Sustainable Biofuels and CoProducts Research Unique Biofuel and CoProduct Capabilites

Pilot Scale Fluidized Bed Pyrolysis Reactor
PyroProbe GC/MS
BEK Torrefaction System
Micro and Pilot Scale Catalytic Pyrolysis
Bio-Oil Upgrading with Continuous-Hydrogenation Reactors

Fermentation Systems from 1L - 3000L
Pilot Scale Centrifuges and DDGS Dryers
Numerous Pilot Scale Mills for Feedstock Reduction and Fractionation
Ethanol CoProduct, Nutraceutical, Polysaccharide, Edible Oil Extraction and Purification Systems

Complete Analytical Systems for Pyrolysis, Biodiesel, and Fuel Ethanol
Feedstock and Conversion Research Pilot Plants

ARS Mission

The Agricultural Research Service conducts research to develop and transfer solutions to agricultural problems of high national priority and provides information access and dissemination to

- ensure high-quality, safe food and other agricultural products;
- assess the nutritional needs of Americans;
- sustain a competitive agricultural economy;
- enhance the natural resource base and the environment; and
- provide economic opportunities for rural citizens, communities, and society as a whole.

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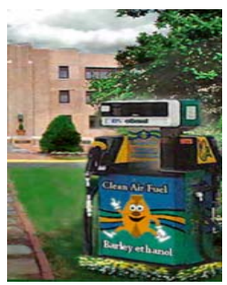
United States Department of Agriculture
Agricultural Research Service
Eastern Regional Research Center
Wyndmoor, Pennsylvania 19038

Sustainable Biofuels and CoProducts Research Unit

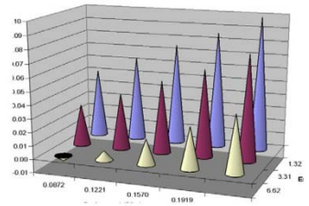
"Conducting Research to Enable the Sustainable Production of Food, Feed, Fuel, and Fiber from Farms"

Kevin B. Hicks, Ph.D.
Research Leader



Techno-Economic Process and Cost Modeling

Techno-economic modeling is one tool utilized in the SBCP Research Unit to provide an understanding of the processing and economic issues SBCP researchers address as they move a new product or process from a laboratory bench to an industrial scale.

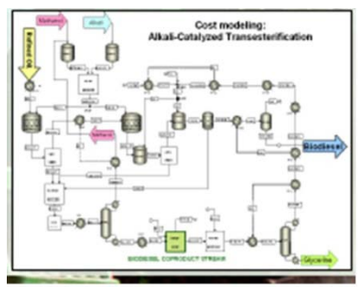


ARS process and cost engineers create these models using state of the art process and cost simulation programs such as Aspen Plus, Superpro Designer, Excel spreadsheets and other resources.

Process and economic models have been developed for various renewable fuel processes including ethanol, biodiesel, and pyrolysis. Other models address emerging processes and products utilizing grains, vegetable oils and dairy products.

These models are available upon request from the Lead Scientists listed in this brochure or from Andrew McAloon (andrew.mcaloon@ars.usda.gov) or Winnie Yee (winnie.yee@ars.usda.gov).

Process Simulation to Estimate Cost of Biodiesel Production from Soy Oil



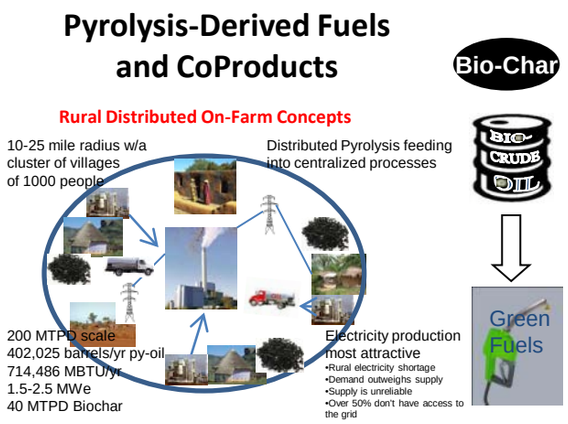
Pyrolysis-Derived Fuels and CoProducts

CRIS Project: 1935-41000-082-OOD
"Distributed-Scale Pyrolysis of Agricultural Biomass for Production of Refinable Crude Bio-Oil and Valuable CoProducts"

Lead Scientist: Akwasi Boateng, Ph.D.
akwasi.boateng@ars.usda.gov

Objectives:

1. Quantify the effect of various agricultural feed-stocks (varying in composition, maturation, post-harvest handling, and pre-treatment) on the pyrolysis process efficiency, kinetics, product yield (pyrolysis oil, syngas, and charcoal), and composition.
2. Develop commercially preferred catalytic and non-catalytic processes for on-farm scale production of stable and transportable pyrolysis oils that meet specifications as boiler fuel or refinable crude oils.
3. Develop technologies that enable commercially-viable fast pyrolysis and post-pyrolysis processes for biochar production from a variety of agricultural feedstocks.



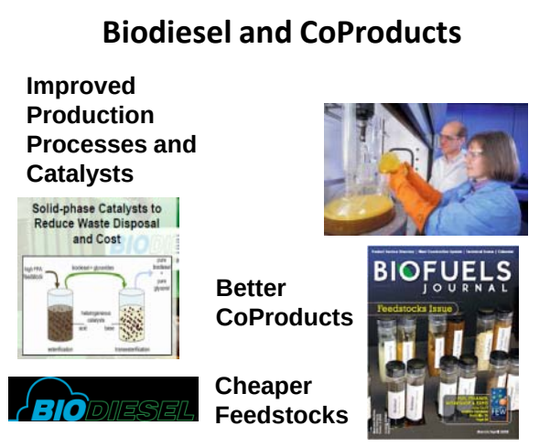
Biodiesel and CoProducts

CRIS Project: 1935-41000-084-OOD
"Expanding the Use of Fats and Oils as Replacements for Fossil-Derived Fuels, Lubricants, and Polymers"

Lead Scientist: Michael Haas, Ph.D.
michael.haas@ars.usda.gov

Objectives:

1. Develop new commercially-viable technologies to produce biodiesel from low-cost feedstocks.
2. Develop technologies to remove performance-degrading biodiesel contaminants such as catalysts, sterol glucosides and sulfur.
3. Develop technologies to make commercially-viable biodiesel coproducts including a) hyperbranched polymers from byproduct glycerol; and b) fatty acid-derived specialty chemicals using environmentally benign processes.



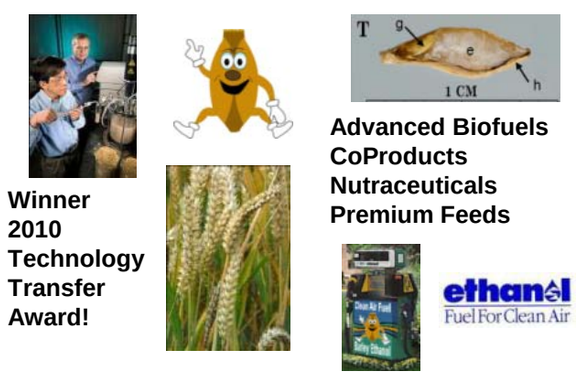
Winter Barley Advanced Ethanol for the Mid Atlantic

CRIS Project: 1935-41000-083-OOD
"From Barley to Biomass – the Development of a Regional Multi-Feedstock Biorefinery"

Lead Scientist: Kevin Hicks, Ph.D.
kevin.hicks@ars.usda.gov

Objectives:

1. Develop economic and commercially-viable processes to produce winter barley ethanol.
2. Develop processes to produce value added polysaccharide coproducts to act as value-added ingredients in food and industrial products.
3. Develop processes to produce value added lipid coproducts useful as nutraceuticals and edible oils.
4. Develop processes to allow the use of non-food cellulosic feedstocks in barley biorefineries to allow production of advanced and cellulosic biofuels.



Ethanol CoProducts

CRIS Project: 1935-41000-085-OOD
"Value Added CoProducts for Improving the Economics and Greenhouse Gas Emissions of Corn and Cellulosic Fuel Ethanol Production"

Lead Scientist: David Johnston, Ph.D.
david.johnston@ars.usda.gov

Objectives:

1. Develop commercially-viable processes for producing new, valuable coproducts from DDGS, thin stillage, CO_2 or other byproducts of corn ethanol biorefining.
2. Develop commercially-viable processes to produce food-grade corn oil, nutraceuticals, carotenoids, or other high-value coproducts from corn ethanol biorefineries.
3. Develop commercially-viable processes to produce high-value coproducts from corn and cellulosic ethanol biorefineries, including hydrocolloids, food gums, succinic acid, astaxanthin, or other high-value coproducts.