



Biological Systems Engineering

Engineering Update

Fall 2010

Engineering Update: ASABE Blue Ribbon Winner!

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BSE is located in Seitz

Engineering Update

Biological Systems Engineering
September 2010

 **Virginia Tech**
Invent the Future

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**
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Virginia Cooperative Extension
A partnership of Virginia Tech and Virginia State University www.ext.vt.edu

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ATVs: Work Smart. Ride Safe

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.

This year's theme is **ATVs: Work Smart. Ride Safe.** Every year, there are more all-terrain vehicles (ATVs) in operation and the operators cover a wide range in age and ability. The US Consumer Product and Safety Commission reports 410 deaths related to ATV use in 2008 and estimates over 135,000 injuries treated in our nation's emergency rooms. They also report that 4 of every 10 people treated in hospital emergency rooms are younger than age 16.

We hope that safety awareness, community based education efforts, and attention to age appropriate use of ATV's will make a difference. For the most up to date Virginia regulations related to ATV use, go to <http://www.atvsafety.gov/state/virginia.html>

As we recognize National



Farm Safety & Health Week this September, please join us in promoting safe and healthy practices on our farms and ranches across the US and in our neighboring countries as producers enter the fall harvest season. We welcome your collaboration as we pay special attention to the issues of ATV safety and rider protection.

Safety training for ATV use is the first step in being a qualified ATV operator. Local ATV dealers, ATV clubs, and safety professionals from Farm Bureau, Cooperative Extension and farm organizations may offer safe ATV operation programs. The Specialty Vehicle Institute of America (SVIA) provides training as well. Visit



them on the Internet at www.svia.org. At a minimum, use the operator's manual and the safety signs on the ATV to help educate yourself before using the machine.

Here are some guidelines for safe ATV use:

- Manufacturers recommend that ATVs with engine sizes greater than 70cc be sold only for children 12 and older and that ATV's with engines greater than 90cc be sold only for individuals 16 and older. The child's strength, skills, and maturity determine readiness to operate an ATV.
- Carrying passengers increases the risk of overturn injury and death. A second person changes the center of gravity of the machine and the machine's steering ability. According to state law, no passengers are permitted on an ATV at any time, except when an ATV is designed to be operated with a passenger.

(Continued on page 3)

ATVs: Work Smart. Ride Safe

(Continued from page 2)

- Know the machine's limitations. Operating on steep terrain, pulling heavy loads, excessive speed, and "wheelie" type starts can result in ATV turnover.

- Wear a full-face shield helmet. The helmet should fit snugly and securely. It should be labeled with the ANSI label.

- If a face shield is not part of the helmet, wear goggles or a separate face shield, especially at high speeds or in wooded terrain. The protective lens should carry the ANSI label.

- Over-the-ankle shoes with sturdy



heels and soles are necessary.

- Gloves and long sleeves are needed for specific jobs.

- Use lights, reflectors, and highly visible flags to increase the ATV's visibility.

- Avoid public roads. Paved and unpaved roads are designed for truck and automo-



tive traffic. ATVs are designed for off-road use. Increased risk for rollovers of ATVs on road surfaces has been shown.

- In Virginia, ATV use on public highways is prohibited, ex-



cept to cross these roads, for agricultural purposes, or while in Buchanan County

- Check your state's vehicle code for use of the ATV as an agricultural machine. Use of the ATV for agricultural purposes and only incidental road travel may be permitted.

Video by Kids/for Kids from Progressive Agriculture

Tractor Supply, RFD TV, and Progressive Agriculture Foundation have joined together to create a video "**This Old Farm**," which introduces children to farm hazards and proper precautions.

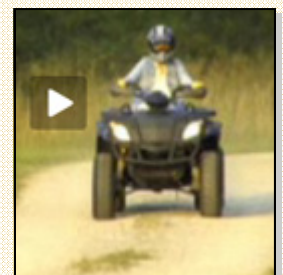
Narrated and performed by children, the 20-minute presentation

celebrates the pleasures of living in the country while moving through a series of farm environments and discussing hazards. Viewers are encouraged to watch for hazards and find them before the characters in the video do. The children do chores and investigate barns, haylofts, personal protective equipment, and vehicles.

View the video online at the Progressive Agriculture Foundation Web site:

<http://www.progressiveag.org>

or the direct link is below...



<http://www.rfdtvbeta.com/streams/safety/>

VCE TMDL In-Service Training



Virginia Cooperative Extension In-service Educational Program
*What every ANR Agent should know about
the Chesapeake Bay TMDL and Virginia
Watershed Implementation Plan*

Wednesday October 13th, 2010
9 am – 12 noon

Virginia Cooperative Extension Northern District Office
2322 Blue Stone Hills Drive, Suite 140
Harrisonburg, VA 22801

This presentation plus question-and-answer period is the only scheduled in-person VCE TMDL in-service training, but a series of subsequent webinars will follow. This session will focus primarily on the Shenandoah-Potomac basin, but ANR agents from across the district and the state are welcome.

Presenters: Brian Benham, Biological Systems Engineering
Jim Pease, Agricultural and Applied Economics

To register: Contact Erin Ling (ejling@vt.edu); 540-231-9058.

Space is limited!

Register: Erin Ling (ejling@vt.edu)



Valuing Manure Nutrients as a Fertilizer

As the fall manure application period approaches a fundamental issue that producers ought to consider is how to value manure as a nutrient resource.

Knowledge of how to value manure provides a way to quantify its economic value. There is no straightforward answer

to this issue because, with manure, one needs to know a number of things including the composition, source, and nutrients in the soil where manure will be applied. Below are a few points to consider in the evaluation:

1. Analyze the manure to determine which nutrients are present and in what amounts. This information, combined with the soil test information, can tell you how much manure should be supplied to meet the nutritional needs of a crop.
2. In evaluating the manure test data, remember that values of total nitrogen (N) are not particularly useful because they do provide much information on the amount of N available to the crop. Of greater importance are the total ammonia-N or ammonium-N (TAN) and organic-N. Ammonia-N in ma-



nure is similar to any form of commercial fertilizer; it is readily available the day of application. Therefore, valuing ammonia-N similar to a commercially available form is certainly a fair assessment. Organic-N, however, is a slower release form of nitrogen because it requires a biological process to make it plant available. The environment-dependent nature of this biological process makes it difficult to ascertain its precise agronomic value. One could use a lower cost N source (typically anhydrous ammonia) to calculate the value of organic-N based on the plant available estimate.

3. Phosphorus (P) and potassium (K) contained in manure is considered approximately as available as the commercial fertilizers. Therefore, valuing P and K in manure

could be calculated by direct comparison to commercial fertilizers.

4. Manure is considered a complete nutrient source because it contains everything a growing plant requires, and the analysis will likely provide you with additional nu-

tritional information. However, it is not necessary to determine an economic value for all of the nutrients. This is especially true for those nutrients that do not necessarily require supplementation to ensure an adequate plant supply (i.e. micronutrients on soils that typically do not exhibit deficiency symptoms). There are various fertilizers available that can be mixed to provide the correct quantities of the primary N, P, K and other secondary and micronutrients. Common commercial fertilizers and how to



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Valuing Manure Nutrients as a Fertilizer (cont.)

(Continued from page 5)

calculate application rates is covered in "*Fertilizer Types and Calculating Application Rates*," VCE Publication #424-035. Available at <http://www.pubs.ext.vt.edu/424/424-035/424-035.html>

5. Organic matter in the manure has some redeeming value, but it would be extremely difficult to assign an economic value to it.
6. One challenge to consider when using manure as a fertilizer source is the unbalanced nature of the nutrients. Applying enough manure to reach sufficient N and K levels usually results in the over application of P, which can have negative economic (from a sense that the excess P would be more beneficial on other fields) and environmental outcomes. However, applying manure based on a sufficient P level usually results in an under-application of N, which can lead to a reduction in yield or need to supplement N with commercial fertilizer at an additional cost.
7. Soil analysis is necessary for fields that receive manure continuously because balancing N, P, and K requirements is almost impos-



sible relying solely on manure nutrients. It does not make sense to calculate the economic value of a nutrient if soil test level in the field manure is to be applied is above the maintenance range for producing a crop. Soil testing is the basis of good nutrient management and soil samples should be taken regularly. Details regarding sampling procedures and laboratory methods are available at:

www.soiltest.vt.edu

In summary, conducting soil tests and manure analysis will help you determine how best to utilize your manure nutrient resources and get the maximum economic benefit from their use. Additionally, you will be able to do so in an environmental responsible manner.

This fall, remember to take good samples of manure and soils and send them for analysis to help you plan and get the best value from manure.

Announcements

Chesapeake Bay Goal Line 2025: Opportunities for Enhancing Agricultural Conservation. October 5-6, 2010; Marriott Inn - Hunt Valley, MD. For more information and to RSVP visit: <http://www.chesapeake.org/stac/agconservationtools.html>

Chesapeake Bay Goal Line 2025: Opportunities for Enhancing Agricultural Conservation

LOGISTICS | REGISTRATION | LINKS AND MATERIAL | STEERING COMMITTEE | STAC HOME

The Chesapeake Bay Program's Agriculture Workgroup (AgWG) under the Water Quality Goal Implementation Team (WQGIT), with the technical and financial assistance of the Scientific and Technical Advisory Committee (STAC), the USDA-NIFA Mid-Atlantic Water Program (MAWP) and collaborating agricultural and environmental organizations, will host a comprehensive scientific conference on potential agricultural conservation enhancements for assisting the Bay partnership in obtaining the water quality goals of the Chesapeake Bay TMDL. Conference participants will engage in facilitated dialogue to:

- Establish a comprehensive understanding of enhanced and "next-generation" conservation tools;
- Identify key agricultural conservation tools for short-term and long-term development for accelerated implementation;
- Recognize opportunities and challenges regarding implementation, tracking, verification and reporting of these conservation tools;
- Develop recommendations for the Chesapeake Bay Program partnership describing specific conservation tools and practices with the greatest potential to achieve present and future Bay TMDL goals.

Discussion and recommendations are being sought from a diverse group of conference participants, including: scientists from major academic and research institutions specializing in social science, nutrient management planning, and agricultural programs; representatives from federal and state environmental and agricultural agencies; county conservation district staff; non-profit organizations; private sector consultants and agricultural industry representatives.



Better Composting School



PURPOSE

To train operators of compost facilities in the science of composting.

WHO SHOULD ATTEND

Composting plant operators, managers and other interested persons.

ENROLLMENT LIMITATIONS

Enrollment will be limited to the first 40 who enroll with the required registration fee.

COURSE OF INSTRUCTION

School starts promptly at 10 am, October 19 and ends at noon, October 22.

REGISTRATION FEE

\$425 for the three-day school if received by October 4, 2010. Registration after October 4, 2010 will be \$450. The registration fee includes handout materials, second-day tour, all breaks, three lunches, first night's dinner, facility rental, and other administrative costs.

LOCATION

Classroom and laboratory work will be held at the USDA Beltsville Agricultural Research Center Building 003 and other locations.

COMPOSTING & COMPOST STANDARDS

Composting is becoming the method of choice for converting organic waste into a marketable product- Commercial Compost. If horticultural industries and home gardeners are to accept commercial compost as they do fertilizers, processed animal manures and peatmoss, the compost must be produced under controlled conditions employing methods deemed acceptable by the industry. Horticultural industries include nurseries, greenhouses, landscape contractors, garden centers, and landscape maintenance companies. Such service providers are major users of organic matter and fertilizers.

Since commercial compost can be manufactured from a variety of waste materials, a variety of standards have been established based on end uses. Managers of composting facilities must be familiar with these standards and with the waste materials and composting systems that can best produce the desired products. Composting to produce a product that is consistent in quality will require good management and quality control.

School participants will learn the basics of making good compost. They will tour commercial operations. They will perform product sampling and learn simple procedures for compost testing. Participants will become better composters. For additional information, call 301-405-1198.

TOPICS

Introduction
Science of Composting
Processes and Equipment
Site Selection
Food Stocks and Mixes
Composting Mortalities
Processes and Odor Control
Computer-Aided Recipe Making
Tour of 4-5 Commercial Composting Facilities
Collect Compost Samples for Laboratory
Health and Safety Issues
Compost Quality and Standards
Laboratory Procedures for Compost Quality
Compost Utilization
Marketing and Economics

GREGORY K. EVANYLO, Ph.D.—Dr. Evanylo, Professor & Extension Specialist, Department of Crop & Soil Environmental Sciences, Virginia Tech, specializes in the utilization of biosolids, manure, and other residuals derived from agricultural, industrial, and municipal activities. His work emphasizes the availability, transport, and effects of nutrients, trace elements, and organic matter in such residuals on plant health, soil properties, and water quality.



JACTONE AROGO OGEJO, Ph.D., P.E.—Dr. Arogo, Assistant Professor & Extension Specialist, Department of Biological Systems Engineering, Virginia Tech, specializes in the management of manure and other organic residuals derived from agricultural and industrial operations. His work emphasizes treatment and product recovery from organic residues as well as agricultural air quality.



ROBERT E. GRAVES, Ph.D., P.E.—Dr. Graves, Professor, Department of Agricultural & Biological Engineering, Penn State, specializes in manure and organic waste handling, processing, storage and utilization and design, and management of animal housing and production systems, especially dairy. In the 1980s he initiated efforts to encourage cooperation between municipalities and farmers in handling leaf and yard waste.



GARY K. FELTON, Ph.D.—Dr. Felton, Associate Professor, Department of Environmental Science & Technology, University of Maryland, specializes in the fate and transport of nutrients and on-farm applications of technology. In particular, his work has focused on poultry litter applications, co-composting poultry litter and other wastes, and nutrient fate and transport from poultry litter stockpiles.



MARION DAVITT—Ms. Davitt manages Penn State's Organic Materials Processing and Education Center. Her work includes day to day management of a composting, mulch manufacturing and soil blending facility; and recipe development, feedstock processing, and enterprise accounting. She also provides technical support to research projects and participates in outreach activities in the organic processing industry.



Harvest Safety Reminders

Harvest will soon be underway and farmers will be in one of their busiest times of the year. Long hours and dangerous working conditions are accepted as a normal part of a farmer's life, but no one should become a statistic for the sake of getting done a day or two earlier.

Safety Tips for Farmers

- Farmers are encouraged to be especially mindful of their safety during the rush of harvest.
- Stay alert. Take breaks -- get out of the cab and walk around every few hours.
- Shut down the machine before working on it. If the combine becomes clogged, shut off the motor, not just the header, before attempting to unplug it by hand.
- Know where your co-workers are. Visibility is poor around large machinery. Many deaths are the result of bystanders being run over or crushed between machines.
- Never trust hydraulic systems when working under a machine. Always use a safety prop if you must work under a header or other heavy machinery.
- Never step over a rotating PTO. The few extra steps you save by not walking

around the tractor aren't worth losing your life.

- Never stand on grain that is being moved. Every year people "drown" in grain carts and grain bins that are being emptied.
- Keep grain auger grates and shields in place. Protect your hands and feet.
- If you must move machinery on a roadway after dark, have working headlights and flashing front and rear warning lights.
- Always display the reflective, triangular slow-moving vehicle (SMV) emblem on all tractors, combines, grain carts, and other farm machinery when driven or pulled on public roadways.

Safety Tips for Residents

- Remember to be watchful on rural roads during harvest. A car going 50 mph coming up behind a farm implement moving at 15 mph, closes at a rate of over 50 feet per second.
- Don't pull out in front of farm vehicles. Heavily loaded trucks and grain trailers can't stop as quickly as a passenger car.
- Watch out! Trucks and farm equipment

may be entering the roadway from field lanes in places where you wouldn't normally expect them.

- Give them room. Eight-row headers are nearly 25 feet wide and 12-row headers are nearly 35 feet wide. These take up nearly all of a roadway. When overtaking a combine, give the farmer time to see you and to find a safe place where he/she can pull over and make room for you to pass. Never attempt to pass a wide farm machine until the driver is aware of your presence.
- Never try to pass a combine or other implement on the shoulder of the road. If you hit a washout or hidden culvert, you could roll the vehicle.
- Harvest activity can disturb deer, causing them to be on the move during times of the day they are usually lying down. Be especially alert for deer during harvest.



Take Harvest Notes for a Smoother 2011

Harvest is like the final exam for your farming practices for 2010, an opportunity to assess your work and make adjustments where needed. For your fall assessment use a notebook (paper or computer) to record what you observed during harvest and the locations of any problems.

Memories can fade, but come winter you'll appreciate having a more precise record so you can tackle these issues.

Possible areas to note include:

- **Weed Pressure.** Note the kind of weeds and their density and location. When working on your herbicide plans for next year, use this information to consider changes in cultivating, herbicide chemistry used, and changes in timing of application.



- **General Observations.** Sometimes changes in yield or plant condition are related to soil type or soil fertility. If there is a particularly good or poor spot in a field and the change can't be explained by soil type, consider taking soil samples. This can help you determine if there is a problem that

can be corrected. If you have an unexplained yield drop in a localized area of a soybean field, consider getting the local VCE Agent involved in the diagnosis.

Your main focus at harvest is getting the crop out of the field, which can make it hard to remember some of these details after harvest or over the winter if you don't write them down. With larger farming operations, remembering specific details about each field can be difficult; however, if you can note this data, it can be of real value as you work toward planning for the next year.

(R. Grisso)

- **Varieties.** Record significant differences among crop varieties. What variety dried down best? Which variety was slow to dry down? What was the condition of the stand? Note changes in yield, especially if you have monitoring equipment available in the combine. Some excellent yielding varieties aren't of much value if they are lying down at harvest. Note critical areas of the field it will be a help when making variety selections for next year.

- **Erosion Concerns.** Note where ditches have washed into fields and other abnormalities so you can repair these when you're in the area with the blade or box scraper.



Nine Ways to Harvest Smarter

A job worth doing is worth doing right — and when it comes to harvesting crops it couldn't be truer. Before taking to the field this fall, consider these tips to make your harvest more efficient and less stressful.

Assess field health. Growers should evaluate late-season crop health to make sure they harvest fields with potential standability problems first. Producers will also want to watch for potential stalk rot, corn borer or stem borer problems in soybeans. Be aware of which hybrids dry down more quickly than others.

Calibrate yield monitors. Taking the time and patience to calibrate a yield monitor properly can go a long way when it comes time to make important decisions from your yield data. You want to know how well it's doing at both high and low flow rates, and make sure that the impact plate and moisture sensors are clean before you start. The information is extremely valuable, so make sure it's as accurate as possible.

Watch moisture levels. Searching for dry corn can cost money, especially at today's fuel prices. Therefore, taking the time to find out which fields are ready to harvest before all the equipment is brought to the field. Having a quality moisture tester on hand to avoid hauling excess water to the market and taking a dock.

Evaluate field loss often. Checking behind the combine to determine field loss is important. Many of the losses occur at the head of the machine; making sure that you have

things adjusted appropriately is valuable. In reasonable operating conditions, loss is approximately 2 kernels/sq- ft, which equals about 1 bushel/acre of loss. Combine operators should be striving for that figure or less. Adjustment and clearance on deck plates is important, as well as making sure that the ear savers are present and in good repair to keep ears from bouncing out of the head. Entire ears lost adds up in a hurry.

Optimize machinery with adjustments. Make the adjustments on your combine one at a time in order to evaluate what's going on. Be prepared and allow time to check on settings in the field. Ordinarily, you want to start at the lower speed setting and then adjust up while maintaining grain quality. The idea is to get as much crop-on-crop threshing as possible. When the kernels rub against each other to loosen from the cob, it's gentler than rubbing against steel. Crops with higher in moisture, puts a premium on machine setup. When cobs are higher in moisture content, they become spongier and harder to thresh. Put a focus on getting the rotor cylinder speed and concave clearance set appropriately.

Capitalize on teamwork. Communication between the combine and cart or truck drivers is critical to maximize efficiency. The combine driver has to assist the cart driver in their operation. Both operators need to know where they will meet and the most efficient way to make this happen. The best combine operator is one who knows how to run a grain cart efficiently. Any time you can have a full grain cart at the end

of the field where the truck is located makes the cart much more productive and reduces field compaction from field traffic.

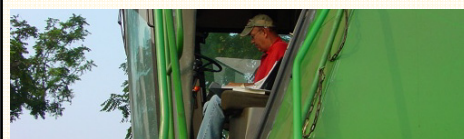
Throttle back when possible.

While your combine has to run wide open, there is opportunity to throttle back your tractor. If you can, throttle back a bit. You can still get a lot done if you're not overloading the engine and you'll use less fuel. Think about logistics: the location of your grain cart, your truck and how you harvest your fields and spend less idle time with the machines running.

Consistency tops hurriedness. One major harvest blunder is that haste often makes waste. Rushing harvest doesn't make things go faster; in fact that is when problems and accidents occur. Any employer who tells an employee to 'hurry up' simply made the mistake of not managing his operation efficiently before they got behind schedule. Steady and consistent always wins over fast and furious at the end of the day; it also puts the most bushels in the bin."

Take a deep breath and relax.

Producers should slow down a little and be safe. Taking short breaks throughout the day will aid in staying mentally alert while fighting off fatigue. It is a proven fact that more accidents happen when you are worn out or distracted. Also, the driver should always be aware of his surroundings and pay special attention when children are in the area.



Prevent Farm Machinery from Corroding

While equipment companies are doing their part to reduce corrosion of tractors and farm equipment, how well you maintain your machinery will determine its useful life. Here are some rust prevention tips.

1. Clean the machine after each use. Dirt, dust and crop residue can be corrosive when mixed with grease and oil on equipment. Rain can also be damaging. It is recommended that you wash equipment down after each use. For example, rotary cutter grass can build up and the deck can rust very fast. Putting a machine away clean helps to preserve equipment.

2. Store indoors. Storing machinery in a shed when it is not being used will keep it clean and dry.

3. Avoid parking on dirt. If inside storage is not possible, tillage implements in particular should be parked on concrete, gravel or blocks of wood to keep the disk blades or chisel plow knives off the ground. They will hold up a lot better if not in contact with grass or soil.

4. Wash off chemicals. Corrosive chemicals such as fertilizer and pesticides should be washed off as soon as possible. Pressure washing with hot soapy water and then rinsing is ideal; however, simply rinsing thoroughly with cold water will also help.

5. Apply plow-bottom paint. You can keep



tillage tools clean and shiny by applying what is called plow-bottom paint. This flat black paint, sold at implement dealers, can be sprayed or brushed directly on the disk blades, sweeps, plow bottoms or other ground-engaging surfaces. It stays on in storage but peels off when it hits the soil and leaves a shiny surface again.

6. Wax annually. Applying a good quality automotive wax or protectant to major surfaces such as tractor hoods and fenders provides additional protection.

7. Do paint touch-ups. Scratches and paint chips can be repainted to



help prevent rust in those areas.

8. Grease bearings. Bearings and other moving parts should be greased before the machinery is stored for the season. Filling the bearings with grease prevents water from seeping in and corroding the bearings.

9. Hang up hydraulic tips. Another area where corrosion is a problem is hydraulic fittings. When unhooking hydraulic hoses from the trac-

tor, some folks drop them on the ground. Then the connections get rusty and don't fit well the next time you try to hook them up. Hoses should be hung up on the machine once they are unhooked to keep the tips off the ground.



10. Retract hydraulic cylinders. Hydraulic cylinder rods on implements are subject to pit corrosion, or pits in the metal, if left extended and stored outside for a season. Pit corrosion can tear out the seals on the cylinders the next time you use the implement. You should retract the cylinders or coat the rods with heavy grease to protect them.

(R. Grisso)



Safety When Driving Equipment onto Trailers

Many turf professionals move mowers and tractors from one job site to another using trailers or trucks.



axle drives and the rear axle steers, so you should drive up and back down.

Loading equipment onto trailers and trucks presents a safety challenge. Loading the right way can reduce the risk of overturn and operator injury.

Overturn Hazard

Most mowers and tractors used by turf professionals have a low center of gravity and are not easy to overturn, but an overturn is still possible when driving up or down a loading ramp onto a trailer or truck. Overturns occur mainly because of the torque on the drive wheels. When driving up a slope, the load on the uphill axle is decreased and the load on the downhill axle is increased. If the downhill axle is the powered axle, the torque driving the axle will tend to rotate the machine around that axle.

The problem can also occur when driving down a loading ramp. If the brakes are applied while descending, the brake torque on the driving axle can cause the machine to rotate about that axle.

Another overturn risk is slipping off the sides of the ramps. This can occur because of steering errors or wheel slippage. If the ramps or tires are wet, the drive tires can spin and allow the machine to slide sideways. Ramps with a good traction surface are important.

Drive Axle Up!

The easy way to avoid this problem is to keep the drive axle uphill while loading and unloading. If you keep the drive axle uphill, any tendency to overturn will lift the driving tires, causing the tires to lose traction, and thus immediately stop the overturning tendency. With a tractor, the rear axle is the driving axle so you need to keep the rear of the tractor pointed up the ramp. Always back a tractor up a ramp and drive down forward.

The same situation is true for a mid-mount zero-turning-radius mower. The rear axle is the driving axle, so back up the ramp and drive down. With a front deck rider, the situation is different. The front

Use ROPS With Seatbelt

Your tractor or mower should be equipped with a Rollover Protective Structure (ROPS) consisting of a rollbar and a seatbelt. Be sure to wear your seatbelt so that if the machine does overturn, you will be restrained in the protected envelope.

Remember; the critical point is to keep the drive wheels of your tractor or mower on the upward side of the steering tires.

(R. Grisso)

PLANS

Building and facility plans are now available for download from the VCE Intranet. Plans are categorized under five main categories: Forage Storage and Feeding, Grain Handling and Feeding, Beef, Horse, and Sheep. You will need Adobe Acrobat to download these files. Please visit:

<http://www.ext.vt.edu/vce/anr/bse/index.html>

Recent Deaths Highlight Dangers of Confined Spaces

In July, two Michigan teenagers were killed when they were powerwashing the inside of a small silo (<http://origin.wzzm13.com/news/story.aspx?storyid=127405&catid=2>). The silo was about 10 feet tall and only accessible by a small opening at the top. Authorities suspect that ammonia gas overcame one of the teenagers and the other child went in attempting a rescue. Several investigators were sickened while inspecting the silo.

Two more teenagers were killed in an Illinois grain bin (<http://www.cbsnews.com/stories/2010/07/29/national/main6725275.shtml>). Five people were at work in the grain bin when one worker fell into the grain. The other four went in to help but quickly realized the danger. Two escaped immediately, and two more were trapped with the original worker. Rescue workers were able to extract one young person, and he was sent by helicopter to a medical facility. Two of the workers, ages 19 and 14, were killed. OSHA determined that one of the employees was underage and none of the employees wore safety equipment.



These incidents highlight the dangers of confined spaces. They aren't strange types of spaces and the chemicals involved are not exotic -- something as simple as a plastic storage container and animal feed can be a deadly set-up.

A confined space is defined as: A space which, by design, has limited openings for entry and exit; unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy.

Confined spaces include but are not limited to storage tanks, pits, silos, vats, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines. Frequently, confined space situations include multiple fatalities as people attempting a rescue are also overcome by dangerous gases. Only trained rescue personnel with the proper gear should enter a confined space to make a rescue. What overcame the first person will most likely overcome the second person as well.

If you have confined spaces at your work site, it is a good

idea to inform all employees about the hazards. Inform them so that they know to stay out of a dangerous situation.

Confined spaces may be encountered in virtually any occupation; therefore, recognition is the first step in preventing fatalities. A NIOSH Alert requests the assistance of managers, supervisors, and workers in the prevention of deaths that occur in confined spaces.

Resources

Confined Spaces Topic page collects links to NIOSH documents and other resources related to confined spaces. <http://www.cdc.gov/niosh/topics/confinedspace/>

Preventing Occupational Fatalities in Confined Spaces: NIOSH AlertDHHS (NIOSH) Publication No. 86-110
<http://www.cdc.gov/niosh/86110v2.html>

Confined Space Hazards a Threat to Farmers (National Agricultural Safety Database)
<http://nasdonline.org/document/1042/d000836/confined-space-hazards-a-threat-to-farmers.html>

(adopted from September Safety News & Notes - CJ Lehtola)

Sensors Monitor Diesel Fuel Quality

Electrochemical sensors can be designed to detect specific chemicals, such as sulfur or sulfur-based compounds. One could then create a system to warn the operator or shut down the engine when the fuel has high sulfur content.

Sensors currently used to monitor the quality of diesel fuel and biodiesel blended fuels during engine operation are unable to adequately detect certain important fuel quality concerns.

University of Illinois is working to develop new technologies to improve these commercially-available sensors. The research is contributing to the development of a sensor that, when placed in the fuel line prior to where the fuel enters a diesel engine, can detect if there are any contaminants in or other problems with the fuel.

If biodiesel is used, the sensor would determine the quality and quantity of biodiesel entering the engine. Biodiesel, a renewable fuel

derived from natural oils like soybean oil, is typically blended with regular diesel fuel.

In some cases, engine manufacturers will support warranties on engines using higher percentages of biodiesel — up to 20 percent. However, they are reluctant to support engines running too much biodiesel because there is some concern it would affect the engine in a negative way.

Using electrochemical sensors to detect contaminants and other quality issues that today's sensors miss. By using electrochemical processes, the sensors are expected to be significantly more sensitive to the chemical composition of diesel fuel.

Electrochemical sensors can be designed to detect specific chemicals, such as sulfur or sulfur-based compounds. One could then create a system to

warn the operator or shut down the engine when the fuel has high sulfur content.

Sulfur is an important contaminant to monitor in diesel fuel, as it can contribute to the release of harmful exhaust emissions. Sulfur damages the catalysts in filters that are part of the engine's exhaust system. Such filters are needed to comply with the EPA strict regulations on emissions levels.

To stay within the EPA's emissions limits, it is no longer possible to simply optimize the combustion process. There is a need to capture some of the emissions from the engine, using filters or other methods.

When sulfur is involved in the combustion process, it creates sulfuric acid, which is a very corrosive by-product that can damage the engine and is also harmful to the environment.



The sensor needs to be improved to successfully detect sulfur and monitor other diesel fuel quality concerns.

Wintertime Sprayer Storage Tips

Protecting sprayers from the elements should be your top priority. Moisture in the air - whether from snow, rain, or soil - rusts metal parts of unprotected equipment. Also the sun's ultraviolet light softens and weakens rubber materials, such as hoses and tires, and degrades some tank materials.

The best protection is storing sprayers in a dry building. But if that's not possible, provide some sort of cover. Remove the hoses, wipe them clean, and store them inside a building. Don't, however, hang hoses over a nail or sharp object. This causes a permanent crease that reduces flow through the hose. Instead, coil hoses around a basket or other large, round object to prevent sharp bends.

Add 1 to 5 gallons of lightweight oil (mineral oil) - depending on the size of the tank - to the rinsing water before the final flushing. As water is pumped from the sprayer, the oil leaves a protective coating inside the tank, pump, hoses, and other parts. Another alternative is to use RV anti-freeze or windshield fluid to prevent freeze and damage of spray components.

To prevent corrosion, remove nozzle tips and strainers, dry

them, and store in a can of light oil, such as diesel fuel or kerosene. Remove rubber nozzle gaskets and store in a dry place.

The off-season is a good time to check spraying tips and clean them. But be careful: Flat spray tips have finely crafted, thin edges around the orifice to control the spray. Even the slightest damage from improper cleaning can cause both an increased flow rate and poor spray distribution.



Be sure to use adequate strainers in your spray system to minimize clogging. If a tip does clog, use only a soft bristled brush or a toothpick - never a metal object - to clean it. Also, be extremely careful with such soft tip materials as plastic. Experience has shown that even a wooden toothpick can distort the orifice.

While you're at it, you might want to clean the nozzle screens, too -

use a toothbrush and soapy water.

Drain all cleaning water from all parts to prevent freezing.

Pumps require special care. After draining the water, add a small amount of oil, and rotate the pump four or five revolutions by hand to completely coat interior surfaces. (Make sure this oil is not going to damage rubber rollers in a roller pump or rubber parts in a diaphragm pump).

Check the operator's manual. If oil is not recommended, pouring one tablespoon of radiator rust inhibitor in the inlet and outlet part of the pump also keeps the pump from corroding.

Another alternative: Put automotive antifreeze with rust inhibitor in the pump and other sprayer parts. This also protects against corrosion and prevents freezing in case all the water is not drained.

Cover all openings so that insects, dirt, and other foreign material cannot get into the system.

Finally, check the sprayer for scratched spots and touch up these areas with paint to eliminate corrosion.

(R. Grisso)



Precision Farming Tools: Automatic Section Control

Automatic section control

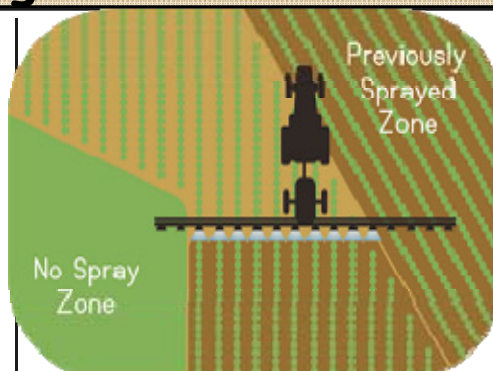
(ASC) is a precision farming technology that turns application equipment OFF in areas that have been previously covered or ON and OFF at headland turns, point rows, terraces, and/or waterways. The control sections may include boom sections or individual nozzles, and rows on sprayers, planters, and other implements. Many farmers have implemented the technology for use on sprayers, with popularity growing for planters.

Benefits

Calculations have shown input application savings from 5% to over 30% for each pass across a field using ASC. A study at Auburn University indicated input savings from 1% to 12% for each pass across a field when using ASC. On average, a 4.3% savings on seed cost could be observed for a farm, while some operations could see as high as a 7% savings. Savings are dependent upon field shape and size, with the highest benefits occurring in small, irregular shaped fields or fields containing conservation management structures such as grass waterways and terraces.

Benefits of ASC technology include:

1. Improved overall sprayer and planter accuracy
2. Reduced overlap thus reducing overall input costs
3. Improved environmental stewardship



4. Reduced crop damage from over-application
5. Improved application efficiency
6. Optimized operator efficiency

Utilizing a guidance system in conjunction with ASC, can significantly improve field efficiency while providing input savings. Generally, ASC technology can pay for itself over 1 to 2 growing seasons.

Components

Today, most sprayer manufacturers provide boom section solenoids as an option on new sprayers. However, some older sprayers can be retrofitted with this technology. Further, several planter manufacturers are working with vendors to provide section- or row-control technology. Consult the manufacturer to determine if this technology is compatible for your equipment.

The cost for ASC technology generally starts around \$2,000 but depends upon existing technology and equipment you may already be using on your farm. As a minimum, you need:

- GPS receiver
- Controller with software capable of automatic section/row control

- Proper boom valves for sprayers or row clutches for planters

Other components can include a flow meter/ control or other sensors to maintain the desired application rate when turning rows or sections ON/OFF. Please consult manufacturers for the necessary components and cables.

References:

Fulton, J., D. Mullenix, A. Sharda, A. Brooke, A. Winstead, and B. Ortiz. 2010. Automatic Section Control (ASC) Technology (ASC) for Agricultural Sprayers. Alabama Cooperative Extension System, Auburn University, Auburn, AL

Fulton, J., D. Mullenix, S. Basinger, A. Winstead, S. Norwood, and B. Ortiz. 2010. Automatic Section Control (ASC) Technology for Planters. Alabama Cooperative Extension System, Auburn University, Auburn, AL http://www.aces.edu/anr/precisionag/Guidance_Systems.php (Accessed on July 29, 2010)

(R. Grisso)



NEW FUNDS: Protecting Youth in the Green Industry

Lawn care, turf management and sod production and installation are economically important activities in Virginia. A large number of young workers are active in this green industry, particularly during summer, as entrepreneurs and as employees of lawn care companies. They do so with minimal training or work experience. Both the environment they work in and the lack of training create hazardous work conditions. There is potential for these workers to incur accidents and heat stress.

Therefore, the overall objective of this newly funded project (from USDA-NIFA) is to develop appropriate training programs and sensor technologies to protect the young workers from accidents and heat stress. The training program and sensor technologies will be developed taking into consideration the survey feedback received from the green industry representatives.

Objectives:

1. To develop appropriate educational programs to familiarize young workers with the safe use of machines that are commonly used in lawn care. This activity will include the development of educational materials as well as training of young workers engaged in lawn care and related activities. The program will emphasize equipment safety as well



as safe use of equipment commonly used in the green industry.

2. To assess the potential use of sensor technologies for protecting workers from heat stress and accidents. This objective will explore adaptation of sensors that are already available to protect young workers from heat stress and equipment runovers.

Current Findings:

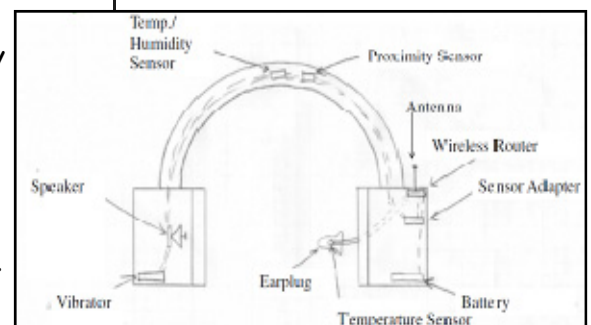
A 20 question survey was sent to the green industry concerning the educational needs of the youth they employed. The electronic survey was returned by 86 participants. Six-nine percent employed youth during the summer and their average crew sizes (numbers on a work site) were : <5 (34%); 5-9 (20%); and >9 (41%). The current safety training programs were administered by: crew leader/chief (67%) or co-worker (26%). Types of equipment youth use: ATV's (2%); utility vehicles (59%); push mowers (52%);

riding mowers (41%); aerators (12%); telescopic mowers (2%); sprayers (5%); fertilizer spreaders (8%), tractors (> 20 hp) (8%); and other equipment (24%).

Expected Outcomes:

1. A work force familiar with the operation and safe use of machines commonly used in the green industry.
2. Significant reduction in number of accidents and heat exposures.
3. The sensor technology developed in this study may be useful for protecting other workers exposed to heat, athletes during training, and children in amusement parks.

Sensor Concept:



Project Personnel:

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Support Staff:

Belinda Carroll / Harold Estes

Cooperators:

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Students Assistants:

Matt Kandel / Jeremy Smith / Andrew Karpin / JD McCoy

Stay Safe while Shoveling Snow

While the leaves are just starting to change, we should be ready for an early snow fall. A prompt may be needed to remind workers, employers and the general public of the hazards associated with snow removal and recovery work.

Cleaning up after a storm encompasses a variety of tasks, each of which can carry risks if performed incorrectly or without proper safeguards. We want people to know what those risks are and what steps they can take to protect themselves against these hazards."

Common hazards can include:

- Electric shock from contact with downed power lines or the use of ungrounded electrical equipment.
- Falls from snow removal on roofs or while working in aerial lifts or on ladders.
- Being struck or crushed by trees, branches or structures that collapse under the weight of accumulated snow.
- Carbon monoxide poisoning from gasoline-powered generators in inadequately ven-

tilated areas or idling vehicles.

- Lacerations or amputations from unguarded or improperly operated chain saws and power tools, and improperly attempting to clear jams in snow blowers.
- Slips or falls on icy or snow-covered walking surfaces.
- Being struck by motor vehicles while working in roadways.
- Hypothermia or frostbite from exposure to cold temperatures.



Means of addressing these hazards can include:

- Assume all power lines are energized, keep your distance and coordinate with the utility.
- Make certain that all electrical powered equipment is grounded.



- Provide and ensure the use of effective fall protection.
- Properly use and maintain ladders.
- Use caution around surfaces weighted down by large amounts of snow.
- Make certain all powered equipment is properly guarded and disconnected from power sources before cleaning or performing maintenance.
- Use and wear eye, face and body protection.
- Clear walking surfaces of

snow and ice and using salt or equivalent where appropriate.

- Establish and clearly mark work zones.
- Wear reflective clothing.
- Use engineering controls, personal protective equipment and safe work practices to reduce the length and severity of exposure to the cold.

More information on hazards and safeguards associated with cleanup and recovery activities after a storm or other major weather event is available online in English and Spanish at <http://www.osha.gov/OshDoc/hurricaneRecovery.html>

ASABE Extension Awards

The following ASABE awards have been awarded to several BSE faculty and were presented at the 2010 ASABE International Meeting.

2010 Educational Aids Blue Ribbon Award (Publications - Medium category) for "Nozzles: Selection and Sizing" by **Robert Grisso**, Pat Hipkins <http://pubs.ext.vt.edu/442-032>

2010 Educational Aids Blue Ribbon Award (Publications - Medium category) for Investing in GPS Guidance Systems?" by **Robert Grisso** and Gordon Groover <http://pubs.ext.vt.edu/448-076>

2010 Educational Aids Blue Ribbon Award (Publications - Medium category) for "Using Tractor Test Data for Select-

ing Farm Tractors" by **Robert Grisso**, **David Vaughan**, **John Perumpral**, Gary Roberson, Robert Pitman and Roger Hoy <http://pubs.ext.vt.edu/442-073>

























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

2010 BSE Commencement Reception BSE Family & Friends



Congratulations—BSE Class of 2010!

 Joshua M. Anderson	 Joshua L. Arnett	 Jorgen L. Berg	 Karen M. Breighner	 Vivian V. Camacho Suarez	 Jennifer L. Deanna	 Joshua A. Flickinger	
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