ERC Symposium

Future Fuels for IC Engines

Welcome
ERC Symposia

- 1999 The Next Fifty Years of Engine Research
- 2001 Exhaust Aftertreatment Technologies
- 2003 Developing the Virtual Engine – Current Capabilities and Future Directions
- 2005 Low Emission Combustion Technologies for Future IC Engines
- 2007 Future Fuels for IC Engines
Engine Research Center

- Largest academic research center focusing on internal combustion engines in the U.S.
- Over $3.65 million annual research budget
- Over 55 graduate students, 10-15 post-docs and visiting scholars, 8-10 research and administrative staff
- Engine Research Center
  - Primary focus is engine performance, combustion, emission control
  - Diesel and spark-ignition engine research
    - Experiments
    - Computer modeling

http://www.erc.wisc.edu/
Transportation power systems:
- Will continue to be a dominant social and economic force for decades to come
- Energy conversion efficiency and its environmental impact are critical issues to the United States and the world

Engine research at a university
- Conduct research that addresses longer term issues
- Provide highly trained engineers who have worked on relevant problems

The Engine Research Center is a major research and educational institution for the investigation of fundamental and applied technologies relevant to IC engines
ERC Mission

- Provide outstanding graduates
  - Trained in combustion engine research and fundamentals
  - To transportation industry, government, academia

- Provide cutting-edge research
  - Help to meet national goals of reduced emissions and reduced fuel consumption

- Provide a technically diverse faculty
  - Serve as a national resource for information on combustion engine science and technology
ERC Graduates

- Industry
  - Virtually every major manufacturer of internal combustion engines boasts ERC graduates
  - Automobile and other vehicle manufacturers
  - Suppliers to the engine industry

- Government
  - National research laboratories
  - Regulatory agencies

- Academia

5 Presidents of SAE
10 Members of SAE Board of Directors
ERC Faculty

Mike Corradini  Pat Farrell  Dave Foster  Jaal Ghandhi

Rolf Reitz  Chris Rutland  Scott Sanders  David Rothamer
- **Total Annual Funding:** $3.65 million
ERC Research Projects

Fuel Injection and Sprays
10 projects

Combustion Optimization and Emissions
24 projects

Charge Preparation
6 projects

Internal Combustion Engine Research

Controls
2 project

Diagnostics
9 projects

Exhaust Aftertreatment
4 projects
ERC Symposia

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Why Future Fuels?

- National Security

  - *It is important that the United States move with all deliberate speed to develop and get into usage alternative fuels that will allow us to end our dependence on foreign oil.*
    Virgil Goode, Congressman – Virginia

  - *If our country is serious about reducing our dependency on foreign oil, we need to get serious about mobilizing the infrastructure necessary to distribute and dispense the next generation of fuels.*
    Bart Gordon, Congressman – Tennessee
Why Future Fuels?

- Climate Change

  - *Practically every environmental problem we have can be traced to our addiction to fossil fuels, primarily oil.*
    
    Dennis Weaver, Actor and Environmentalist

  - *Feeding our addiction to fossil fuels is how we got in this mess in the first place.*
    
    Lois Capps, Congresswoman – California

  - *When you have energy companies like Shell and British Petroleum, both of which are perhaps represented in this room, saying there is a problem with excess carbon dioxide emission, I think we ought to listen.*
    
    James Baker, Politician
Why Future Fuels?

- **Fuel Economy**

  - *As a National Academy of Sciences report concluded several years ago, we can improve fuel economy substantially using current technologies (not even including hybrid technology) without reducing safety, significantly raising prices or costing American jobs.*
  
  Sherwood Boehlert, Congressman – New York

  - *So the only way we're going to improve fuel economy ... swiftly and to the maximum extent practical is if the government requires it.*
  
  Sherwood Boehlert, Congressman – New York

  - *$3.89 a gallon!*
  
  Stranger at the next pump
Why Future Fuels?

- Emissions
  - The methods that EPA introduced after 1970 to reduce air-pollutant emissions worked for a while, but over time have become progressively less effective.
    Barry Commoner, Biologist
  - Across the nation, America’s pumps are primed to deliver clean diesel and cleaner air.
    Stephen Johnson, EPA Head
  - If you think about it, it just makes sense - cleaner fuels, leads to cleaner engines, and all of that leads to a lot cleaner air.
    Stephen Johnson, EPA Head
Why Future Fuels?

- New Combustion Technologies
  - *I think the internal combustion engine will disappear from the streets of our cities in the next thirty years because transportation will be mass transportation, or probably electrical power.*
    Gaylord Nelson, Politician and Environmentalist
  
  - *The combustion of fossil fuels is essential to our energy policy and must continue to be a part of a balanced energy plan for this country.*
    Jerry Costello, Congressman – Illinois
  
  - *Efficiencies higher than that of current diesel engines combined with dramatically lower emissions can be achieved by engines operating in advanced combustion regimes.*
    DOE Website
Why Future Fuels?

– “Future Fuels” is a really good idea for an ECR Symposium
  Rolf Reitz, ERC Professor
Sessions

Emission Requirements

Combustion Fundamentals

Engine Perspectives

Worldwide Perspectives
Keynote Presentations

- **John L. Robbins**
  Manager, Special Projects, ExxonMobil Research and Engineering
  - “The Outlook for Energy: A View to 2030”

- **Norm Brinkman**
  General Motors R&D
  - “Fuels and Propulsion Systems for the Future”
Agenda – Wednesday Morning 1

- 8:00 – 8:30 Registration and Continental Breakfast
- 8:30 – 9:00 Welcome and Opening Announcements
- 9:00 – 9:45 Keynote Address: John L. Robbins
  Manager, Special Projects, ExxonMobil Research and Engineering; Introduced by Dave Foster
  - “The Outlook for Energy: A View to 2030”
- 9:45 – 10:15 Refreshment Break
10:15 – 12:15 Emission Requirements, chaired by Chris Rutland

- **Dean Tomazic**, Director, Performance & Emissions, FEV Engine Technology, Inc. North American Technical Center
  - “Alternative Fuels for DI-Diesel Engines Meeting Future Emission Standards”

- **Tim Johnson**, Corning
  - “Diesel Emission Control Review”

- **Bruce Bunting**, Oak Ridge National Labs
  - “Strategies for Optimization of Engines, Fuels, and Aftertreatment”

- **Paul Morschauser**, Diesel Program Director, Madison Area Technical College
  - “Biodiesel Engine Performance”

12:15 – 1:15 Lunch
**Agenda – Wednesday Afternoon 1**

- **1:15 – 3:15  Combustion Fundamentals, chaired by Scott Sanders**
  - **Chuck Mueller**, Principal Member Technical Staff, Engine Combustion Department, Sandia National Laboratories
    - “Using Unconventional Fuels and In-Cylinder Strategies to Achieve High-Efficiency, Clean Combustion”
  - **Dave Foster**, Phil and Jean Myers Professor of Mechanical Engineering, University of Wisconsin
    - “Fuels as Enablers for Alternative Modes of Combustion”
  - **Ellen Meeks**, Reaction Design
    - “Strategies for incorporating detailed kinetics into engine simulation”
  - **Harry Lehtiniemi**, ADAPCO
    - “Efficient Engine CFD with Detailed Chemistry”

- **3:15 – 3:45 Refreshment Break**
3:45 – 5:15 Engine Perspectives, chaired by Rolf Reitz

- **Brad A. Boyer**, Technical Specialist, Research and Advanced Powertrain, Ford Motor Company
  - “Benefits of Direct Injection in Hydrogen Engines”

- **Chris White**, Professor of Mechanical Engineering, University of New Hampshire and University Summer Faculty at Sandia National Laboratories
  - “Advanced Hydrogen-Fueled Engines: Potential and Challenges”

- **Kevin Bruch**, Caterpillar
  - “Future Fuels and Energy Systems”
Agenda – Wednesday Evening

- 6:30 – 7:15 Cash bar, Monona Terrace
- 7:15 – 8:00 Dinner, Monona Terrace
- 8:00 – 8:45 The Broad Energy Perspective
  - Harold Ray, Vice President (retired)
    Southern California Edison
Agenda – Thursday Morning 1

- 8:45 – 9:00 Opening Comments

- 9:00 – 9:45 Keynote Address: Norm Brinkman
  General Motors R&D; Introduced by Roger Krieger
  - “Fuels and Propulsion Systems for the Future”

- 9:45 – 10:15 Refreshment Break
10:15 – 12:15 Worldwide Perspectives, chaired by Dave Foster

- Patrick Gastaldi, Renault
  - “Potential of the Mild HCCI Combustion for Worldwide Applications”

- Gautam Kalghatgi, Shell Oil
  - “Is Gasoline the Best Fuel for Advanced Diesel Engines? Fuel Effects in 'Premixed-Enough' CI Engines”

- Harrison Sigworth, Senior Consultant/Research Fellow, Chevron Energy Technology Company
  - “Transportation Fuels--Future Options and Opportunities”

- Ron Graves, Oak Ridge National Labs
  - “Future Fuels? or More of the Same? – A High Altitude Perspective”

12:15 – 1:15 Lunch
Agenda – Thursday Afternoon

- 1:15 – 2:00  ERC Faculty Presentations of Current Work

- 2:15 – 3:30  ERC Student Presentations, Poster Session, and Lab Tours

- 3:30  Conference Ends