

consumption, thanks in part to Coskata's "next generation ethanol" process based on OSU research and technology. Independent research conducted by the U.S. Department of Energy showed Coskata's process compared to conventional gasoline can reduce carbon dioxide emissions by as much as 84 percent.

Biodiesel Benefits

Each year, U.S. livestock slaughter facilities alone produce about 2.5 million tons of tallow from cattle and about 0.5 million tons of lard from hogs. Biodiesel can be processed from animal fats and plant oils. It has a very positive net energy gain. Current OSU research is focusing on oil seed production, oil conversion and which fats, oils and greases are most beneficial to supporting a sustainable biodiesel industry. Much of the research is being conducted through DASNR's Robert M. Kerr Food and Agricultural Products Center.

Down on the Farm

Sorghum-related biofuels research is taking a localized approach with the aim of making possible the effective production of ethanol in the farmer's own field. Sweet sorghum provides high biomass yield with low irrigation and fertilizer requirements. The OSU Biofuels Team is working to determine the maximum possible harvest window for sweet sorghum in Oklahoma as well as environmental parameters that may affect the feasibility of on-farm fermentation.



Thermo Tolerant Yeast

OSU scientists are working to enhance enzymatic conversion of cellulosic materials, the major combustible component of non-food energy crops. Researchers currently are investigating the best conditions for use of the



Kluyveromyces marxianus IMB4 yeast strain in maximizing ethanol production from various cellulosic feedstocks. The thermo tolerant yeast strain is allowing researchers to "crank up the heat" and increase biomass-to-ethanol conversion efficiency.

Fast Facts about OSU Biofuels

OSU, the University of Oklahoma and the Samuel Roberts Noble Foundation form a three-way partnership that is the foundation of the \$40 million Oklahoma Bioenergy Center established by Gov. Brad Henry in 2007.

DASNR is utilizing \$10 million in special legislative appropriations toward the development of Institute for Agricultural Biosciences in Ardmore, part of the Division's statewide Oklahoma Agricultural Experiment Station system.

OSU is the South Central Regional Center for the national Sun Grant Initiative, established to create new solutions for America's energy needs and revitalize rural communities. The South-Central Region provides funding to scientists and engineers at land-grant universities in Oklahoma, Texas, Louisiana, Arkansas, Missouri, Kansas, Colorado and New Mexico.

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Biofuels Research at OSU



Oklahoma Agricultural
Experiment Station

Division of Agricultural Sciences
and Natural Resources

Oklahoma State University

Introduction

An interdisciplinary team at Oklahoma State University and cooperating institutions will potentially revitalize rural areas in Oklahoma and beyond by creating new ethanol production practices that will enhance and strengthen the state's multi-billion-dollar energy industry.

The OSU Biofuels Team is a multi-college, multi-institutional effort, with the current team encompassing scientists and engineers within the OSU Division of Agricultural Sciences and Natural Resources; the OSU College of Engineering, Architecture and Technology; the University of Oklahoma; and Brigham Young University.



Our system is unique in that we can utilize switchgrass, other grasses, crops, and associated cellulosic residues in ways that do not compete directly with agricultural food, feed or fiber needs; our scientists focus on cost-effective environmentally sustainable production practices that help reduce the nation's dependence on foreign oil.

Robert E. Whitson
Dean and Director, DASNR
Vice President of Agricultural
Programs at OSU

Bioenergy Thrusts

Research being conducted by the OSU Biofuels Team involves the study of several promising biomass-to-ethanol pathways. Support comes from the Oklahoma Agricultural Experiment Station, other DASNR and university funding allocated by the state legislature through the Oklahoma Bioenergy Center and external sources such as the U.S. Department of Agriculture, U.S. Department of Transportation and national Sun Grant Initiative.

Feedstock Development

The OSU Biofuels Team is examining the sustainable bioenergy potential of numerous lignocellulosic feedstocks, from straw and woody materials to sorghum, switchgrass and many other varieties of natural grasses. Prime benefits of these energy crops are that they could be produced on underutilized lands, have lower input requirements and are naturally adapted to specific, wide-ranging but still local environmental conditions.

Gasification-Fermentation Conversion Technology

In this thermochemical process, carbon materials are converted into synthetic gas using gasification technologies. After the chemical bonds are broken, microorganisms patented by the OSU Biofuels Team convert the resulting syngas into ethanol. The beauty of the OSU sys-



tem is that for every 1 unit of energy put into the process, more than 3 units of energy are returned. Traditional corn-based ethanol production provides 1.6 units of energy per 1 unit of energy input.

Coskata Inc., which is a national biology based renewable energy company, and automotive giant General Motors made international news in January 2008 when they announced their cooperative plans to reduce fossil fuel



Biomass

(1) Gasifier

(2) Cleaning & Storage

(3) Bioreactor

(4) Distiller

Ethanol & Other Products