Biological Systems Engineering

Engineering Update Fall 2011

Engineering Update: ASABE Blue Ribbon Winner!

In this issue…

BSE is located in Seitz

Engineering Update

Virginia Tech *Invent the Future*

Biological Systems Engineering
September 2011

To: Extension Unit Directors, Extension District Directors, Extension Program Leaders, and ANR Agents

Dear Co-Workers: Engineering Update is a joint effort of Biological Systems Engineering and other interested parties. Subject matter areas include timely information on water quality, natural resource management, TMDL, air emissions, animal waste management, machinery management, precision farming, application technology, farm safety, energy, engineering education, and technology. Please use this information in your on-going Extension programs and circulate to all Extension staff and interested parties. Engineering Update is electronically accessible at: (http://intra.ext.vt.edu/anr/bse/index.html).

VirginiaTech *Invent the Future* — Virginia Cooperative Extension — *A partnership of Virginia Tech and Virginia State University* www.ext.vt.edu — VSU Virginia State

National Farm Safety & Health Week

National Farm Safety & Health Week (September 19-25) is an annual promotion initiated by the National Safety Council in 1944 and has been proclaimed as such by each sitting US President since that time.

The Pesticides and Farmworker Health Toolkit presents crop specific pesticide safety information for Latino farmworkers in highly visual and engaging ways to meet the current educational needs of the target population. The toolkit consists of training flipcharts containing discussion guides for trainers, crop-specific pesticide information handouts for farmworkers, and hands-on activities to assess farmworker knowledge and skills.

NCSU crop specialists identified the most commonly used pesticides in each crop based on NC production practices for inclusion in toolkit materials. The toolkits are available in Spanish and English. The US EPA has approved the toolkit for worker training as required by the Worker Protection Standard. These educational materials have been produced for tobacco and ten other commodities (i.e., apples, bell peppers, blueberries, Christmas trees, cucumbers, grapes, landscape/turf, strawberries, sweet potatoes, and tomatoes).

Field testing with farmworkers involved in tobacco production in 2008 and farmworkers involved in tomato production in 2009 provided insight into farmworkers' layout preferences for the handouts and their understanding of visual materials and central learning messages associated with the toolkit.

The entire learning packages for both sweet potatoes and tobacco, including flipcharts, handouts, and activities, underwent testing with farmworkers and pesticide educators. Results of field testing of the toolkit included enthusiastic endorsement of the toolkit by clinic outreach workers and agency safety trainers, observations noting farmworker active engagement throughout trainings, and demonstrated increase in knowledge among farmworkers participating in the training.

For ordering information for the Pesticides and Farmworker Health Toolkit, visit **http://go.ncsu.edu/pesticide-toolkit**

Options Available for Farm Lighting

Farm lighting is a key factor for worker safety, animal production and overall farmstead security.

Many farm facilities use incandescent bulbs in a variety of settings, but the upcoming phase-out of incandescent among US retailers demands consideration of energy efficient lighting alternatives.

A variety of bulbs and fixtures already are available to replace incandescent bulbs. A new publication compares some of the indoor and outdoor lighting options and their features.

"**Energy Fundamentals for Farm Lighting**" is available to download. The incandescent bulb produces light using electrical resistance and much of its energy is wasted as heat. In spite of low initial cost, the short bulb life and lack of energy efficiency make these bulbs a costly source of lighting.

The incandescent phase-out officially begins with 100W bulbs in 2012 and will grow to include the lower wattage bulbs during the next few years.

Alternative options for farm lighting include energy efficient technology such as compact fluorescent bulbs (CFL), light-emitting diodes (LED) and tube fluorescent fixtures.

This publication also explains lighting terminology for comparing the energy efficiency of different bulbs. Incandescent bulbs will begin disappearing from hardware store shelves throughout the coming months. Contact your local electric utility provider to learn about available rebates on energy efficient lighting alternatives.

For more tips on energy efficiency around the farmstead, visit *http://farmenergy.exnet.iastate.edu*

Cotton Harvester Resources

Production of high-quality cotton lint begins with variety selection, continues with attention to all production practices, and ends with a well-planned and well-executed harvest. As harvest time nears, critical crop management decisions include scheduling defoliation, defoliating effectively, and timing harvest to get the best lint quality and yield.

Harvester adjustment and operation affects quality and yield. Improper adjustment will reduce quality. When you do not adjust or operate the harvester properly, you will suffer decreased harvesting efficiency or yield loss. Harvester loss level normally decreases as a % of total yield as the yield increases.

http://www.cottoninc.com/Cotton-Harvest-Systems

Energy Efficient Fans for Poultry Production

Fans are an important component of mechanically ventilated facilities. They are the driving force behind the exchange of air that is necessary to create a healthy environment for poultry and associated farm workers. Other components of the ventilation system, such as the inlets and controllers, are essential to create a properly functioning system which is also energy efficient.

Fans impact energy usage in two different ways. They not only use energy to operate, but the management of fans impacts the efficiency of the heating energy used within the building. Fan management is crucial in winter because over-ventilating exhausts heating energy needlessly.

Quantifying quality

To understand the principles of fan selection, some basic terms must be understood. These include the following:

Air delivery: Air delivery is the amount of air that a fan will move at different conditions. This term is expressed as volume of air movement per unit time. The standard unit is cubic feet per minute (cfm).

Static pressure: Static pressure is the difference in pressure that a ventilation fan creates between the inside and outside of a mechanically ventilated structure. Static pressure may be measured using a manometer (Figure 1). Fans are used to create a vacuum within a building by exhausting air. The indoor environment, having a lower pressure than outdoors, will draw air in through inlets (Figure 2). This is called a negative pressure system. In most animal housing situations, the static pressure operates between 0.04 and 0.08 inches of water. A free hanging fan, such as a stirring fan, will operate with no static pressure.

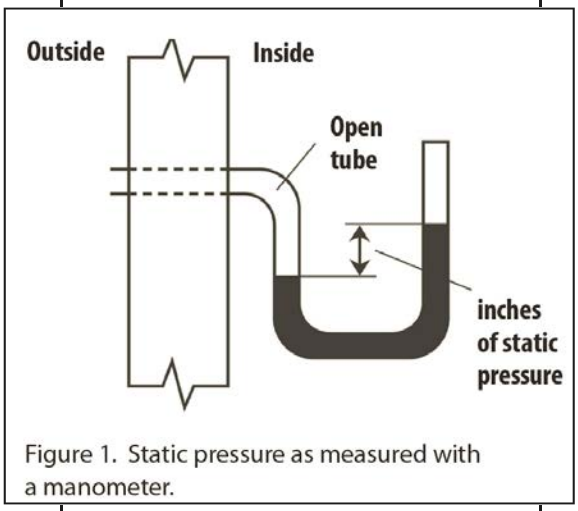
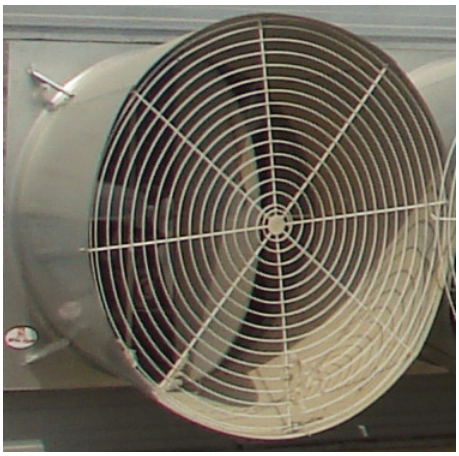


Figure 1. Static pressure as measured with a manometer.

Fan efficiency: Fan efficiency is the amount of air delivery that a fan will provide per unit of electric power used, given in cubic feet per minute per watt (cfm/W). In general, small fans are less efficient than larger fans. Efficiencies range from about 5 cfm/W to 25 cfm/W.



Fan rating

Fans should be rated by an independent lab to show air delivery and efficiency as a function of static pressure. This information will be presented by using either a graph or table. An example appears in Table 1. Accessories on the fan such as guards, shutters, and discharge cones impact

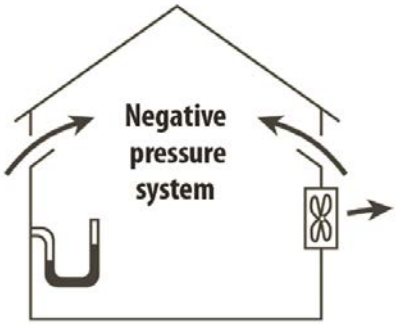


Figure 2. Negative pressure system with inlets and an exhaust fan.

Energy Efficient Fans (Cont.)

(Continued from page 4)

performance and should be noted when examining test data. Test results are available from the Bioenvironmental and Structural Systems (BESS) lab at the University of Illinois (www.bess.uiuc.edu).

Table 1. Example fan data for a 50-inch fan with shutter, guard, and discharge cone (BESS Lab)

Static pressure Inches of water	Speed rpm	Airflow cfm	Efficiency cfm/W
0.00	540	29,500	27.4
0.05	537	27,600	24.4
0.10	535	25,400	21.5
0.15	534	22,900	18.5
0.20	533	19,600	15.5
0.25	533	15,800	12.5
0.30	534	6,500	5.3

A common mistake is to select fans based on fan diameter. Never assume that two fans of equal size will perform the same since different motors, curvature of blades and other attributes greatly influence the performance. For instance, it has been found through testing of several 50-inch fans that the air delivery (at 0.10 inches of water) ranged from 18,000 to 28,600 cfm, and the efficiency ranged from 14.3 to 24.5 cfm/W.

Selection criteria

Mechanical ventilation systems are generally composed of multiple fans which are staged on as temperature rises. In some systems this begins with small fans and larger fans are added to increase the air delivery. Fans should be selected based on air delivery and efficiency ratings at 0.10 inches of water. The shaded area of Table 1 illustrates the data that should be used for fan comparisons and selection. Efficiency is another criterion that should be considered. Table 2 shows median and upper quartile test results for efficiency ratings by fan size. Choose fans which are within the upper quartile of rated fan efficiencies. Many utility companies provide rebates for efficient fans that meet target efficiency.

Check with your electrical supplier for

(Continued on page 6)

Table 2. Fan test results for efficiency based on fan size and 0.10 inches of H_2O (BESS lab)

Diameter of fan	Efficiency rating	
Inches	Median rating cfm/W	Top ¼ rating cfm/W
<16	7.9	8.7
16 to 20	10.3	11.2
22 to 35	13.0	14.6
36 to 46	15.9	17.2
48 to 56	18.9	20.4
>56	20.1	21.5

Energy Efficient Fans (Cont.)




(Continued from page 5)

rebate requirements before purchasing fans.

Factors affecting fan performance

The configuration in which a fan is installed and the manner in which it is maintained greatly affect its performance. Guards generally decrease the fan performance less than 5 percent and should always be left in place because they protect workers from the fan and the fan from objects. Shutters reduce fan performance from 10 to 25 percent but are necessary for periods when the fan is not operating. Dirty shutters and blades can reduce air delivery by as much as 40 percent. Regular cleaning and maintenance keep shutters operating at their manufactured level of efficiency. Well maintained discharge cones increase fan efficiency by 15 percent or more. If belt-driven fans are used, check belt tension regularly. Loose belts will cause the fan to be less efficient and effective, perhaps by as much as 50 percent. An over-tight belt will cause undue wear on bearings.

Improper fan maintenance can negate energy savings from proper fan selection. Simple routine maintenance steps include:

- Regular cleaning and maintenance of fan blades and shutters
- Maintain discharge cones
- Check belt tension regularly
- Check with utility provider for rebates when replacing or upgrading fans

Fan ratings are based on a fan that is in a new condition and should include all accessories which will be used in your application.

Summary

Good quality fans are essential for proper performance of mechanically ventilated poultry facilities. Inefficient fans can add to production cost in two ways. The most obvious cost is wasted energy that is expended while using an inefficient fan. Other costs can be due to poor air quality in the building due to under-ventilation or wasted heat due to over-ventilation. Fans that are inefficient or mismanaged may allow air quality to diminish and therefore stress animals. Stressed birds are more susceptible to disease as well as have less-than-optimal growth and feed conversion. Management and proper staging of fans is also an important part of an energy efficient system and will be dealt with in other fact sheets.

Adapted from: Harmon, J, M. Hanna, and D. Petersen. 2010. University Extension, Iowa State University Publication Number PM-2089h, Ames, IA

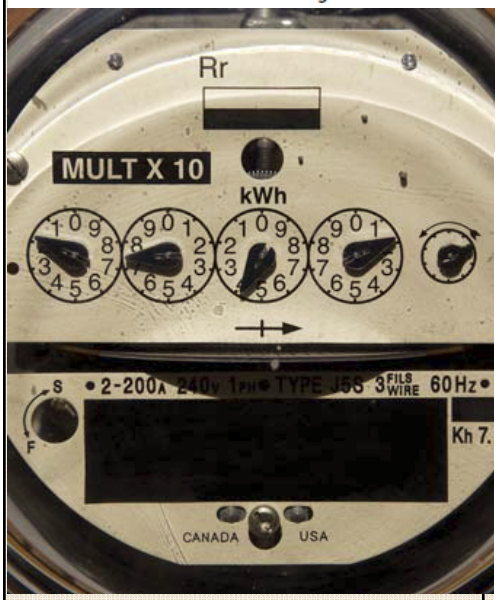
(adapted by B. Grisso)

Tracking the energy use on your farm




How much electricity DOES it use?

Although it's relatively easy to relate diesel or propane with a specific use such as tillage or crop drying, subdividing the total kilowatt hours (kWh) you used as listed on a monthly bill can be more challenging. What does leaving your lights on all day cost? How much does that fan motor use? The answers to these questions can be found pretty simply if you have some basic information. First of all, what is the wattage rating (W) of the item? Light bulbs generally have the wattage rating stamped on them. Other items, such as motors, can generally be assumed to use about 1 kW (1000 watts) per horsepower (hp). The other critical information needed is how long it is used.



Taken from M. Hanna, Jay Harmon, Jane Flammang, Iowa State University Extension.

Swine – Example 1

As an example, your 1200 head swine finishing barn has fifty-six 100 W incandescent lights. Your normal practice is to turn the lights on when you enter the building at 7 am and turn them off after checking pigs in the evening at 5 pm. Your total electric usage is 4750 kWh for the month at a cost of $.10 per kWh. How much of this is due to the lights?

The basic equation is: kW x hours = kWh
Power usage = 56 lights x 100 W/light = 5600 W or 5.6 kW
On time = 7 am to 5 pm = 10 hours per day
Monthly usage = 5.6 kW x 10 hrs/day x 30 days/month = 1680 kWh
Monthly cost = 1680 kWh x $0.10/kWh = $168/month

An additional 3070 kWh (= 4750 kWh – 1680 kWh) are being used by other electrical devices. If you decided to try to cut back by only using the lights one hour in the morning, and one hour in the evening, how much could be saved?

Monthly usage = 5.6 kW x 2 hrs/day x 30 days/month = 336 kWh
Savings = 1680 kWh – 336 kWh = 1344 kWh or $134.40/month

Grain Drying – Example 2

Hours of "on" time for electric motors can be approximated to help sub-divide electrical usage. For example, a 20 hp motor on a grain drying fan is estimated to operate 15 hr/day for 24 days during a monthly billing period.

Power usage = 20 hp x 1kW/hp = 20 kW
On time = 15 hrs/day x 24 days = 360 hrs
Usage during the month = 20 kW x 360 hrs = 7200 kWh x .10 kWh = $720/month

Fans – Example 3

If a minimum ventilation fan with a ½ hp motor runs continuously, what is the monthly electrical usage?

Power usage = ½ hp x 1 kW/hp = 0.5 kW
On time = 24 hrs/day x 30 days = 720 hrs
Monthly usage = 0.5 kW x 720 hrs = 360 kWh
Monthly cost = 360 kWh x $0.10/kWh = $36/ month

Dealing with Pesticide Spills after a Hurricane

Get advice quickly from your agricultural chemical retailer or manufacturer on cleanup of specific chemicals…

- Your personal safety and that of anyone helping you should be the first consideration.
- Appropriate personal safety equipment should be used, such as heavy-duty rubber gloves, rubber boots, a chemical- resistant apron, and eye protection.
- A respirator may be necessary for some chemicals. If you know the product or products damaged, use the personal protection as required on those labels.

When the flood waters subside after a hurricane, carefully evaluate the pesticide storage area. If this area was under water, damaged containers and spilled product could result in a potentially hazardous situation. Deal with it the same way as any spill.

When in doubt, use the personal protection equipment suggested. Then follow these standard guidelines for handling spills:

1. ***Control the spill***: Stop the spill as quickly as possible by restoring the container to its upright position, closing a leaking valve or hose, or putting a secondary container in place to catch the leaking solution. Bags that are broken or soaked through need to be carefully placed in a secondary container, such as a drum or heavy plastic bags.
2. ***Call your retailer***: Get advice quickly from your agricultural chemical retailer or manufacturer on cleanup of specific chemicals. They also can provide you with special safety advice and other information.
3. ***Contain the spread***: When the leak has been stopped, contain the spread of the spill by creating dams of absorbent material in the path of the spilled liquid. It may be most important to first divert a spill away from a nearby pond, stream, or storm sewer before attempting to stop the spill or leak. This is a judgment call that only you can make.
4. ***Begin cleanup promptly***: As soon as the situation has been stabilized, begin cleaning it up. Quick response to a spill is not only required in many states, but will prevent the chemical from leaching or washing away in a rainstorm. If possible, stand upwind or use a fan for ventilation.
5. ***Use absorbent materials***: On pavement or concrete, use absorbent materials to capture the spilled liquids. They then can be shoveled or swept into disposal containers. Non-chlorinated pet litter is an excellent, inexpensive absorbent material to keep on hand for such purposes. Large spills may require commercially available pillows of highly absorbent materials.
6. ***Properly dispose*** of the damaged or absorbent materials: Contact your County Extension office to find out where to dispose of the damaged pesticides.

If there is standing water in your pesticide storage facility, assume it is hazardous until you can check all pesticide containers for leaks or breakage. Do not allow any skin contact with this water. If there is no evidence of pesticide leakage into the water, it can be safely pumped out.

- Chemtrec Emergency Hotline, 1-800-424-9300.
- EPA Pesticide Management and Disposal, 703-305-7385.

Harvest — Think Safety

Pay special attention to the safety features of their equipment. Agriculture remains one of the most dangerous occupations in the US. In a typical year, 551 workers die while doing agricultural work, but exercising caution, getting rest and being safety-minded can go a long ways toward increasing safety.

Some examples of fall farm activities that raise the risk factor and deserve special attention:

- Power take offs (PTO's) need to be well protected to avoid any contact with clothing or people during operation.
- Make sure safety shields are in place on all equipment everyday, they are there for a reason and are important. The same is true of equipment safety instructions.
- Always be aware of power lines that can come in contact with moving equipment and augers around grain bins.
- Grain bins deserve special attention and caution when grain is being loaded and removed. Safety measures should be put in place to avoid any risk of entrapment and suffocation (*see next article*).
- Take periodic breaks to help avoid fatigue. Take a rest break for a few minutes, go for a short walk or give family members a call.
- Stay focused on the equipment and avoid distractions from all the electronic equipment and screens in the cab or mobile phone.
- Use extra caution when backing equipment. It is easy to overlook something or, more importantly someone especially a child.
- Protective eye and ear wear is important in many situations.
- Watch railroad crossings. There is heavy traffic on railroads and crossings can be very dangerous.
- Rural intersections will have heavier-than-normal travel and dusty conditions may limit visibility, as can sun glare. Standing crops may also block a clear view of oncoming traffic.
- Heavily loaded trucks and grain trailers can't stop as quickly as passenger cars, and farm vehicles move slower on the road, which means passenger cars and trucks can close in very quickly.

The excitement and joy of harvest can be lost in the blink of an eye when a farmer, family member or friend is injured. Be careful out there so you or someone you know doesn't become a statistic.

(adapted by B. Grisso)

Engulfment and Suffocation in Grain Bins

During the week of June 6, 2011, three workers, one each in Iowa, Michigan and North Dakota, were killed when they were engulfed (buried or trapped) by grain while on the job. In Texas, a fourth worker was also buried in grain, but was rescued and survived.

Suffocation from engulfment is a leading cause of death in grain bins, and the number of these deaths continues to rise. In fact, the number of deaths more than doubled between 2006 and 2010. These fatalities are preventable if employers follow work practices and provide training and equipment as required by OSHA's Grain Handling Facilities standard.

How are workers suffocated or engulfed in grain bins?

Suffocation can occur when a worker enters a bin and is engulfed by grain or when bins develop hazardous atmospheres or do not have enough oxygen. A worker can be engulfed or suffocated if the worker enters the bin and:

Stands on moving/flowing grain and the moving grain acts like "quicksand" and buries the worker in seconds

Entering a bin while the auger is operating is dangerous. As the auger unloads the bin, grain flows to the outlet and is released, causing the grain above it to flow in and replace the released grain. When a worker stands on flowing grain, their weight forces the grain supporting them to flow to the outlet more quickly, causing them to rapidly sink into the grain. According to one source, at the average flow rate for grain, a 6-foot tall worker can be covered with grain in 11 seconds and would be unable to free him/her self after the first 5 seconds.

Stands on or below a "bridging" condition that collapses and buries the worker

"Bridging" occurs when grain clumps together, because of moisture or mold, creating an empty space beneath the grain as it is released. Bridged grain resists the downward pull that normally moves loose grain to the bin outlet and rarely becomes hard enough to support a person. If a worker steps onto the bridge, it can cave in under the worker's weight, burying him or her in the empty space. Even if the grain flow is stopped before

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According to a Purdue University report, 26 workers died in 2010 in grain bin engulfment and 51 were entrapped overall, representing the most entrapments in one year since Purdue began keeping records in 1978. On Aug. 17, OSHA announced a new hazard alert that outlines the risks inherent in grain handling in an effort to better inform workers and employers of the hazards involved with this work.

Engulfment and Suffocation in Grain Bins

(Continued from page 10)

entering a bin, a worker could still be covered if they step onto a grain bridge and it caves in. As grain cascades down, the victim is covered with an "avalanche" of grain that traps and suffocates him or her. Standing under bridged grain is also hazardous because bridged grain can cave in unexpectedly and bury and suffocate the worker.

Tries to loosen a pile of grain and the grain caves in onto the worker, or stands next to a pile of grain on the side of the bin and the grain unexpectedly caves in onto the worker

Even though a wall of grain may appear safe, one scoop of grain may weaken support and cause the grain to cave in. If a worker is knocked off balance by the weight of grain, he or she can be covered quickly and suffocate. In some cases, grain can be loosed from outside the bin by bumping it with a pole through an access cover.

The atmospheric conditions inside the bin are at dangerous levels

Inside a storage bin, there is a potential for oxygen levels to be at unsafe levels. Also there is a potential for hazardous gases to be present. Because such hazardous atmospheres may be present inside a bin, a worker could quickly suffocate and become a victim.

Following these measures can SAVE WORKERS' LIVES:

- De-energize (turn off) and disconnect, lockout and tag, or block off all mechanical, electrical, hydraulic and pneumatic equipment that presents a danger, particularly grain-moving equipment. Grain should not be emptied or moved into or out of the bin while workers are inside because it creates a suction that can pull the worker into the grain in seconds.
- Prohibit and prevent workers from walking down grain and similar practices where walking on grain is intended to make it flow.
- Prohibit and prevent worker entry onto or below a bridging condition, or where grain is built up on the side of the bin.
- Train all workers for the specific hazardous work operations they are to perform when entering and working inside of grain bins.
- Provide each worker entering a bin from a level at or above stored grain, or when a worker will walk or stand on stored grain, with a body harness. The body harness should have a lifeline that is positioned and is of sufficient length to prevent a worker from sinking further than waist-deep in grain.
- Provide workers with rescue equipment, such as winch systems, that are specifically suited for rescue from the bin.
- Station an observer who is equipped to provide assistance and perform rescue operations outside the bin.
- Ensure that communications (visual, voice or signal line) are maintained between the observer and the workers who entered the bin.
- Test the air within a bin for oxygen content and the presence of hazardous gases before entry.
- Provide and continue ventilation until any unsafe atmospheric conditions are eliminated. If toxicity or oxygen deficiency cannot be eliminated, workers must wear appropriate respirators.
- Issue a permit each time a worker enters a bin, unless the employer is present during the entire entry operation. The permit must certify that the above precautions have been implemented before workers enter the bin.

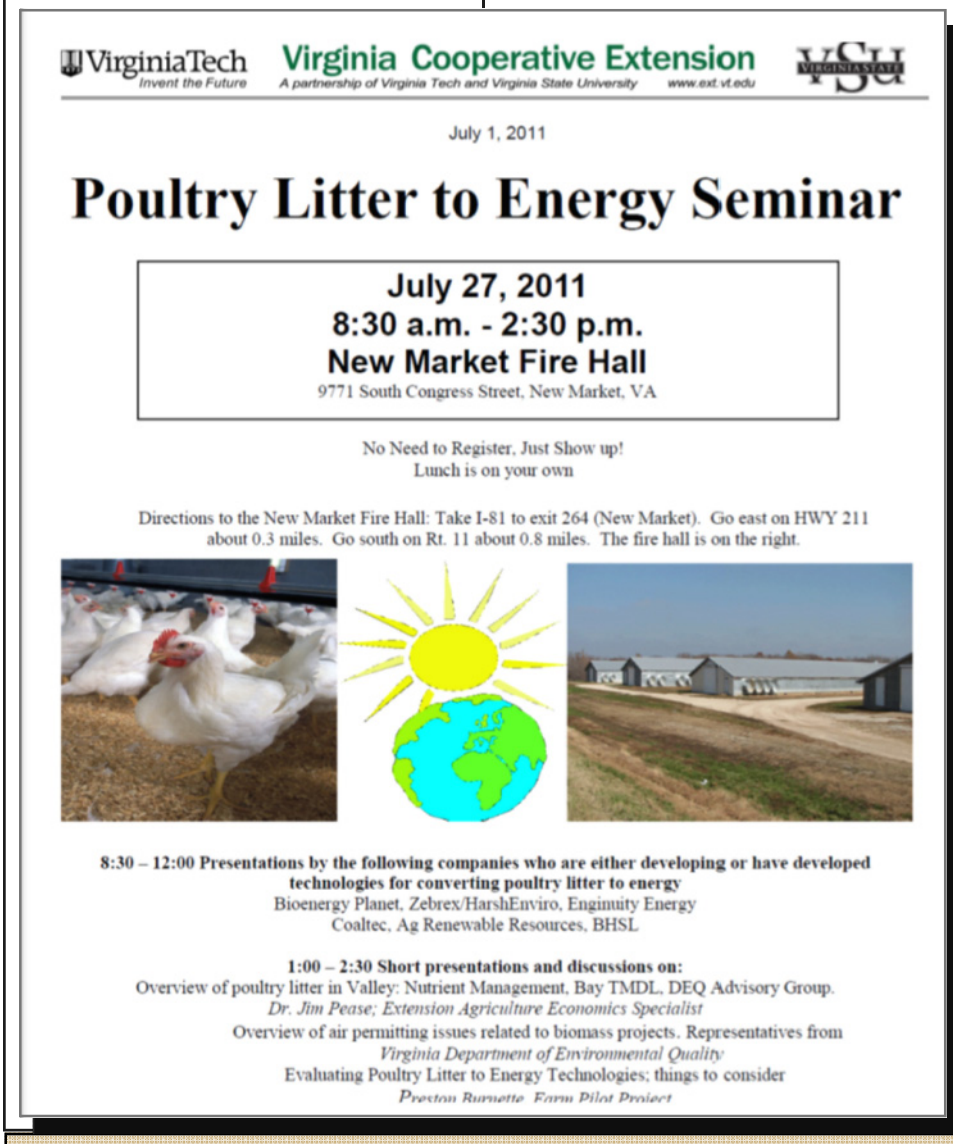
(adapted by B. Grisso)

http://www.uaex.edu/Other_Areas/publications/PDF/FSA-1010.pdf

Recorded Presentations from Poultry Litter to Energy Workshop Now Available

A Poultry Litter to Energy seminar was held on July 27, 2011 in New Market, VA. The goal for this event was to educate participants on poultry litter to energy technologies and aspects to project development in Virginia. The session provided participants with a clear overview of the different bioenergy conversion technologies, key considerations when evaluating poultry litter to energy technologies, and presentations from seven different poultry litter to energy technology providers. More than 75 people attended this event with participation from individual farmers, poultry integrators and other private industry, state and federal agencies, environmental groups, and other sectors. The session also received a lot of coverage from the local media. Likely, many more people will access the archived version of the presentations, which are now posted online, at Virginia Cooperative Extension's Agricultural Byproduct Utilization website (below).

(by J. Ignosh & R. Clark)



VirginiaTech *Invent the Future* — Virginia Cooperative Extension — *A partnership of Virginia Tech and Virginia State University* www.ext.vt.edu — VSU

July 1, 2011

Poultry Litter to Energy Seminar

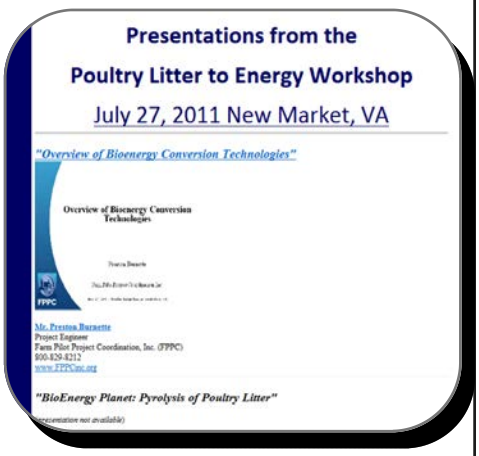
July 27, 2011
8:30 a.m. - 2:30 p.m.
New Market Fire Hall
9771 South Congress Street, New Market, VA

No Need to Register, Just Show up!
Lunch is on your own

Directions to the New Market Fire Hall: Take I-81 to exit 264 (New Market). Go east on HWY 211 about 0.3 miles. Go south on Rt. 11 about 0.8 miles. The fire hall is on the right.

8:30 – 12:00 Presentations by the following companies who are either developing or have developed technologies for converting poultry litter to energy
Bioenergy Planet, Zebrex/HarshEnviro, Enginuity Energy
Coaltec, Ag Renewable Resources, BHSL

1:00 – 2:30 Short presentations and discussions on:
Overview of poultry litter in Valley: Nutrient Management, Bay TMDL, DEQ Advisory Group.
Dr. Jim Pease; Extension Agriculture Economics Specialist
Overview of air permitting issues related to biomass projects. Representatives from
Virginia Department of Environmental Quality
Evaluating Poultry Litter to Energy Technologies; things to consider
Preston Burnette, Farm Pilot Project



Presentations from the
Poultry Litter to Energy Workshop
July 27, 2011 New Market, VA

"Overview of Bioenergy Conversion Technologies"

Overview of Bioenergy Conversion Technologies

Mr. Preston Burnette
Project Engineer
Farm Pilot Project Coordination, Inc. (FPPC)
800-829-8212
www.FPPCinc.org

"BioEnergy Planet: Pyrolysis of Poultry Litter"

(presentation not available)

http://www.bse.vt.edu/green/Workshops/PoultryWorkshop072711.htm

Yield Monitor Calibration Tips

GPS-based yield data has proven to be an extremely valuable management tool on many farms. However, improperly calibrated yield monitors can essentially generate difficult to interpret or useless data … ***Garbage In = Garbage Out.***

Economic risk in agriculture has increased dramatically. Considering the amount of economic risk involved in each decision, taking the time and patience to properly calibrate a yield monitor is essential if the yield data will be used to make future agronomic decisions for your farming operation.

Most yield monitors operate on the same basic principles. Yield monitor manufacturers strive to build accuracy into their units; however, each machine has its sources of errors. Proper calibration requires harvesting 3 to 5 separate calibration loads. Each load should represent different flow rates. This can be easily accomplished by harvesting at different speeds (i.e. 3 mph, 3.5 mph, 4 mph, 4.5 mph, 5 mph, etc.). The different flow rates represent different yield levels to the yield monitor. Additionally most manufacturers recommend that the calibration load weigh between 3,000 to 6,000 pounds, approximately 50 - 100 bushels. Each load should be individually weighed in a weigh wagon or other accurate scales. If one load appears to be uncharacteristically high or low, redo that load before completing the calibration.

Check the accuracy of your yield monitor throughout the harvest season. To insure consistent data additional calibrations may be necessary. Multiple calibrations are essential in higher moisture grain. For example corn at 25% moisture moves through a combine much differently than corn at 17% moisture.

Other important tasks:

√ Calibrate for each grain type.
√ Calibrate grain moisture sensor
√ Calibrate temperature sensor

Review the following yield monitor checklist for more tips.

Yield Monitor Checklist

Before Operation

- If you have not already done so, back up any data from the previous season on the memory cards, thumb drives, monitors, etc. After the previous harvest data is backed up delete the files from the memory devices. It is good practice to keep several backup copies of the raw data in different locations in case it is lost, stolen, damaged or modified.
- Check your memory card, thumb drive, etc., to be sure they work properly.
- Contact your local dealer or manufacturer to make sure that you have the recent software and firmware upgrades for your yield monitoring and mapping system. You can obtain information about these upgrades through your manufacturer's web site or by contacting technical support.
- Check all cables, connections, and sensors for wear or damage from rodents.
- For elevator-mounted moisture sensor units make sure the grain is cleaned out and the manual clean-out motor works and all doors are shut!
- Inspect the flow sensor. Look for wear on the grain elevator and missing or worn paddles. Check to make sure that the spacing between the paddles and the top of the elevator meets the manufacturer's requirements.
- Look for wear on the flow sensor's impact or deflector plates and replace if plates appear worn.
- If you purchase a new or used combine with an existing yield monitor installed double check to make sure it is installed properly.
- Avoid running electrical wires next to the GPS antenna which may cause interference with the receiver signal. Running wires perpendicular to each other decreases the chance for electrical noise that may occur from other electronics.

During Operation, Prior To Calibration

- Make sure your memory card, thumb drive, etc., is installed into your yield monitor and turn on your combine and yield monitor. Make sure there is proper communication between the card and the display monitor. Usually an error message will appear on the display indicating there is no communication with the card.
- Check to see if you are receiving a good differential correction signal (DGPS).
- Raise and lower the header to make sure the stop height switch operates correctly. Some monitors are equipped with a manual switch which turns on and off data collection to your monitor. You may have

(Continued on page 14)

Yield Monitor Calibration Tips

(Continued from page 13)

to adjust the header height switch to accommodate the preferences of different operators during harvest.
- Make sure to set row width according to number of rows for a row crop header and the appropriate width of a cutting platform header.
- Engage the separator and observe the elevator speed on the monitor to see if it is working.
- Put the combine in drive and make sure the ground speed indicator is working.
- Before calibrating loads make sure you are using accurate scales to weigh the grain. Certified scales or calibrated weigh wagons are recommended. If you are using weigh wagons it is recommended to leave the wagon in one location in the field. Moving the weigh wagon through a field causes it to shake and bounce which can throw off the calibration of the weigh wagon. Make sure you are also using the same scales throughout calibration.

During Calibration

- When collecting temperature readings of the equipment for some yield monitors make sure the combine has been out in normal operating temperatures for several hours. For example, taking a temperature reading from the combine when it has been in the shed or under a shade tree is much different than under direct sunlight. Take temperature readings close to the moisture sensor on the combine.
- Collect moisture calibrations for each grain type. Take a good representation of the moisture of the grain harvested throughout the loads.
- When calibrating monitor for ground speeds use typical field conditions rather than a road or waterway. Tire slippage can create inaccuracy with calibration.
- Harvest calibration loads at different flow rates. Yield will vary throughout the field. Adjusting flow rates will improve accuracy. When calibrating loads it is recommended to use loads between 3,000 to 6,000 pounds. This helps reduce variability with excess grain that may be in the combine. - Gather loads in well represented areas of the field. Avoid starting calibration loads on turn rows, weed patches, or areas of major topography changes in the field. Hillsides and rolling ground can impact calibration load data because of how the grain impacts the flow sensor. If you are unable to avoid topographical changes make sure you get a good representation of loads going up-and-down hill and side-to-side of a hill.
- It is recommended to calibrate for each type of grain for each year. The dynamics of the combine changes from wear and tear and can influence the outcome of your yield data.
- When conducting on-farm research trials or harvesting fields with multiple varieties consider creating a calibration load for each treatment or variety. For example, calibrate for regular corn and high oil corn separately due to the differences in test weight and moisture characteristics of the grain.
- Calibrate for different moisture levels per type of grain. For example, calibrate differently for corn below 22% moisture versus corn above 22% moisture.

During Harvest

- Correct any malfunctions or errors indicated by the yield monitor. This can include moisture and flow sensors not working properly and loss of DGPS signal. Make sure the monitor is actually collecting data. Sometimes one can manually switch off data collection on the monitor and forget to turn it back on.
- If you have a long harvest season it would be wise to do periodic calibration loads throughout the season to check or improve accuracy. It is suggested to recalibrate if you see more than a 5 percent difference in error, 5 lb/bushel differences in test weight, or temperature changes greater than 10 degrees.
- It is recommended to back-up data onto your computer and data storage devices frequently throughout the harvest season. A simple electrical shock form improper wiring or lightning can destroy your data.
- If significant changes are made to the elevator chain, paddles, or flow sensor during harvest you will need to recalibrate. Tightening the elevator chain, replacing old paddles or changing the gap of the flow sensor to the paddles changes the outcome of the previous calibration.
- If you run into problems with the monitoring equipment during harvest check through the trouble shooting information in the operators manual. Contact technical support if you are unable to solve the problem.

(adapted by B. Grisso)

Balers for Urban Woody Biomass

A design team was asked to develop a baler for urban biomass. Baling makes it easier to collect and deliver biomass to biopower and biofuels plants that are distant from the biomass source. The objective stated: "make urban woody biomass the next major Recyclable!"

In communities from Santa Rosa, CA, to San Antonio, TX; Chicago, IL; and Washington, D.C., there are tens of millions of tons of biomass that could be used for generating power or producing biofuels, if only there were street-legal balers robust enough for everyday use by landscapers, arborists, and roadside maintenance crews.

The design of an urban baler with partial funding from the USDA Small Business Innovation Research (SBIR) Program. After visiting with potential users, customers, and land managers at more than 60 locations in four western states and collecting samples of dozens of urban prunings and materials from all sorts of project sites, the design criteria was developed. The samples were characterized (what are the geometric mean lengths and bending strengths of tree branches cut by a power line maintenance crew?). Pressure and density relationships were developed, and Poisson forces were determined using instrumented purpose-built laboratory balers.

The engineering prototype was completed early in 2008 and has since been operated at many locations. The new designed baler has successfully baled mesquite, power line prunings, landscape trimmings, and even the discarded Christmas trees that are left on the curb for disposal during the first week of January.

We have particularly noted a satisfying crunching sound when hardwood prunings and dried-out forest thinnings are baled. Field trials with the baler and transport of baled biomass from urban centers to power plants have provided information to solidify both the engineering parameters and the market driven performance specifications.

Production prototypes should be available in 2012, and general production will begin early in 2013. At that time, arborists, landscapers, urban recycling centers, and others will be able to participate directly in the biofuel feedstock supply chain. As one participant observed at a recent workshop, "Wouldn't it be cool if the stuff I pruned out of my garden this week became part of the e-85 I put in my car next week?"

(Adapted by B. Grisso from Resource Magazine, Sept/Oct 2011)

The Biobaler

Should the feedstock come from residues or dedicated crops? Should the biomass come from forest areas or agricultural land? Should it be converted into liquid biofuels or into heat and power?

A projects was initiated to develop short rotation woody crop plantations such as willow and hybrid poplar. A weak link in the system was the harvesting of woody crops over small plantation areas.

A few machinery manufacturers had already modified self-propelled forage harvesters and adapted a woody crop cutterhead. However, these large and relatively expensive machines were not suitable to an emerging new crops often tested on only 2.5 or 5 acres per site. Engineers came up with the concept of modifying a round baler to harvest short-rotation woody crops.

The first prototype was developed and successfully tested in willow plantations. Round bales weighing 660 to 1,100 lbs were harvested in 3 to 4 minutes per bale. During the following year, the saw-blade cutterhead was replaced with a more aggressive flail cutterhead and tested in natural

prairies, fallow land, and forests to collect open-area shrubs and underbrush. Natural shrubs were harvested at a slower rate than plantations, typically one bale per 6 minutes. However, the round bales made a neat and tidy package that could be easily removed and transported. This approach was remarkably innovative because natural invasive species are generally shredded or burned on site, and little value is obtained from this biomasses.

Today, more than 20 Biobalers are operating in Europe and North America. The commercial version is more robust than the experimental prototypes tested. The Biobaler can harvest 25 to 45 bales per hour in plantations and 10 to 20 bales per hour in natural stands, depending on crop yield, soil firmness, and stem diameter. The machine can cut and bale stems as big as 6 inches in diameter, but it works best in two- to three-year-old woody crops, which are typically 0.8 to 1.2 inches in diameter. It produces round bales that measure 4 × 4 ft and weigh about 1,000 lbs at typically 50 percent moisture. An interesting feature of these woody crop bales is that they naturally dry down to about 30 percent moisture after a few months of outside storage. This improves their heat value when used for combustion. The Biobaler can be operated as a one-man harvest system with subsequent moving and transport of bales, so it is well adapted to various scale operations.

The future

The Biobaler is used today to

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The Biobaler (cont.)

(Continued from page 16)

remove brush and invasive plants. It can improve the management of natural shrubs to reduce the risk of wildfires and enhance the growth of more desirable plants.

The Biobaler is also used to harvest woody crops in plantations over diverse areas. In the future, more plantations may be developed, which still hold vast areas of marginal and underutilized land.

The development of the Biobaler has shown that the same machine can collect low-value wood residues and harvest high-value dedicated plantations. Collected biomass can come from forest areas or from agricultural land. The best end-use of the woody crop bales will depend on local needs for heating, fiber-based manufacturing, and bio-refining. The versatility of the Biobaler has added a new option for valuing woody crops in agriculture and forestry.

(Adapted by B. Grisso from Resource Magazine, Sept/Oct 2011)

Avoiding Back Injuries in Vineyards

Over 70,000 people experience back injuries annually and it is considered one of costly and painful experience in their lives. The body part that is the most susceptible back injuries is the lower back. These injuries are generally caused by improper lifting and lifting of heavy weights. Training and use of common sense by employees may potentially reduce the number of back injuries.

Back injuries are most common among vineyard workers. Improper lifting of weights particularly during harvest is the primary cause of these injuries. Employees must be aware of the hazards associated with manual lifting of weights in the work place. They must be trained to lift weights safely. The following are the steps recommended to prevent back injuries among vineyard workers.

√ Lift the weight using your legs and not your back.
√ Limit the weight to be lifted to a maximum of 50 lbs preferably 25 lbs.
√ For lifting weights over 50lbs, get the assistance from coworkers.
√ Do not twist with the load lifted. Twisting may put additional strain on the back causing injury.
√ Do not extend yourself to lift the weight. Often stretching and lifting results in back injury.
√ Use material handling devices such as dollies and carts whenever possible.

(by J. Perumpral)

Tractor Test Reports

The Nebraska Tractor Tests are the best source of unbiased performance testing.

With a cash outlay in the six figures, a tractor purchase is a serious decision that warrants much analysis beyond the color of the paint. Sure, dealer and brand are important, but the bottom line is that a tractor has to deliver the type of performance and dependability required for multiple tasks on the farm.

Farmers depend on the Nebraska Tractor Tests as their most reliable and unbiased testing data. The Nebraska Tractor Tests conform to OECD standards, and the laboratory is the officially designated tractor testing station for the United States. OECD stands for the Organization for Economic Cooperation and Development, and its 29 member countries adhere to the tractor test codes with active tractor test stations in approximately 25 countries. The OECD codes require that the tractors be tested in the country of manufacture.

The OECD Tractor Test has compulsory tests that are performed. This includes verifying manufacturers' specifications, performance of the tractor at the main power takeoff, the power lift and hydraulic pump and the drawbar. Included in the drawbar tests and PTO tests are fuel consumption measurements.

Snapshot of performance

The basics of tractor performance, including PTO performance, fuel consumption, hydraulic pump performance and drawbar power, are what most farmers are interested in, especially with high horsepower 4WD tractors. These tractors must be big enough to pull air drills and have a hydraulic pump capacity to drive air cart mechanics.

Drawbar tests are conducted on a concrete track so that the conditions are equal across tractors and so that comparisons can be made between different testing facilities. As a result, the test reports are not directly transferable to field conditions, but they give an approximate comparison. The concrete test track gives the best tractive conditions, and is the same surface for everyone. If the tests were conducted on soil, the results would be useless as the conditions would be different for each test.

The standard test of drawbar performance is measured with unballasted tractors at rated engine speed and the maximum power engine speed in all gears between 15 percent slip and 15mph plus partial loads of 75 percent and 50 percent of pull at maximum power in two separate gears. The measurement most relevant to farmers is measured at 75 per cent of pull at maximum power, which reasonably reflects typical field work over a year of drawbar use. Adding ballast increases pull and can increase drawbar power in some cases, but may cause increased fuel consumption from the added weight you carry around.

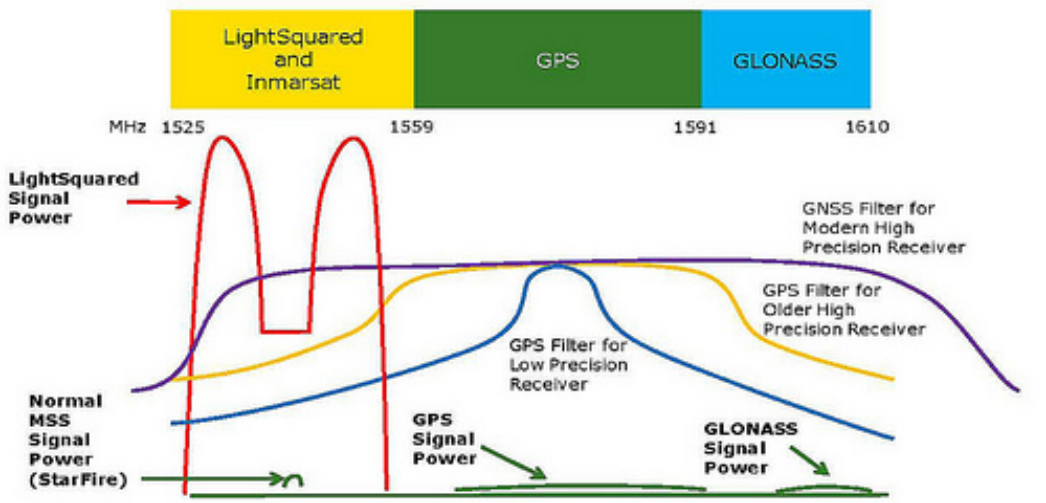
When diesel fuel prices spike, many farmers turned a critical eye to fuel efficiency. The Nebraska Tractor Tests measure fuel consumption as a measure of power for a given amount of fuel, and the result is reported in horsepower-hours per gallon of fuel or Hp•hr/gal.

The most useful PTO measurement is maximum power at rated engine speed, which is the highest power level that a tractor can sustain, measured in horsepower. Tractors with a power bulge can produce more power at a slower engine speed, but there is no power reserve. It is interesting to note that in some of the new engines, the only thing different between the tractor models is how the electronic chip controls the horsepower of the engine. A 190 horsepower engine and 250 horsepower engine are exactly the same, except for the electronic control.

The Nebraska Tractor Test Laboratory has reports for tractors and they can be found online at www.tractor-testlab.unl.edu/testreports.htm in a PDF format at no charge. Test reports going back as far as 1920 are also available, for example a report on a 1920 Rumley Oil Pull K12 model, is available.

(adapted by B. Grisso)

LightSquared Causing Massive GPS Interference



Deere & Co., a major provider of precision agriculture equipment and services, notified the FCC May 26, 2011 of substantial interference with its GPS receivers by the LightSquared signal.

Deere receivers registered impact of and interference by the LightSquared signal as far away as 22 miles from a transmitter. Further, the company has found no practicable technical solution to the problem. Deere met with an FCC legal advisor to report on its analysis of recent New Mexico tests of the Lightsquared signal and effects on GPS equipment.

The US military conducted anechoic chamber tests at a White Sands facility and open-air tests at Holloman Air Force Base in April. The tests, which simulated various cellular base station transmission schemes proposed by LightSquared in L-band frequencies between 1525-1559 MHz, without exception demonstrated severe interference to high-precision GPS receivers.

The tests included configurations where the simulated emission was reduced in bandwidth and/or assigned to frequencies in the lower part of the L-band. The Deere presentation contains an interesting graphic showing how high-precision receivers are more affected by the proposed LightSquared signals than are consumer grade receivers. The reasons:

- Modern high-precision receivers use filters that cover MSS, GPS, and GLONASS bands
- Wideband filters are required for higher rate, precision codes

Deere also confirmed that while there are important potential mitigation strategies that may be worth exploring such as repositioning LightSquared's operating frequencies, modestly reducing transmitter power such that it can be deemed to provide meaningful protection for precision farming operations essential to today's US agricultural sector.

Deere emphasized that, based on this data and analysis, other similar systems risking serious harm to the US agriculture industry.

For more information watch the downloadable webinars at: ***http://www.gpsworld.com/wireless/market-insights-webinars-8423***

(adapted by B. Grisso)

Q&A: "No-Mow-in-Reverse" Survey

On average, one child each day in the US is backed over by a parent while operating a riding mower. Several of my fellow agriculture teachers and lawn and garden professionals have asked "What can one do to prevent these tragic accidents?"

The biggest danger from "mowing in reverse" comes from the blind spots present on most riding mowers, especially those equipped with a large grass catcher in the back. A three foot tall child playing behind the mower would be impossible for an operator to see from the seat.

For the past few weeks, observers have been conducting a survey of riding mowers/ garden tractors sold in the New River Valley. During this process, it was found that the lawn mower industry adopted a voluntary safety standard in 2003 (ANSI/OPEI B71.1-2003). This standard requires a "no-mow-in-reverse" (NMIR) mechanism on new mowers; however, manufacturers are permitted to install equipment that overrides this safety feature.

The NMIR feature cuts off the mower blades when shifted into reverse. After reviewing the equipment at local vendors that sale mowers, most mowers sold have override devices. This device is either a button on the dash or position on the ignition switch which will override NMIR feature. Some of the mowers have a statement on the dash to "look for children" before overriding this feature.

After visiting with lawn care professionals at various dealerships, it was discovered that commercial mowers (usually greater than 25 hp and 60 in. cutting widths) have "no-mow-in-reverse" features. We will continue to survey mowers and dealerships to determine the compliance of manufactures with the "no-mow-in-reverse" standard.

(by D. Swafford)

Q&A: Where to go to find Agricultural Chemical Use Statistics

From time to time someone wants to know the latest statistics on Agricultural Chemicals and Pesticides use in the US. So, where do you go for the most accurate data? It is The USDA National Agricultural Statistics Service (NASS). The data given on this site may not be as current as last year, but they are the most current and reliable data that can found.

For example, USDA just published the 2010 Agricultural Chemical Use survey data for vegetables. The data includes statistics for on-farm use of commercial fertilizers, agricultural chemicals and integrated pest management practices from producers of targeted vegetable crops. The agricultural chemical use estimates focus on the acreage treated with herbicides, insecticides, fungicides, and other pesticides.

The URL listed below will take you to their site. A specific link on the URL above takes you to another "page" where you can find use data for specific chemicals and crops for a given year: Here is the direct URL for that site:

http://www.pestmanagement.info/nass/app_statcs1_year.cfm

For example, if you want to know Pounds of 2,4, D (Active Ingredient-- A.I.) per year in Virginia on Corn, you get a chart shown below. You can also get statistics for:

- √ % average treated acres
- √ Number of applications
- √ A.I. per application (lb/ac)
- √ A.I. per year (lb/ac)

http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Chemical_Use/

Conditioning Wide Swaths Are Hay Quality Keys

To harvest the most high-quality hay or haylage, condition the crop and lay it in wide swaths. Both are essential for fast drydown and low field losses.

When conditioners were developed, people thought that, because we were conditioning, we didn't need to wide swath anymore. But it's really important to recognize that the two are totally different, and we need both. Conditioning helps the stems dry; a wide swath helps leaves dry.

Start by mowing alfalfa at a 2-4" cutting height and grasses or alfalfa -grass mixes 3-4" high. Then do a really good job of conditioning the crop. Conditioning breaks stems and the waxy layer covering them, allowing water to evaporate. Use intermeshing rubber rolls, while steel rolls are recommended when abrasive soils can rapidly wear rubber rolls.

Research shows that you don't see a lot of difference in the amount of conditioning that you get and the subsequent drying rate – as long as you do a good job of setting both rolls up. Conditioning is important, even when you're making haylage. Fresh-cut forage is about 75% moisture and haylage is put up at 55-62% moisture. To move from 75% to 60% moisture you have to lose 900 gallons of water per acre. You need to condition well in order to get that water to leave that plant.

Mowing without conditioning may be an option for growers who only make haylage, although they'll add up to four hours of drying time. But laying the crop in wide swaths – at least 60% of the cutting width – regardless of how it will be stored. With wide swaths faster drying is observed all the time and higher forage quality about 70% of the time. Higher quality may not be seen, but faster drying is.

Choose mowing equipment carefully because some can lay swaths up to 80% of the cutting width while others only go to 40%.

(Adapted by B. Grisso)

Building a Fire Pit

There's just something nice about sitting outdoors around a warm fire talking with friends to create a happy feeling in people.

Of course, for most of us, just piling up wood somewhere in the yard and starting a fire is not a good option. An open fire is hard to control and is a real mess to clean up. We need a place which helps us control the fire, and which is safe and easy to clean up. Rural homeowners who want the pleasures of an outside fire have discovered the value of a fire pit.

What is a fire pit?

Basically, a fire pit is any structure that contains and controls an exterior fire. Most fire pits are one to two feet high and can be built in any shape desired by the builder. Although circular is the most common shape, square, rectangular or even irregular structures can be very attractive in different settings. Some fire pits burn wood and some burn propane or other gas. Both wood and gas fire pits have advantages. Gas pits are instant start, instant stop- which can be good safety features- and gas units are easier to clean up- no ashes to dispose of. Gas pits do require some substantial pipe-fitting and professional hookups to assure a safe construction.

Gas fire pit kits are sold over the internet, and some of the kits look very nice. Some basic gas-appliance precautions will take care of any potential problems. For instance, it is recommended that a professional plumber install the piping and hook-up of the fire pit burner. Also, if gas is ever smelled, don't try to light the fire pit or touch any electrical appliances, and call the gas supplier. Keep the unit covered when not in use, especially in wet weather.

In some cases, a fire pit can be nothing more than a ring of flat quarter-inch thick, eighteen- inch wide metal welded into a circle and pounded into the ground. Fire pits can also be extremely formal and impressive brick or rock masonry structures incorporated into matching patios and other large yard structures. It's all up to the individual homeowner's wants and needs.

There are a number of portable, low cost fire pits which can be purchased at discount centers and building material stores. These portable fire pits- most are basically tubs on legs- have their uses and good points: they are cheap- most cost less than $200, and they can be moved if needed. However, they tend to burn out fairly quickly, most require some sort of assembly, and they can be tipped over if someone runs into them. There are some very low-cost metal rings which can be purchased for around $60 at many stores. The bottom edge of these rings is hammered into the ground, and that is all that is required. These structures contain a fire.

Permanent Installations

A fire pit is another destination in the yard or on the acreage. It adds an exciting dimension to the landscape and brings people out at night to experience and become comfortable with the natural

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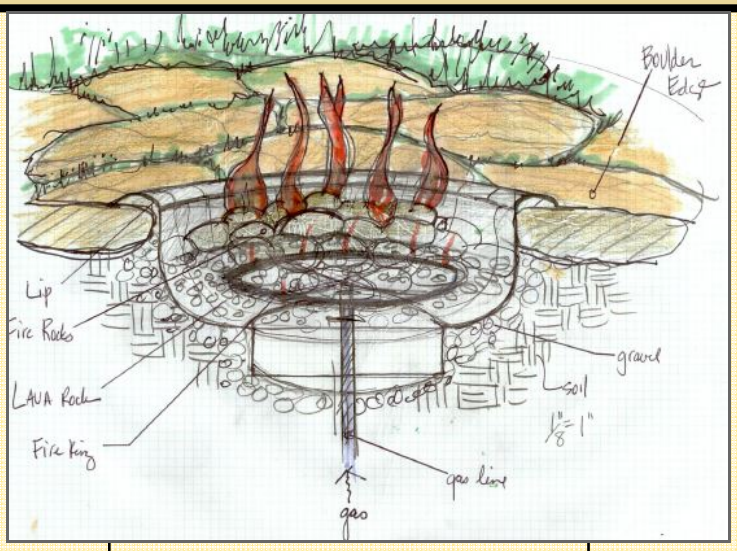
Fire Pit (cont.)

(Continued from page 22)

world.



Homeowners considering a permanent fire pit should first check with city or county codes to learn if there are any regulations about open fires in the back yard. The codes may not allow or there may be regulations about the distance from structures or water source. This leads to the importance of a water source in case a fire gets out of control. A bucket of water on hand is always a good idea.

The best location for a fire pit is one where it will be used. If it is far from the house, it may seem less appealing on a dark night, particularly if the area between the two is uneven or sloped. Often homeowners think they would like a fire pit "in the woods," but one closer to the house may be used more frequently.

Instructions on building fire pits recommend that they be at least twenty feet from any structure, away from power lines and not directly under trees. Think about the direction in which the smoke will drift. Choose a level location that will not collect water. Decide where and how to store firewood. The materials and style of the area should relate well to the rest of the built landscape. This means using the same, similar or complementary materials.

Materials

Homeowners can build a fire pit by using pre-cut paving bocks, offered for sale at most building supply stores. Basically, the size and shape of the brick structure is planned in the yard, and then a level base is made, and blocks are laid on the planned lines. Very often a metal pit bowl is used, and the size of the bowl determines the size of the brick structure, but fire bricks can also be used to line a regular cement block or brick structure.

Although most fire pits are built so that the walls of the pit extend up to make a low wall of sorts, there's no reason that the pit can't be below ground level. This sort of installation looks very nice for formal patio settings.

For a really permanent fire pit structure, the blocks or bricks can be cemented into place, but dry-laid bricks work just as well. For circular fire pits, most stores that sell building materials have pre-formed blocks with the ends beveled so that when laid end to end, a circle is formed. These blocks work well, and the size of the circle can be adjusted easily.

It really doesn't hurt anything if the blocks are not perfectly snug and tight against the neighboring blocks when the pit is built. The basic function will work fine, and some neat light-effects will occur when the firelight flickers through the cracks of the structure.

One caution fire pit builders have to keep in mind: Never use water-soaked rocks or

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Fire Pit (cont.)

(Continued from page 23)

blocks. There are some very attractive rocks to be found in many streams and rivers, but any rocks picked up from waterways must be allowed to dry out totally before being used in a fire pit. It takes a very long time for water-saturated rocks and blocks to lose their soaked-up water, and if these rocks or blocks are heated in a fire while water is still inside, they can explode from the water inside which can't get out before it turns to steam. Use only dry materials.

Stone is the most common material used for pits. This ranges from boulders to concrete and natural wall stone, as well as brick. Masonry brick walls involve more skill and materials and create a less natural look. A level layer of gravel similar to that used below a dry laid patio provides a solid base on which to add the stone.

Some Things to Consdider When Building a Fire Pit

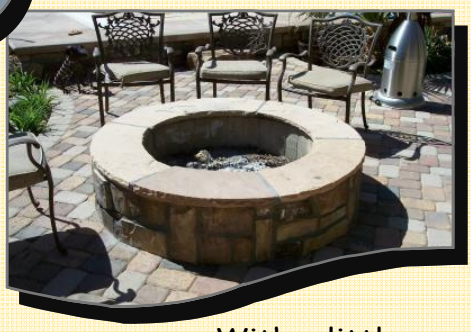
Be careful when choosing the location of the fire pit. Don't put the pit over septic system structures, and keep away

from underground plumbing and of course gas lines.

When using a fire pit for cooking or grilling (by the way, cooking outside even if it's only hotdogs and marshmallows, is a really nice attraction to a fire pit) make sure that the structure of the pit fits the grill surfaces. When building a fire pit to be used for cooking or grilling, first find the grate you would like to use and design the size around it. Be sure to leave enough room around the fire pit for people to sit.

A point that most people don't think about is the proper management of fire pit fuel. Decide where and how to store firewood. You want it to be handy, but not too close to the scene.

Seating around the fire pit is very important. Space management is crucial. There needs to be space for those who choose to stand and move about and there needs to be some sort of seating arrangement. Portable chairs or permanent seating can both be used.



With a little planning for shape, size, and building materials, and site selection, rural homeowners can have a functional outdoor cooking structure that allows friends and family to sit around a fire and ask life's important questions such as, "Is that hot dog ready yet?"

(adapted by B. Grisso)

ASABE Extension Awards

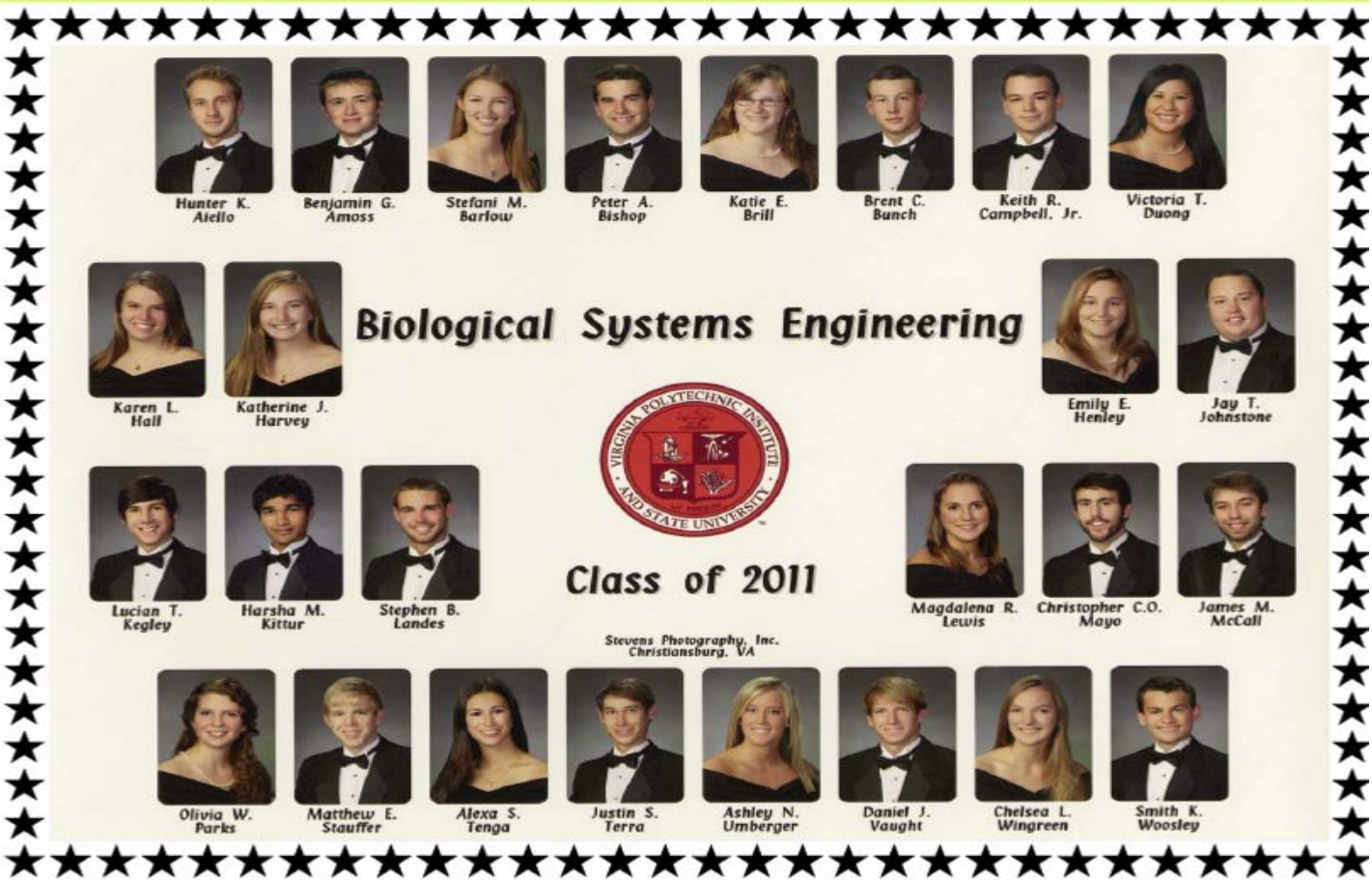
The following ASABE recognitions have been awarded to several BSE faculty and were presented at the 2011 ASABE International Meeting.

2011 Educational Aids Blue Ribbon Award (Publications – Medium category) for "Assistive Technologies in Agriculture" by **Robert Grisso**, **J. Perumpral**, K. Pevaski, and K. Ballin. *http://pubs.ext.vt.edu/442-084*

2011 Educational Aids Blue Ribbon Award (Publications – Medium category) for "Predicting Tractor Diesel Fuel Consumption" by **Robert Grisso, J. Perumpral, D. Vaughan**, G. Roberson, and R. Pitman. *http://pubs.ext.vt.edu/442-073*

BSE News: http://www.bse.vt.edu/08/news

Congratulations—BSE Class of 2011!



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