Thermal Barrier Coating Trials

Thermal Barrier Coating (TBC):
- Used to protect metal of blades from high temperatures

Bond Coat:
- Used to adhere the TBC to the blade’s metal surface

Possible Advancements:
- Higher temperature stability
- Simplifies production
- Longer lifespan
Thermal Barrier Coating Trials

Project:
- Testing new Bond Coat and Thermal Barrier Coating combinations
- Focus on adhesion and expansion characteristic
Thermal Barrier Coating Trials

Participation:
- Sample sectioning and polishing in preparation for inspection
Aged Material Evaluation

Project:
- Evaluate hazards of continued operation for a turbine casing with \(~100,000\) equivalent baseload hours

Hazards:
- Graphitization / Spheroidization
- Loss of strength
Aged Material Evaluation

Participation:
- Sectioning and polishing
- Hardness testing and tensile strength estimations
- Etching, Metallography and analysis of microstructure
- Analysis of size and distribution of Graphite nodules

Determination:
- No immediate danger in continued operation
- Indication of development of a possible hazard, yearly re-evaluation advised

Low Temperature Inlet Section
- Pearlite
- Ferrite

High temperature Outlet Section
- Graphite Nodules
- Spheroidized Carbides
Blade Fracture Analysis

Project:
- Analyze and discover cause of cracking in two Row 2 blades

Participation:
- Sectioning and polishing
- Optical Microscopy
Blade Fracture Analysis

Participation:
- Scanning Electron Microscope (SEM) Imaging
- Energy-dispersive X-ray Spectroscopy (EDS) elemental mapping.
Blade Fracture Analysis

Participation:
- Optical Microscopy and SEM Imaging
- Grain Size Analysis
- γ’ Size analysis

Determination:
- No materials flaw detected
- Failure due to overstress in the design
Questions?

Thank You

TBC Advisors
Dr. Cora Schillig
Neil Hitchman

Fracture Analysis Advisors
Dr. Keneth Star
Dr. Zafir Abdo

Lab Operations Management
Vinay Jonnaladda
Joshua Rolland