



# MICROBAL CONDITIONING AND PRETREATMENT TO CONVERT GRASSES TO ETHANOL AND LIGNIN ADHESIVE

**Cellulosic Alcohol to Supplement Grain Alcohol:** For centuries, people have fermented sugars from grains into alcohol. Recently, this industry has rapidly grown to produce fuel-grade ethanol. As the demand for ethanol continues to grow, we will also see greater production of “cellulosic” ethanol from biomass such as corn stalks, hay, or wood. These all contain cellulose - a chain of glucose molecules. An aromatic polymer, called lignin acts like a wrapping on a cable to shield the chains of cellulose.

**Lignin presents both a problem and an opportunity:** It stiffens the plant and protects cellulose from decomposition. While beneficial to plants, this chemical resistance inhibits conversion of biomass to ethanol and other chemicals. Its complicated structure has limited lignin’s commercial use. To remove it, pretreatments using acids require expensive stainless steel equipment, but yield a low value product that is burned in boilers. The opportunity is that successful production of bioethanol will involve processing large amounts of lignin. Our aim is to simply and economically remove the lignin as an inhibitor to conversion and recover it in a higher quality form useful for value-added products.

**University R&D Through the MTA Strategic Biomass Initiative:** Investigators at The University of Mississippi are working with scientists and engineers at the other comprehensive universities in the state to develop processes and products using biomass. The Ole Miss project on “Microbial Conditioning and Pretreatment of Biomass for Lignin Co-Products” is supported by the US Department of Energy through the Mississippi Technology Alliance Strategic Biomass Initiative (MTA-SBI).

**The Project Combines Many Disciplines:** UM biologists and graduate students have selected and cultured bacteria. Dr. Charles Burandt, a botanist with the Center for Natural Products Research, is growing switchgrass, sudan grass, and *Miscanthus* as biomass feedstock. UM Chemical Engineering graduate students working with Dr. Clint Williford are applying bacteria to “soften up” the biomass. They follow this with enzymatic conversion of the cellulose to see if the bacteria made the biomass easier to breakdown. Likewise, two industrial partners, American Biorefining and MBI International are applying their advanced pretreatment technologies to more effectively

free the cellulose for conversion. UM Chemical Engineers will assess the combined effects of microbial conditioning and pretreatment. They will also separate the lignin for analysis by Dr. James Rawlins of the Thames-Rawlins Polymer Science Group at The University of Southern Mississippi. He will assess the lignin for use in adhesives and polymeric binders by Mississippi industries making engineered wood products such as plywood.

Project success will provide three major benefits: first, use of a biomass readily grown in Mississippi will support a new segment of the agricultural economy; second, reduced capital costs and simplified operations will allow processing closer to the farm, and shift income to local economies; and third, enhanced production of not one, but two, product streams – ethanol as a gasoline additive in Mississippi, and a lignin co-product useful for adhesives by Mississippi industry.

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# PRESIDENT'S MESSAGE



This is shaping up to be a great year for the Mississippi Biomass Council and I am really excited to be a part of the flurry of activity. The MBC successfully co-hosted the

First Annual Biodiesel Workshop on August 24, 2006 on the campus of Mississippi State University and we had over 200 individuals registered for this event. There was standing room only at the Bost Conference Center Auditorium as Dr. Foglesong, President of MSU, and Marie Thomas, Legislative Assistant for Senator Thad Cochran opened this full day workshop. I want to convey a special thanks to Stuart Dean, MBC Treasurer, and his team at MSU Industrial Outreach Service, for making the MBC website available for all activities related to the Biodiesel Workshop including on-line registration and maintaining full details about the day's program. Dr. Rafael Hernandez, MSU Chemical Engineering faculty member, was the main driving force behind this workshop.

This event is an excellent example of how the Biomass Council can achieve



L to R: Sumesh Arora, Bonnie Raitt, Lauren Michaud

success by partnering effectively with many other groups to promote biomass related activities. Keeping in line with the mission of getting the word about

biomass to the general public, we quickly acted upon a unique opportunity that presented itself recently. I was contacted by [Reverb Rock](#), to come and display a booth during Bonnie Raitt's concert at the Thalia Mara Hall in Jackson, MS on September 26, 2006. As some of you may already know, Bonnie Raitt is among a handful of highly recognizable celebrities who use biodiesel in their tour buses and trucks, and she mentioned that during her performance that night.

Lauren Michaud, business analyst with the Mississippi Technology Alliance, and I gathered up our biomass paraphernalia (handouts, posters, etc.) and the big MBC sign and we set up the booth for



MBC/MTA booth display at the Bonnie Raitt concert

about five hours during the concert. While Bonnie's troop was on stage, her vehicles were being filled with B99 biodiesel by Kirk Dickerson, President of Dickerson Petroleum, a biodiesel and fuel distributor based in Kosciusko, MS. Tim Sallee, who is the lead bus driver for the Band, told me that "**Bonnie Raitt does not put biodiesel in the buses for publicity, but she uses biodiesel because it is the right thing to do.**" Although it is not everyday that we get such high profile acts come through Jackson, such opportunities are a great way to inform the public about the value of home grown fuels. I salute Bonnie Raitt in going the extra "mile" to use and promote biodiesel while touring the country.

We are in the thick of planning next

year's Sixth Annual Southern Bio-Products Conference show which be held once again at the Golden Moon Casino at the Pearl River Resort in Choctaw, MS from April 16-18. We hope to attract a broader



Bonnie Raitt's tour vehicles being refueled by B99 biodiesel

audience at next year's conference by highlighting some of the success stories in the biomass industry and encourage a greater representation from the industry and commercial enterprises, while still keeping the research base to showcase the latest technological improvements and products that are on the horizon. My goal is to have representation from about a 10-state region at the minimum, truly making it a "Southern" event. We need to reach out to a broad spectrum of individuals working in plant and animal agriculture and forestry, the energy generators and distributors, and companies and service providers in the bio-based products industries.

I am looking forward to the exciting events that the MBC is working on this year and urge all those who receive this newsletter to support the MBC by becoming members. Please contact me at [sarora@technologyalliance.ms](mailto:sarora@technologyalliance.ms) or 601-960-3659 if you have questions, comments, or suggestions on how we can serve the biomass community in the region better.

# *MSU DEVELOPING ENERGY SYSTEM FOR RESIDENTIAL, AG AND COMMERCIAL USES*

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Starkville, MS.--Mississippi State will use a new federal grant of nearly \$1 million to develop an alternative energy production system for use in residential, agricultural and small commercial buildings.

The U.S. Department of Energy is channeling a grant of \$962,000 to the university's Micro Cooling, Heating and Power, and Bio-Fuel Center. The federal agency previously provided \$3.8 million for the program, which was established in 2004.

"The grant will allow researchers to develop a CHP system to be used in residential or small-building application," said mechanical engineering professor Louay M. Chamra, leader of the university's Micro-CHP research program.

Chamra said the initial system will consist of a vapor compression cooling system will consist of a vapor compression cooling system powered by a propane or natural gas-driven generator, with waste heat recovery for hot water and heating. He predicted a small commercial CHP system delivering less than 15 kilowatts of electric power could be available within two or three years.

"This system will be packaged as one unit to be used in a residential home or on a small farm," said Chamra, who earned a doctorate in mechanical engineering from Pennsylvania State University in 1992 and joined the MSU faculty

in 1996. "Fifteen kilowatts is more than enough for most houses."

Combined cooling, heating and power is a promising technology for increased energy efficiency through the use of distributed electricity generation and waste energy recovery systems at or near end-user sites. Waste energy from the power production is used to provide the cooling, heating and hot water/steam needs for the site.

Chamra said CHP systems are expected to promote energy reliability and self-sufficiency for many large institutional, industrial and agricultural applications, while also providing energy security during disasters. He said the systems are designed to be environmentally friendly by reducing greenhouse emissions.

"We continue to benefit from the computer and information systems technology revolution in which Mississippi State is a research leader," U.S. Rep. Chip Pickering, R-Miss., said in announcing the latest DOE grant.

"But the next innovations that will shape our world involve alternative energy production and conservation, and Mississippi State's reputation and results in this field is making it a known quantity in the energy research community," he added.

The Micro-CHP and Bio-Fuel Center at MSU is a joint campus effort among the departments of mechanical engineering and agricultural and

biological engineering, Swalm School of Chemical Engineering and Mississippi Agricultural and Forestry Experiment Station. The center's work focuses on demonstration, education and research.

The biomass generated in the region is a candidate energy source to fuel different types of engines for CHP systems. Bio-fuels can be produced from sources such as animal wastes and wood by-products.

"The overall aim of the center's bio-fuel research is to develop liquid or gaseous fuels for micro-CHP systems," Chamra explained. "To accomplish this goal, developmental tasks include identifying and characterizing biomass materials, optimizing gasification processes, and enriching bio-fuels made for micro-CHP systems.

"Thus, micro-CHP systems may expand the growing biomass-based economy in Mississippi and the Southeast," he added.

Chamra is a research specialist in the areas of heat transfer enhancement, heat exchangers, boiling and condensation, refrigeration, and process equipment.

For more information, contact Dr. Chamra at 662-325-0618 or [chamra@me.msstate.edu](mailto:chamra@me.msstate.edu).





# OCTOBER 2006 ENERGY AWARENESS MONTH

The State of Mississippi marks **Energy Awareness Month** by promoting energy efficiency and renewable energy in the state's private and public sectors through field days, workshops, conferences and energy demonstrations. Participants receive awareness materials and efficiency education that conveys the message that smart energy choices, including the use of energy efficiency and renewable energy technologies, expand our energy supply, create a healthier environment, support our economy and increase national security.

## SCHEDULE OF EVENTS

### OCTOBER 4 - 10AM - 3PM

#### CHANGE A LIGHT: CHANGE THE WORLD CAMPAIGN KICK-OFF

USDOE, EPA, HUD and MDA - Energy Division partner

**Location:** Woolfolk State Office Bldg, first floor lobby and McCoy Federal Office Building, first floor lobby, Jackson MS

**Contact:** *Janis Hill*

### OCTOBER 6 - 10AM - 1:30PM

#### RENEWABLE ENERGY DAY

MDA Energy Division partners with sponsors: TVA, Entergy, ATMOS Energy, Chevron, MS Dept of Transportation and MS Soil &

Water and with Conservation Buddies: MS

Natural Science Museum and Hinds County Soil and Water.

Event will highlight renewable energy sources with fun, games, and educational displays for children of all ages.

**Location:** MS Agriculture and Forestry Museum, Jackson, MS

**Contact:** *Lisa Campbell*

### OCTOBER 14

#### DISPLAY BOOTH ON ENERGY CONSERVATION

For participants in health screening

**Location:** Greater Meridian Health Clinic, Meridian, MS • **Contact:** *Janis Hill*

### OCTOBER 16-17

#### PARTNERING FOR SUCCESS WEEK - FEATURES INDUSTRIES OF THE FUTURE

#### BEST PRACTICES WORKSHOP ON BOILER AND STEAM TRAINING

Designed for technicians in the field

**Location:** Grand Casino Resort, Tunica, MS • **Contact:** *Betty Norman*

### OCTOBER 17-19

#### PARTNERING FOR SUCCESS WEEK - FEATURES THE MS ENERGY

#### COORDINATORS ASSOCIATION CONVENTION AND EX-

### POSITION

Plenary and breakout sessions, exhibitors, energy efficiency demonstrations, gala dinner with entertainment, State Energy Management Program awards & door prizes!

**Contact:** *Angelica Rawls or Jim Becker*

### OCTOBER 23-24

#### PRESENTATIONS AT THE MS SCIENCE TEACHERS ASSOCIATIONS MEETINGS

Energy Patrol and the National Energy Education Development (NEED) Programs.

**Contact:** *Lisa Campbell*

### OCTOBER 24 and 26

#### ENERGY EFFICIENCY BROWN BAG LUNCHES

To be announced

### OCTOBER 25

#### NEED WORKSHOP FOR TEACHERS

**Location:** Columbus, MS • **Contact:** *Lisa Campbell*

# MBC COMPANY SPOTLIGHT

## Environmental Support Services, Inc.

Environmental Support Services, Inc. (E.S.S.I.) is a Mississippi corporation owned by Thomasene Wilson and operated by Byron Wilson. The Houston, MS based company offers environmental services to swine operations in Mississippi and Alabama. These services include water and soil sampling, on-farm inspection and completing the required Mississippi Department of Environmental Quality (MDEQ) or Alabama Department of Environmental Management (ADEM) paperwork. This allows swine operators to meet the required data standards set forth in their state permit.

E.S.S.I. also offers a full line of design services for swine water application. This includes a waste water pump, underground lines and dispersal equipment, in other words, a complete application field design package to meet regulatory requirements of the MDEQ, ADEM, or the United States Department of Agriculture Natural Resources Conservation Service (USDA – NRCS) requirements.

E.S.S.I. also conducts third party chemical and laboratory testing for companies wishing to have products tested, which allows them to present their products with unbiased results. While small, this corporation offers a wide range of services by networking with other Mississippi corporations. Many of these associations were made through an active participation in the Mississippi Biomass Council. Byron has been a member of the Mississippi Biomass Council since its inception almost seven years ago and currently serves as the Vice Chairman of the Board of Directors. For additional information on E.S.S.I., please call 662.456.5362 or 662.456.6748 or email at [wchicocreek@aol.com](mailto:wchicocreek@aol.com)

“Specializing in waste management service and sampling”

# SAVE THE DATES

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## NATIONAL WORKSHOPS/CONFERENCES/MEETINGS

- **Advancing Renewable Energy Conference: An American Rural Renaissance** will take place on *October 10-12, 2006* at the America's Center in St Louis, MO. <http://www.technologyforums.com/6EN/index.asp>
- **Association of State Energy Research and Technology Transfer Institutions (ASERTTI)**, Annual Meeting will be held on *October 16-19, 2006* in Cocoa Beach, Florida. <http://www.asertti.org>  
Sumesh Arora, President of the Mississippi Biomass Council and Director of the Mississippi Technology Alliance - Strategic Biomass Initiative (SBI) will be giving a presentation at the (ASERTTI) meeting on October 18, 2006 in Cocoa Beach, Florida. Arora was invited by ASERTTI Executive Director, David Terry, to discuss the activities of the SBI that are focused on facilitating the commercialization of biomass technologies and involve building relationships between the universities and the industry and other vital stakeholders such as the Mississippi Biomass Council.
- The BBI Biofuels Workshop & Trade Show Series is now being held annually on each coast: **Eastern Region:** *October 30-November 1, 2006 in Nashville, TN at the Gaylord Opryland Resort & Convention Center*  
**Western Region:** *November 27-30, 2006 in San Diego, CA at the Manchester Grand Hyatt*  
BBI Biofuels Workshop & Trade Show Series, a spin-off of the world-renowned International Fuel Ethanol Workshop & Expo held annually in the Midwest, continues to focus on near-term development of commercial-scale ethanol and biodiesel production, and provide information and expertise that specifically target regional challenges and opportunities for further development of the biofuels industry. <http://www.bbibiobiofuels.com>
- **Cellulosic Ethanol Summit: Integrating Communities in the Value Chain to Build a New Industry**, will take place on *November 13-15, 2006* in Washington, DC. <http://www.infocastinc.com/cell06.html>

## MISSISSIPPI WORKSHOPS/CONFERENCES/MEETINGS

- **Breakfast with an Innovator** will be held on *Wednesday, October 11, 2006*, 8:00 a.m.-9:15 a.m. at the Edison Walthall Hotel, 225 East Capitol Street in Jackson. Featured Speaker is Dr. Randy Goldsmith, President and CEO, Mississippi Technology Alliance. Randy has written, trained and practiced extensively nationally and internationally in innovation-based economic development. Registration is \$10 per person. To register, please visit <http://www.technologyalliance.ms/innovator-event.php>.
- **MS-FAST will hold a two day SBIR/STTR Workshop on the Mississippi State University (MSU) campus**, Starkville, MS, on *October 12<sup>th</sup> - 13<sup>th</sup>*. Location of the workshop will be the auditorium (Rm. 115) of the [Franklin Center](#) (Dept. of Forrest Products). This workshop is FREE and lunch will be provided on day one. The first day of the workshop will consist primarily of a proposal writing seminar. The featured speaker for Day 2 of the event will be Dr. William Goldner, National Program Leader with the [USDA SBIR Program Office](#). Dr. Goldner oversees the Renewable and Alternative Energy Funding Opportunities within the USDA SBIR Program. Other segments of the conference will include an overview of the federal SBIR/STTR programs, MSU resources and capabilities and partnering opportunities that may support an SBIR/STTR project, and non-SBIR/STTR R&D opportunities and seed capital funding resources. Information will also be presented on the MS-FAST Phase 0 Program and how to apply for Phase 0 assistance (\$3,000) to support a company's Phase 1 proposal development efforts.
- **Technology Expo:** *On October 17, 2006*, the Rankin County Chamber of Commerce and Hinds Community College will hold a Technology Expo on the Hinds Community College campus in Pearl from 8:30 a.m.-2:30 p.m. The purpose of the expo is to promote careers in technology to Rankin County High School students.
- **Mississippi Forestry Association Annual Meeting** will be on *October 26, 2006* in Jackson, Mississippi. Value of using forest derived biomass, such as post-harvest wood waste, for generating energy will be some of the topics discussed at the meeting. For more information visit [www.msforestry.net](http://www.msforestry.net)
- **The Seventh Annual Conference on High Technology** will be held on December 5th & 6th, 2006 at the Mississippi TelCom Center in Jackson. The all new Conference on High Technology kicks off with registration and a continental breakfast at 7:30 followed by a general session and two back-to-back breakout education/training sessions on five tracks – Companies, Capital, Communities, Clusters and Communications. The Mississippi Biomass Council is a proud sponsor of the conference and will be hosting a booth during the event. For more information visit [www.technologyalliance.ms](http://www.technologyalliance.ms)

# 6TH ANNUAL SOUTHERN BIOPRODUCTS CONFERENCE

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**THEME: "SUCCESS STORIES IN AN EMERGING INDUSTRY"**

The Mississippi Biomass Council presents the Sixth Annual Southern Bioproducts Conference, April 16-18, 2007, at the Golden Moon Hotel and Casino in Choctaw, Mississippi.

The biomass climate is one of growing importance, both internationally and at home. Here in Mississippi, we have the natural resources, research capability, and community support to capitalize on the growing demand for alternative and renewable energy and fuels, and environmentally-friendly products.

This year's conference will highlight past successes in the biomass arena. Topics of discussion will include industry & commercialization, policy & legislation, business & financing, and research & development.

The conference agenda will also feature several relevant speakers, from industry and academia, at the national, state, and local levels, including a luncheon with a keynote speaker. There will also be numerous opportunities for networking, including a reception on the evening of April 16, 2007.

There will also be a student research poster competition, with cash prizes. Additionally, the Mississippi Biomass Council will award the Second Undergraduate Biomass Studies Scholarship, in the amount of \$1,000 towards a student's tuition.

Be sure to watch the Mississippi Biomass Council's website for the updated conference information! <http://ms-biomass.org>

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## **Mississippi Biomass Council**

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*This newsletter is published by the Mississippi Biomass Council. Compiled and Edited by Elizabeth Myles.*

*Individuals who wish to submit articles, opinions, commentaries, etc. please send to [emyles40@hotmail.com](mailto:emyles40@hotmail.com)*

*"Partial funding for compilation of this newsletter has been provided by the United States of Department of Energy*

*Grant # DE-FG36-05GO85002."*



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