- **Materials for Advanced Turbocharger Designs (Agreement 17257)**
  - Philip J. Maziasz – (PI and Presenter) ORNL, and Pat Pattabiraman, Honeywell TurboTechnologies, and Amit Shyam, ORNL
  - Oak Ridge National Laboratory, Oak Ridge, TN
  - Thursday, May 21, 2009, evening poster session

"This presentation does not contain any proprietary or confidential information"

Project ID: pmp_13_maziasz

Overview

Timeline

- Project is now being executed
- Project ends 36 mo. later
- Project is 0% complete

Budget

- Total Project Funding - $1,450,000
  - DOE - $725,000
  - Honeywell - $725,000
- DOE - $230,000 in FY2008 and $105,000 in FY2009

Barriers

- Technical Barriers Addressed:
  - Higher fuel efficiency demands higher exhaust and turbocharger temperatures
  - Higher temperatures dramatically reduce component performance and durability

Partners

- ORNL, Honeywell, and Honeywell turbocharger customers
- Technical lead - Honeywell

Objectives

- This new ORNL/Honeywell CRADA project (NFE-08-01671) is to provide the critical test data needed for new materials that enable the design of advanced turbocharger systems with upgraded performance and more durability.
- This new CRADA project is a direct follow-on with much wider scope to ORNL/Honeywell CRADA (NFE-08-01259) on cast CF8C-Plus stainless steel for turbocharger (housing) applications.

Milestones

- **FY2008** – none
- **FY2009** – Identify and prioritize the critical turbocharger components and materials properties needed for design of such components with improved performance (9 mo after start, tentatively Dec., 2009). New CRADA project is in the final stages of signing and execution.

Barriers – DOE/EERE/OVT

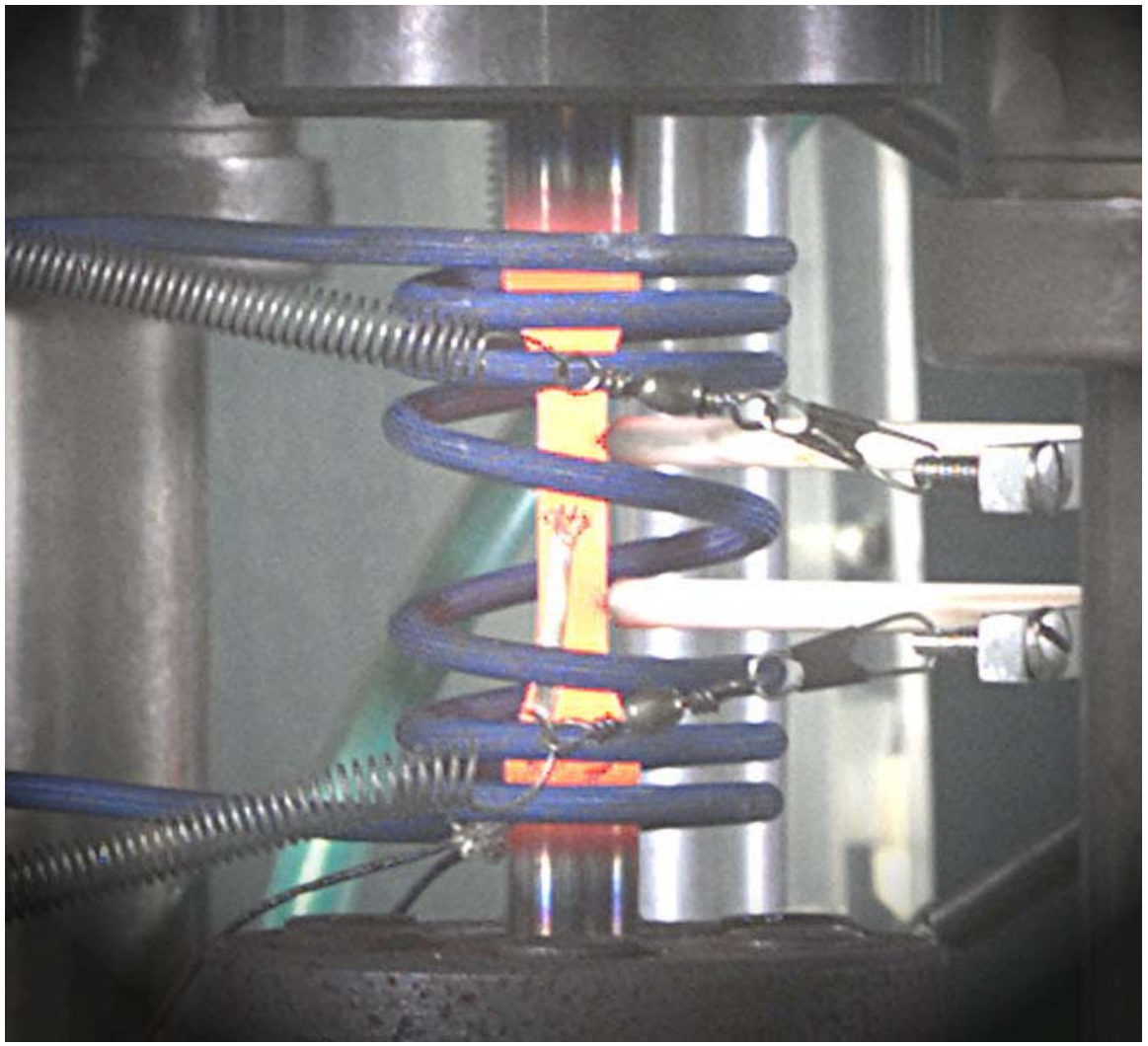
- This CRADA project is focused on developing turbocharger designs that can withstand the higher diesel and gasoline engine temperatures necessary to achieve higher fuel efficiency and lower emissions in both on-highway trucks and automotive passenger vehicles.
- Higher engine exhaust temperatures cause turbocharger component performance to become unacceptable. Higher temperatures also reduce component durability.

Approach

- Honeywell is the world leader in turbochargers for automotive and diesel engine applications, and ORNL is the world leader in selecting and developing new materials for high-temperature applications
- Honeywell will assess and prioritize the components that would benefit most from materials upgrades or alloy development.
- ORNL and Honeywell will work with commercial materials suppliers to obtain new or modified materials for testing, and for evaluation for component prototyping

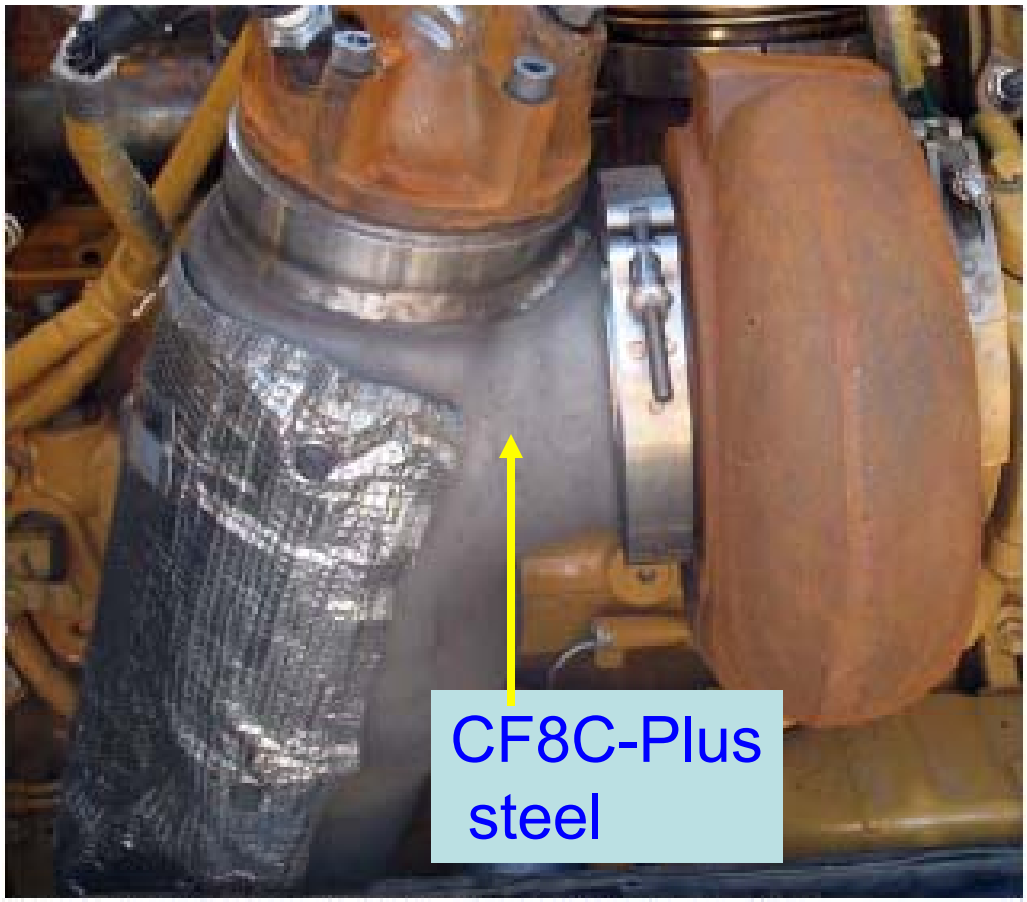
Approach – Honeywell will analyze needs for turbocharger system components

Approach – ORNL is uniquely equipped to test and understand materials behavior at high-temperatures



ORNL high-temperature isothermal Low-cycle fatigue (LCF) test of new cast CF8C-Plus stainless steel for Honeywell turbocharger housing application (CRADA NFE-08-01259)

Approach – Honeywell is working together with Caterpillar and ORNL to make CF8C-Plus turbocharger housings to test on Caterpillar diesel engines



Caterpillar Regeneration System (CRS) Housing

Caterpillar commercialized CF8C-Plus for CRS application in late 2006. Over 400 tons of CF8C-Plus have been cast for this single application. To-date, all units are operating with no failures.

- **CRS combustor regenerates ceramic diesel particulate filters (DPF), which causes very high temperature and rapid cycling conditions**

Technology Transfer/Application

- Honeywell is testing new CF8C-Plus steel for turbocharger housing application (NFE-08-01259, funded by EERE Technology Commercialization and Development Program).
- Honeywell and ORNL will test and evaluate new materials for casings, impellers and shafts for both the hot and cold sides of the turbocharger system (NFE-08-01671, funded by EERE/OVT).

Activities for FY2009/FY2010

- Identify and prioritize critical components and current materials that limit performance and reliability
- Identify and prioritize new or modified alloys with upgraded performance and temperature capability most beneficial to advanced turbo-technology
- Characterize fresh and service-exposed components to verify degradation/failure modes