

November 2010 Issue

PENNSSTATE



Cooperative Extension  
Renewable and Alternative Energy



## ENERGY UPDATE

November, 2009

### IN THIS ISSUE

Biomass Heating Workshop  
Flax - A Potential Energy Crop  
Anaerobic Digester Display  
Economics Depend on Market Basics  
On the Issue of Wood Co-firing of Coal-Fired Power Plants  
Eco-Clean Burners

### UPCOMING EVENTS

Biomass Heating Workshop  
17-18 December, 2009 at Clearfield  
County Career and Technology Center.  
register online at  
<http://www.pafuelsforschools.psu.edu>

Biomass CHP and Thermal  
Systems Short Course  
17-18 March at Penn Stater Hotel and  
Conference Center, State College,  
PA. see <http://www.bioenergy.psu.edu/shortcourses/chp2010.html>

### WELCOME!

Another heating season is upon us, oil has risen about \$40/barrel since spring, and energy costs are again resurfacing as an issue. The need for new feedstocks and careful life cycle analyses of existing feedstocks has become critical. In this issue, we showcase some of the work we have been doing on novel feedstocks: new crops, plastics, and woody biomass. We also discuss some of the issues with the development of the woody biomass resource and some of the issues that need to be overcome for local use of biomass in combined heat and power projects. We have updated our newsletter schedule to once every two months.

Sincerely,

Greg W. Roth  
Program Leader  
Renewable and Alternative Energy  
Penn State Cooperative Extension

## Biomass Heating Workshop

### Analyze buildings for their potential

Biomass heating is an exciting opportunity that has been growing in popularity in Pennsylvania and beyond. More and more schools, offices, hospitals, and businesses have been taking advantage of the benefits of biomass heat - low fuel cost, renewable, locally produced fuel, reduced emissions and ecological benefit.

On 17-18 December, the PA Fuels for Schools and Beyond Working Group, in conjunction with Penn State Cooperative Extension and USDA-RCND, is offering a special "technical training" that will give attendees the skills needed to

## LINKS

[PSU Renewable & Alternative Energy](#)

[Coping with High Energy Prices](#)

[Biomass Energy Center](#)

analyze a building to assess whether or not it is a good candidate for a biomass heating system.

The workshop will be held in Clearfield, PA, and will include both classroom-style training and a visit to a working biomass heating facility. Thanks to several sponsorships and volunteer efforts, The cost is only \$10. Registration details are available on the internet at <http://www.pafuelsforschools.psu.edu>

Dan Ciolkosz, Agricultural and Biological Engineering Department

## Flax - a Potential Energy Crop

### Experiences at the Penn State Energy Crops Display Site

The 2009 Bioenergy Crops Display at Penn State included trials of several unusual crops that are not commonly grown in this area. This month's article focuses on our experiences this year growing flax. In the 1940's there was a reported 2 million acres of flax being grown in the United States. At that time, flax was being grown primarily for fiber and linseed oil. Currently, there is very limited acreage dedicated to flax production in the U.S. with most being grown in Minnesota and Wisconsin.



On May 12, 2009 an acre within the energy crops display field was planted using no-till methods with brown flax at a seeding rate of 40 lbs/acre. Germination was rapid and the crop quickly produced a thick canopy that effectively competed with weeds. The crop grew to a height of 30 to 36 inches and produced a pale blue flower. It is interesting to note that the flowers follow the sun in the morning, much like sunflowers, until midday when the flax flowers close until the following morning. The seed was produced in a capsule or boll, each containing 8 to 10 seeds. The crop was harvested at 12% moisture on September 15, 2009 using a combine. The seed separated easily from the stalk but the stalk tended to wrap on the reel of the combine, forcing the operator to stop and clear the stalks from the reel once during the harvest operation. Flax stems are very fibrous and wire-like when compared to small grain stalks. From the one acre plot there was 12 bushels of seed produced. Typical yield reported from Minnesota ranges from 10 to 20 bushels/acre. Our plan is to press the flaxseed to extract the oil. The expelled flax meal should have a crude protein content of about 35%. Flaxseed is gaining popularity for human consumption with a retail value of up to \$3 per pound.

Our goal for 2010 is to grow 2 to 3 acres of flax and try to obtain a yield of 15 bushels or higher, as well as to gain more experience with combine setup and harvesting.

Don Rill, Agronomist/Research Technician, PSU Farm Services

## Small Scale Anaerobic Digester Display

### Turning cow patties into biogas!



One of the many highlights of Penn State's recent Ag Progress Days (APD) was the Agricultural and Biological Engineering Department's display of a small, working anaerobic digester. The 30 gallon digester is fed about 1 gallon of dairy manure per day and produces biogas that is burned to keep the digester heated. This "smaller" digester is ideal for showing the basic principles of on farm digestion as well as illustrating design considerations for full-scale systems. The designer/builder/operator, Patrick Topper, is a graduate of the department and was on-hand to answer questions about farm-based anaerobic digesters. When it is not being placed on display, the digester is used for feedstock tests and research experiments that investigate ways to improve digester operation and productivity.

Digesters are an important way that Pennsylvania farms can improve their operations by generating "green" electrical power. You can learn more at Penn State's biogas website, [www.biogas.psu.edu](http://www.biogas.psu.edu), which provides information about types and uses of digesters, farm digester case studies, links to other digester related sites, and PA specific items such as Net Metering, Energy Portfolio Standards, and cost share revenue sources.

Patrick Topper, Agricultural and Biological Engineering Department

## Economics Depend on Market Basics

### Greensburg CHP Plant Tour



Like the age old question, "What came first the chicken or the egg?" markets for renewable energy can be hung up by a very similar quandary. If renewable energy projects, in particular biomass, need to establish a long term production history to eliminate the risk of entering the fuel supply market, who will build the first combustion system or who will commit to providing the supply? What comes first, a robust supply of low cost renewable biomass energy or the plant capacity and a willing buyer of heat and electricity waiting for the supply to become available?

To raise awareness to this challenge and learn of steps Cooperative Extension in Westmoreland County is taking to find an answer, Penn State College of Ag Sciences Dean Bruce McPheron and other key administrators paid a visit to the Greensburg Thermal plant located next to the State Correctional Institute at Greensburg. Greensburg Thermal sells heat and offsets electricity purchases for the prison using a high tech circulating fluidized bed combustion system that normally burns waste coal. Because of the clean burning design of the system introducing alternative fuels like woody or agricultural biomass in combination with waste coal will likely improve air emission characteristic and qualify a percentage of the electricity production for participation and the State's Alternative Energy Credit program.

During the week of November 22, 2009 a test burn is schedule at the plant using switch-grass in combination with the normal fuel. The test will prove the ability of the plant to utilize renewable fuels while maintaining the required heat output and while also improving the overall air emissions. The goal at the conclusion of the test will be to modify the plant's air permit.

The plant tour conducted for Dean McPheron and the tour participants by plant owner/operator David Goldsmith included a walk-through of the various plant components including the fuel storage, feed system that have been modified to handle the different qualities of renewable fuel s, the combustion boiler and the sophisticated air flow controls that suspend fuel on a cushion of air during combustion, as well as the particulate management and disposal system.

The tour also included a discussion of the challenge of tying all the business aspects of transitioning to renewable fuels while maintaining profit margins that can be achieved when using only low cost environmentally inferior fuel like waste coal. Tied to this discussion was a need to continue research and development in the area of pre-combustion fuel preparation and handling.

The plan following the test will be to identify potential sources to meet the plant needs for renewable fuel and phase in the supply for the long term. This will present new opportunities to convert existing facilities and develop new locations that will continue the growth of demand for this clean, carbon neutral fuel source to displace traditional fossil based fuels like coal, oil, and natural gas.

[Ed Johnstonbaugh, Extension Educator, Westmoreland County](#)

## On the Issue of Wood Co-firing of Coal-Fired Power Plants

### Best use of Woody Biomass?

Researchers in Penn State's School of Forest Resources have analyzed the possibility of wood co-firing of coal-fired power plants for the potential impact on the forest resource of the Northeastern United States. If wood co-firing of existing power plants reaches an average of 2 percent by BTU value across the region, the impact is relatively minor - only Ohio, Pennsylvania, West Virginia and Maryland would see a resource impact of more than one million green tons annually. However, once wood co-firing reaches a level of 3 percent, the impact on wood demand in Maryland (1.9 million green tons), Ohio (8.0 million green tons), Pennsylvania (7.0 million green tons), and West Virginia (5.0 million green tons) begins to reach a level where co-firing facilities will negatively impact the competing wood-using industries and potential future energy projects.



Therefore, the potential impact of policy incentives pushing wood co-firing of existing power plants have obvious shortcomings, especially if they result in co-firing these facilities over 5% BTU basis, on average. If utilities are incentivized to tap into the woody biomass resources of different regions, and enabled to pass the fuel cost increases associated with higher demand for woody biomass on to customers through legislation, they will be in a position to out-compete other woody biomass users, both in the existing wood-using industries and in any future wood-energy alternative industries. The inefficiencies in the generation of electricity by co-firing with wood also should be considered; power generation in power plants typically achieves less than 30% efficiency, which will be decreased with the introduction of wood into the feedstock; while combined heat and power (CHP) plants, for instance, can typically achieve energy efficiency of 60%. Energy efficiencies of smaller district heating systems, such as those promoted by the various [Fuels for Schools](#) programs in the states, can be even higher. And it is important to note that as the size of these projects decreases, the more efficient they become in term of biomass logistics and the energy consumed by moving the wood to the conversion facility.

For the full Penn State Extension TechNote, visit <http://woodpro.cas.psu.edu/TechNotes.htm>.

[Charles D. Ray, Associate Professor, School of Forest Resources](#)

## Eco-Clean Burners Seek to Market Quality Plastic Fuel

### Project Will Create New Jobs

Plastic can be recycled. However, one does not have to look too far to notice that not all plastic ends up in the recycling bin. Enter Eco-Clean Burners, a new company that will market a plastic-fueled boiler system for heating buildings.



Additionally, the new company will manage a plastic fuel collection, processing and quality control system designed to sell the fuel with the burner.

John Shea, Jr. of the Penn State's Allegheny County Cooperative Extension, is the leader of a team that has the goal to change the way we, as a society, view plastics. "I want to stress after plastics have served their intended purpose, our researchers feel the best way to recover value is to recycle them," notes Shea. He continues by adding, "But if the plastic items cannot be recycled for one reason or another, let's begin thinking about reclaiming the energy locked inside those hydrocarbon molecules."

Eco-Clean Burners is a new venture founded in the Greater Pittsburgh region of Pennsylvania. The company's goal is to market a plastic-derived fuel water heating system for heating greenhouses and other structures. Eco-Clean Burners will assure that all plastic fuels they sell will meet rigid quality standards, thus guaranteeing the highest operating efficiency with minimal air emissions from these hot water heating systems.

Incidentally, Eco-Clean Burners will create approximately 54 new jobs as part of its social mission to employ disadvantaged individuals from within the region.

Penn State's role is to help promote the concept of using non-recycled and non-recyclable plastics in a safe and environmentally friendly fashion. "Our role is also to help assure that jobs are retained in Pennsylvania," Shea added.

Eco-Clean Burners has been established to provide business opportunities initially in Allegheny County, Pennsylvania, and eventually for the entire United States. This process has been a cooperative effort of the Allegheny County Cooperative Extension office and the newly formed Penn State Center in Pittsburgh, with technical support from the Departments of Agricultural and Biological Engineering and Horticulture at Penn State.

With support from local governments and the Department of Economic and Community Development, Eco Clean burners will be located in Sharpsburg, a suburb of Pittsburgh.

Local project support has been provided by the following organizations: Community Foundation for the Alleghenies; Pennsylvania Resources Council, Inc. (PRC); The Pennsylvania Technical Assistance Program (PennTAP); The American Chemistry Council and Morrison Fiduciary

For further information, contact John Shea, Jr. by e-mail, [ajs37@psu.edu](mailto:ajs37@psu.edu).

[Jim Garthe, Agricultural Engineer and John Shea, Extension Educator, Allegheny County](#)

## About Renewable & Alternative Energy

For more information on Cooperative Extension's Renewable and Alternative Energy Resources at Penn State visit our home page at <http://energy.extension.psu.edu/>

© 2009 College of Agricultural Sciences

For copyright, alternative media and affirmative action information use the following links: [Copyright](#); [Alternative Media](#); [Affirmative Action](#).

### [Forward email](#)

✉ [SafeUnsubscribe®](#)

This email was sent to dec109@psu.edu by [gwr@psu.edu](mailto:gwr@psu.edu).

[Update Profile/Email Address](#) | Instant removal with [SafeUnsubscribe™](#) | [Privacy Policy](#).

Email Marketing by



Penn State University Extension | Penn State University | 116 Asi Building | University Park | PA | 16802