The UTSR Gas Turbine Industrial Fellowship Program

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Leonardo Technologies, Inc.
Contractor for the US Department of Energy / NETL

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Acknowledgement

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Fellowship Program Description (1/2)

• Provides undergraduate and graduate-level engineering students with the opportunity to work at leading gas turbine industry sponsoring companies
• Provides the sponsoring companies an opportunity to recruit technical talent from a highly selective pool of applicants
Fellowship Program Description (2/2)

• Fellows spend 10-12 weeks over a summer working at a sponsoring company
• Fellows get a lump sum stipend of $11,500 (undergraduates) or $13,500 (graduates)
• Companies pay the stipends
  – OEMs pay $25,000 per year and get 2 Fellows
  – Non-OEMs pay $12,500 and get one Fellow
  – Member companies can hire additional Fellows from the applicant pool, and they will also be part of the Program.
Typical Work Areas at Companies

- Heat transfer
- Aerodynamics
- Combustion
- Thermodynamics
- Advanced materials and coatings
- Design
- Manufacturing
- Test and evaluation
Eligibility

• Must have a GPA of at least 3.0
• Must be US citizens or green card holders
• Undergraduates must complete their Junior year by June of the year that they work at the company
Selection Process

• Applicants provide transcript, letters of recommendation from faculty, description of technical area of most interest and list of companies they most want to work for

• Companies provide rank order of preferred applicants

• Offers are made for best match of company choices and applicants’ choices
Benefits to the Fellows

- Work experience in the gas turbine industry is an advantage in seeking jobs after graduation – in industry or academia
- Work experience helps them decide which fields they like best within the GT industry
- Practical knowledge gained helps make their remaining academic work more relevant
Benefits to Companies (1/2)

• Host student Fellows proportional to dues level – Assess some of the best students in the nation for future employment as they work on real world problems

• The students have been encouraged by their professors to apply and are interested in the gas turbine industry; an advantage in recruiting future employees
Benefits to Companies (2/2)

• Historically, 80% of the UTSR Fellows benefit the gas turbine industry
  – 70% of them accept jobs with companies in the gas turbine industry
  – Another 10% stay in academia, teaching and researching on gas turbine topics
Since the fall of 2010, Southwest Research Institute is implementing the program for NETL, with oversight from LTI, site support contractor for NETL.

2013 Fellowship Program data:
- 53 Eligible applicants
- Made 11 offers to fill the 9 slots (82% acceptance)
- 9 Fellows selected (17% of eligible applicants)
- 8 Universities
- 6 Host Companies
Status of the Fellowship Program (2/2)

• 2014 Fellowship Program data:
  – 42 Eligible applicants
  – Made 10 offers to fill the 9 slots (90% acceptance)
  – 9 Fellows selected (21% of eligible applicants)
  – 7 Universities
  – 6 Host Companies
Fellowship Host Companies 2013 / 2014

• GE
• Siemens
• Solar Turbines
• FlexEnergy
• Woodward Governor
• Florida Turbine Technologies
<table>
<thead>
<tr>
<th>Fellow</th>
<th>University</th>
<th>Company</th>
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<tr>
<td>Potts, Goeffrey</td>
<td>St. Louis U.</td>
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<td>Fabozzi, Eric</td>
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<tr>
<td>Hayes, Shelby</td>
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<td>Woodward Governor Company</td>
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Examples of Fellows’ 2013 Projects

• Fellows are required to write a report and a PowerPoint presentation on their projects, which are posted on the UTSR Fellowship website www.swri.org/UTSR

• Following are the titles and conclusions charts from three of the presentations that were planned for the 2013 program.

• You can see all of the 2013 and earlier Fellows’ presentations on the website.
2013 UTSR Fellowship

August 7, 2013
Shelby Hayes

Industrial Turbomachinery Systems

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Primary Summer Projects

UNS N08020 Research and Weld Trials

Spray Angle Characterization

EB Weld Development

Industrial Turbomachinery Systems
Skills and Lessons Learned

• **Company Methods**
  - Six Sigma
  - Culture into Action

• **NPI Processes**
  - Assemblies
  - Quality Inspections
  - Braze Processes
  - Pressure Testing
  - Lathe
  - SMD Testing
  - Laser Marker

• **Production Processes**
  - EB Welding
  - FPI
  - CMM
  - Flow Test
  - Collar Press Fit

• **Customer and Supplier Interaction**
  - GE Tour
  - Phone and Email Correspondence
  - M&P Face-to-Face

• **Welding**
  - TIG
  - Laser Tacking
  - Spot/Resistance Tacking
  - Microscope Inspection

• **Project Management**
  - Wedding Planning/Delegation Proficiency
University Turbines Systems Research Fellowship
2013

GE Power & Water

Presenter: Kevin Luo

Coatings & NDE Development
Manager: Kathleen Morey
Mentor: Joshua Margolies
Project 1

Microstructure and Property Comparisons for AG1 Ceramic Coatings
Conclusion

In terms of the powder comparison, the St-Gobain AG1 9237 powder produces a better ceramic top coat than the Sulzer Metco SPM 2000-1. The tensile strength is higher on the AG1 9237 coatings sprayed with either parameters or on top of either bond coat. In terms of metallurgy, the 9237 coatings also hold a distinct advantage in terms of having more vertical cracks per linear inch and having a better resistance to horizontal cracks.

For parameters, the repair TGTS parameter sprayed better top coat. TGTS has a distinct advantage over the GVL OEM in the tensile results and the horizontal crack length nonconformity.

Further investigation should be done to examine the observed low deposit efficiency and for the 9237 its appearance of higher porosity. Examining an additional lot for each powder could verify the findings of this project and could initiate a services implementation plan to use the better powder and parameter.
Solar Turbines Internship Exit Presentation

Geoffrey Potts

Heat Transfer
Aero/Thermal & Performance

Mentor: Yong Kim
Supervisor: Hee-Koo Moon
Manager: John Mason
- **Background**
  - An early thermal paint test showed high temperatures on the leading edge of the turbine blade
  - Design team moved to address durability concerns in certain parts of the turbine
**Recommendation**
- It is acceptable to widen swirl cool slots as long as the radial trip strip is added.

**Benefits**
- Save time in the manufacturing of the blade
- Save cost because the core die does not need to be replaced as frequently
- Keeps the blade below oxidation temperature
# 2014 Fellows (1/2)

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<tr>
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<td>Alieninov, Phillip</td>
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<td>Woodward Governor Company</td>
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<td>Mullenix, Lindsay</td>
<td>Clemson University</td>
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<td>Tuesta, Alfredo</td>
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The UTSR Fellowship Program is providing valuable experience for the Fellows and a source of trained engineers for the gas turbine industry.