INVESTIGATING THE PRODUCTION AND USE OF TRANSPORTATION FUELS FROM INDIANA COALS

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Four groups involved

- Production
- Use
- Economics
- Environmental Impact

Production Issues and Fischer-Tropsch

Rakesh Agrawal, W. Nicholas Delgass, Fabio Ribeiro
School of Chemical Engineering
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Commercialization of Coal-derived FT Jet Fuels

Steve Heister (AAE), Bill Anderson (AAE),
Jay Gore (ME), Yuan Zheng (ME), Bob Lucht (ME)

Achievements

- Identified key research needs for the commercialization of coal-derived FT jet fuels
  - Combustion and emission characteristics of FT fuels and blends
  - Thermal stability of FT fuels and blends
  - Potential endothermic fuels
- Identified available research facilities
  - Fundamental combustion research facilities
  - Gas turbine combustor facility
  - Emission analyzers
  - Laser diagnostics facility
  - Fuel thermal management facility
- Initiated fuel surrogate studies
  - Fuel tuning
  - Test fuel availability

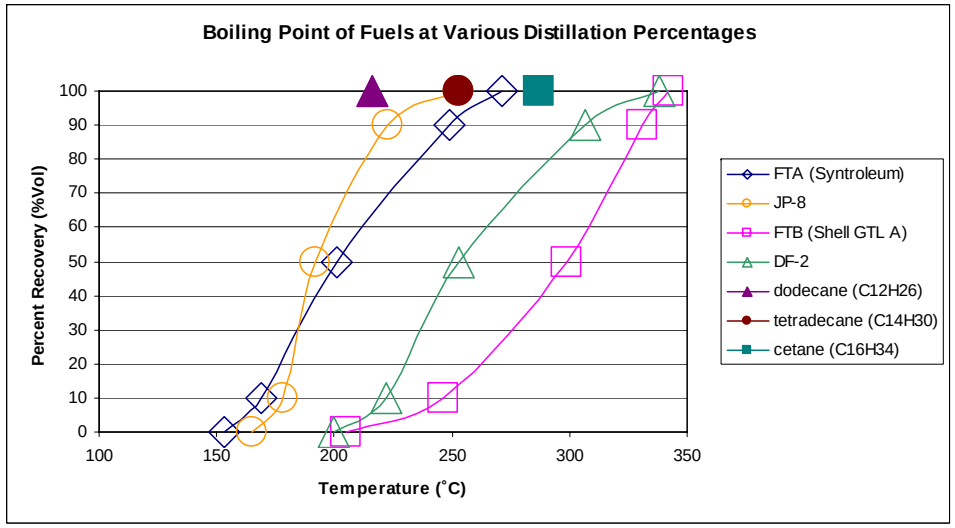
Preliminary Fuel Surrogate Study

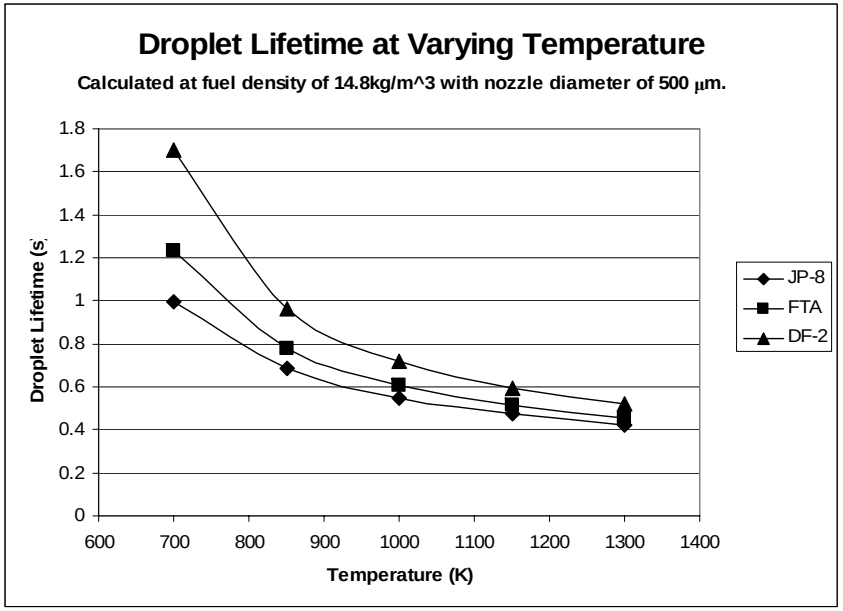
- FT fuels
  - 90% iso-paraffins, 10% n-paraffins
  - Average carbon number around 13
  - H/C ratio 2.1

- Selection of surrogates (pure hydrocarbon mixtures)
  - Fuel component limits
  - Commercially available and affordable
  - Physical characteristics: density, viscosity, distillation curve, etc.
  - Chemical characteristics
    - Overall: flame velocity, ignition delay, smoking point, etc.
    - Detail: laminar premixed flame structure (temperature, major and intermediate species), etc.

Preliminary Fuel Surrogate Study

- An example





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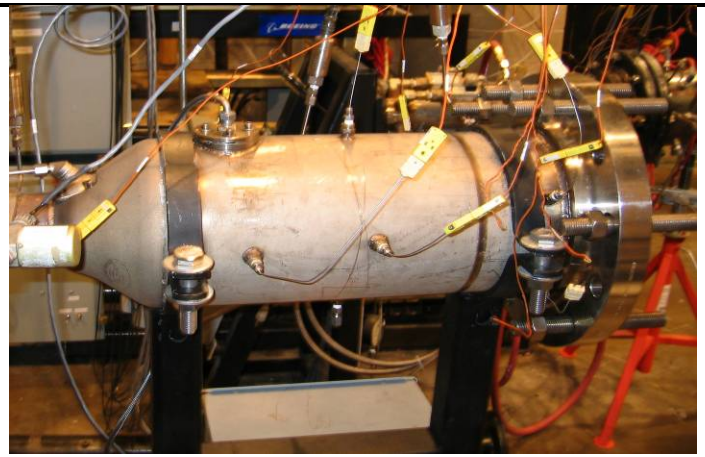
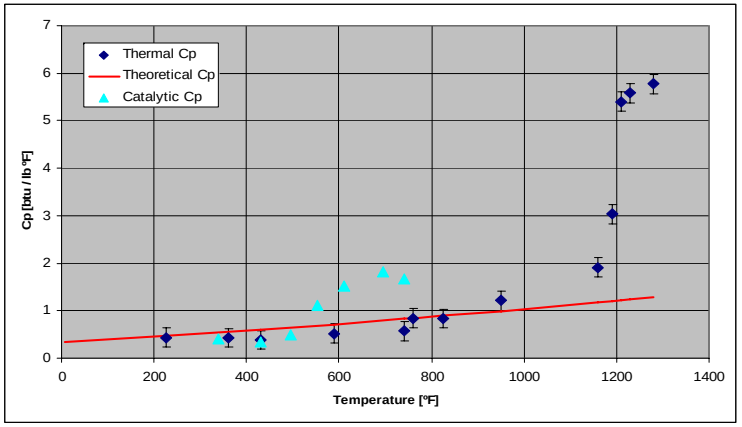
Conventional Jet Fuel Projects



- Various facilities in the Zucrow Laboratories for jet fuels combustion and emission research



- Endothermic fuels research in the Rolls Royce UTC aimed at development of improved thermal heat sink fuels

Future Directions

- To investigate FT jet fuel specification and surrogates
- To test atomization, fuel/air mixing, ignition, combustion performance, and emissions for FT jet fuels and fuel blends in gas turbine research facilities at Zucrow Laboratories
- To test coking properties of FT fuels and fuel blends
- To Identify desirable chemical structures for non-coking endothermic fuels

Policy Alternatives to Stimulate Private Sector Investment in Domestic Alternative Fuels

Policy Issues

Wally Tyner, Agricultural Economics

Preliminary Conclusions

- **For Base Price Range of $55 and $70 / BBL**
  - Expected Cost to The Government = 11- 22 Cents/Gal
  - If Oil Remains Above $45, the Actual Cost = $0 !
- **So is This a Beneficial Policy ?**
  - If the National Security Cost of Imported Oil is Greater Than 11-22 Cents / Gallon, Then Yes, the Nation Benefits from This Policy.
- **(One Estimate of These Costs Ranges Between $1.70 and $3.40 / Gallon of Liquid Fuel)**

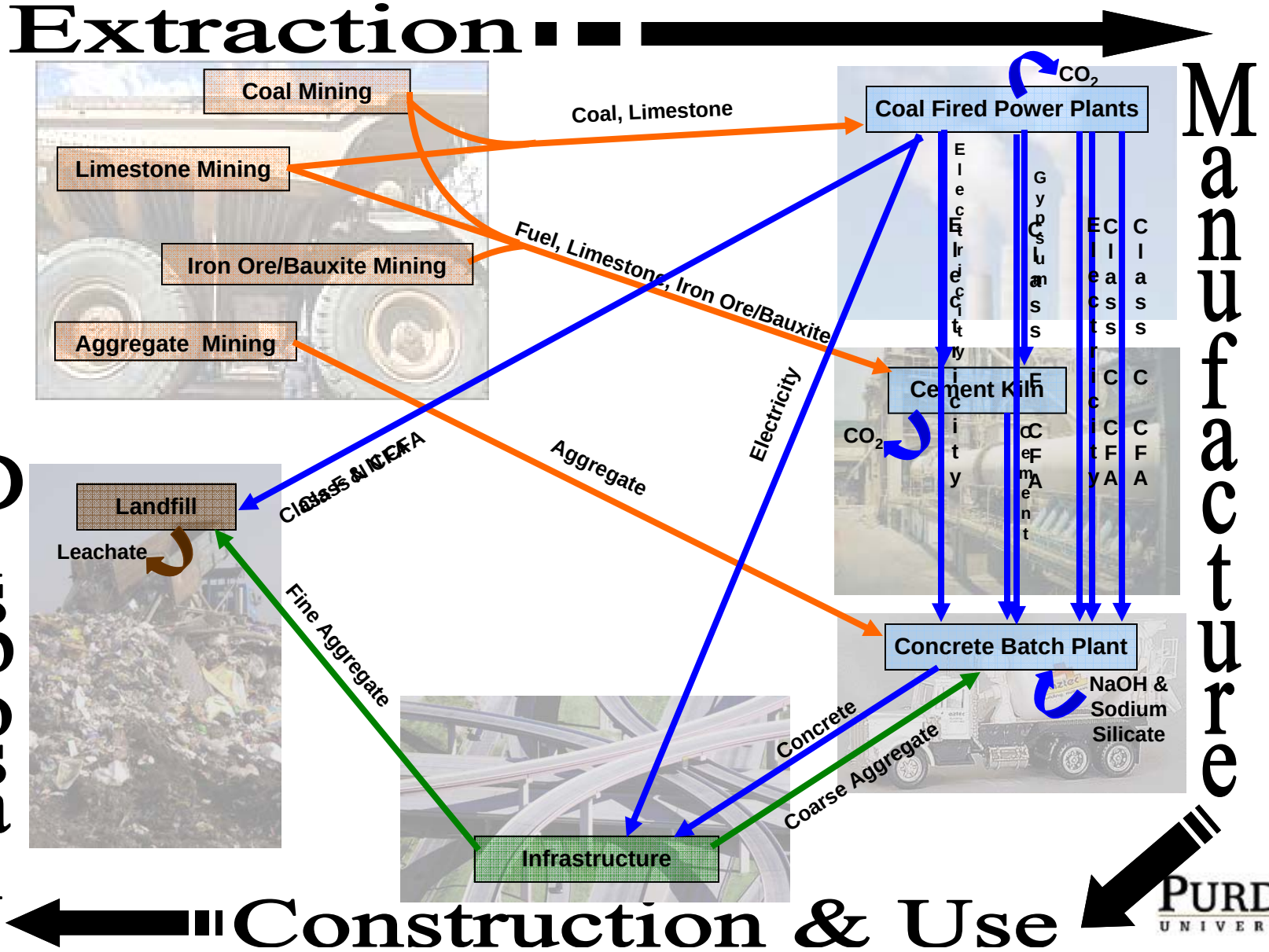
Investigation of the Environmental Implications of Coal to FT Fuel Production

Environmental Issues

Thomas P. Seager, Civil Engineering

Identify the waste streams typical of FT fuel production and match those with raw material feedstock requirements in other industries that can be co-located with FT fuel production, such as cement or drywall manufacture.

Geopolymer Concrete Life Cycle



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