



# BECON

BIOMASS ENERGY CONVERSION FACILITY



**Bridging the gaps between laboratory research and real-world applications is a hallmark of the Iowa Energy Center. In this tradition, the Energy Center created the Biomass Energy Conversion facility (BECON), located in Nevada, Iowa.**

BECON supports the development of bio-based technologies by helping researchers and entrepreneurs install and operate pilot-scale process demonstration systems. The facility serves as a platform for researchers interested in taking bench-scale research to the pilot scale, and for entrepreneurs looking to move technologies beyond the development stage to full commercialization.

BECON, along with other world-class R&D capabilities available in central Iowa along the Highway 30 corridor, provides resources for developing bio-based fuels, chemicals, and products that are among the best in the world.

BECON is uniquely positioned to serve commercial implementation for biomass to fuel and chemical development within the Highway 30 corridor of bio-related facilities.

For additional information on how we can partner with you and your business needs, contact us at (515) 382-1774 or [iec@iastate.edu](mailto:iec@iastate.edu)

#### PROJECT SUPPORT

- Pre-commercial anaerobic digestion, biodiesel, thermal gasification, and supercritical fluid units
- Industrial-scale utilities, equipment, and tools
- On-site support for facility maintenance and safety

#### FACILITY INFRASTRUCTURE

- 22,000 sq. ft. of high-bay, laboratory, office, and conference room space
- Large parking lots and lay-down areas

#### UTILITIES

- 480-volt, 3-phase electricity
- Natural gas
- City water/sewer
- Cooling tower water
- 150 psi steam
- 110 psi compressed air
- 250°F process hot water/glycol



# SUCCESSSTORIES

HOW BECON IS WORKING FOR THE STATE OF IOWA



## ► Frontline BioEnergy, LLC.

*Building on a process that converts biomass into combustible gas*

In 1995, Robert Brown, director of the Bioeconomy Institute at Iowa State University, and his research team began early thermal gasification research and development at the BECON facility with the support of a \$169,584 grant from the Iowa Energy Center. Ten years after the original Iowa Energy Center project, Jerod Smeek teamed up with other members of Brown's research team to form Frontline BioEnergy, LLC. They partnered with Iowa State University and the Iowa Energy Center to perform thermal gasification research at BECON. "Having an operating, pilot-scale gasifier at BECON really helped us close the deal," Smeek said.

Capitalizing on the thermal gasification success, Frontline built its next-generation TarFreeGas® system at BECON in 2013, which creates a better quality syngas that can be used to make products or fuels. In April 2013, the U.S. Department of Energy (DOE) announced it would invest \$4.2 million in Frontline's TarFreeGas® gasification technology. In addition to the DOE-funded project, Frontline will continue working at BECON to demonstrate integration of its TarFreeGas® technology for methanol synthesis to make renewable methanol.

## ► MycoMeal

*Using fungus to improve ethanol production*

Iowa State University researchers Hans van Leeuwen, Vlasta Klima Balloun, and their research team started the development of MycoMeal at BECON. MycoMeal is a process that uses a fungus to improve the efficiency of ethanol production and creates a viable co-product for the ethanol industry. Their research was supported by a three-year, \$412,669 grant from the Iowa Energy Center.

After the initial pilot-scale research and development at BECON, it was determined that they were ready for the next phase—directly demonstrating how MycoMeal could use fungus to remove hazardous materials in thin stillage, making the waste stream recyclable, and harvesting the fungus as a protein-rich animal feed. In July 2013, Van Leeuwen began additional research, building off of the MycoMeal project that focused on recovering oil from fungi to make fuel. The project is funded in part by an Iowa Energy Center grant for \$181,072. "Working on our project at BECON was wonderful; the facility and staff were helpful in demonstrating the MycoMeal research to individuals, politicians, industries, and potential investors from all over the world," said Leeuwen.

## ► Innovative Energy Solutions, Inc.

*Converting industrial waste into fuel*

Innovative Energy Solutions, Inc. (IES) was founded by Iowa State University professor Atul Kelkar, who developed a pilot-scale technology at BECON that converts waste hydrocarbons into transportation fuels. The technology has great potential to benefit the environment by using wastes such as plastics, refinery residues, and used oils to create alternative diesel fuel. Additional investments have allowed Kelkar to hire Iowa State graduate students and continue scaling up the technology at BECON.

After concluding the original research, Dr. Kelkar built on his findings and began collaborating with Iowa State professor Zianglan Bai to research how mixed municipal solid wastes can be directly converted to fuel using the IES conversion technology. In support of this work, the Iowa Energy Center granted the team a \$130,000 award.

## ► Catilin, Inc.

*Using BECON to redefine its biodiesel production technology*

After researching solid biodiesel catalysts as doctoral students at Iowa State University, Jennifer Nieweg, Carla Wilkinson, and Yang Cai began their own startup company, Catilin, Inc. In 2008, the co-founders scaled-up Catilin's bench-top research to the pilot scale at BECON, with the goal of demonstrating how a solid catalyst could convert low-cost oils into biodiesel fuel. The process not only created a renewable fuel, but also did so in a safe, cost-effective, and environmentally conscious way.

In May of that year, Catilin's proprietary catalyst, process, and team were acquired by Albemarle Inc., a Louisiana-based specialty chemical company. Albemarle's resources provided the capital necessary to hire full-time staff and focus on the final development processes at BECON. Today the team is bringing the process, now known as GoBio T300, into full commercialization through business development and marketing at Albemarle. The process has already been successfully implemented statewide and internationally.