressures to 4 atm
- 10-20 specimens/run
- 100's of hours of exposure
- Stress-rupture capability

A **Steering Committee** has been organized to identify and prioritize candidate ceramics and environmental barrier coatings

Bjoern Schenk **Honeywell**

Beth Opila **NASA**

Mark van Roode **Solar Turbines**

John Holowczak **UTRC**

Krishan Luthra **GE**

Jay Morrison **Siemens-Westinghouse**

Wendy Matthews **Capstone**

Steve Waslo **DOE**

Matt Ferber/Karren More **ORNL**

These facilities and related microstructural, mechanical, and corrosion characterization capabilities comprise a user center for environmental exposure and analysis. The user center is available to materials developers and suppliers, turbine manufacturers, and system designers

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