

January/February 2013

RESOURCE

engineering and technology for a sustainable world



ALSO INSIDE:

- Gravity Isn't Free**
- Killer Buildings**
- ASABE Ballot**
- BS+30 Survey**



Your Opinion Counts in PE Licensure

The National Council of Examiners for Engineering and Surveying (NCEES) establishes the requirements for licensing Professional Engineers (PEs). Currently, the

NCEES model specifies that an aspiring PE must meet the following requirements: (1) hold a bachelor’s degree in engineering from an ABET-accredited program, (2) have at least four years of appropriate work experience, (3) achieve acceptable results on the Fundamentals of Engineering exam and the PE exam, and (4) possess a clean disciplinary record.

Recently, an additional requirement has been proposed: a master’s degree or an equivalent 30 credit hours of graduate coursework in engineering. As an engineering society, ASABE has the opportunity to express an opinion on this proposal. In the Last Word section of this issue, Jay Harmon introduces the question at hand, and Dan Thomas and Maynard Herron offer arguments, pro and con. Please read both views, and then complete the on-line member poll at www.surveymonkey.com/s/ZZ77LRB. Your response will help to determine our Society’s position. If you prefer, mail or email your comments to ASABE Executive Director Darrin Drollinger, 2950 Niles Road, St. Joseph, Mich., 49085, USA, or drollinger@asabe.org.

Matters of Import

The Outstanding AE50 Awards

In June 1984, *Agricultural Engineering* (now *Resource*) included “A Forum for New Developments” in an issue on technology. From this focus on identifying innovative technology, the AE50 was born.

Product nominations poured in. And they continue to do so. The products featured in this issue represent not only the diversity of the agricultural and biological engineering fields, but companies of all sizes and varying pursuits, bringing advanced technology to the marketplace.

The interest in new technology and innovative applications of existing technology remains constant. As was the case in the beginning, many of this year’s AE50 winners may be further improved as technology advances and will in turn inspire further innovations.

Winners were announced on the ASABE website in late 2012, which is earlier than usual, because the AE50 awards will be presented at the 2013 AETC in Kansas City, Mo. And I’m eager to shake some hands! On behalf of the Society, congratulations to those who take home the coveted awards.

Tony Kajewski
KajewskiAnthonyH@JohnDeere.com

events calendar

ASABE CONFERENCES AND INTERNATIONAL MEETINGS

To receive more information about ASABE conferences and meetings, call ASABE at (800) 371-2723 or e-mail mtgs@asabe.org.

2013

- Jan. 28-30 **2013 Agricultural Equipment Technology Conference.** Kansas City, Missouri, USA.
- July 21-24 **ASABE Annual International Meeting.** Kansas City, Missouri, USA.

2014

- July 13-16 **ASABE Annual International Meeting.** Montreal, Quebec, Canada.

2015

- July 26-29 **ASABE Annual International Meeting.** New Orleans, Louisiana, USA.

ASABE ENDORSED EVENTS

2013

- Feb. 24-26 **International Conference on Agricultural Engineering: “New Technologies for Sustainable Agricultural Production and Food Security.”** Sultan Qaboos University (SQU), Sultanate of Oman.
- Mar. 25-17 **AWRA 2013 Spring Specialty Conference on Agricultural Hydrology.** Hilton St. Louis at the Ballpark Hotel, St. Louis, Missouri, USA.
- April 1-5 **From Waste to Worth: “Spreading” Science and Solutions.** Grand Hyatt Hotel, Denver, Colorado, USA.
- May 19-22 **13th National Watershed Conference, A Forum: The Future of Watershed Based Natural Resource Conservation.** Harrah’s Veranda Hotel and Tunica Conference Center, Tunica, Mississippi, USA.
- May 27-19 **3rd Climate Change Technology Conference (CCTC 2013): Engineering for Global Sustainability.** Concordia University, Montreal, Quebec, Canada.
- July 7-11 **9th European Conference on Precision Agriculture.** Lleida, Catalonia, Spain.

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ON THE COVER:

Abstract Circles Technology Background © Macrocozm/Dreamstime.com

RESOURCE

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January/February 2013



Congratulations, AE50 Winners!



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A Salute to the Winners

Resource is pleased to sponsor the **AE50 awards program**—celebrating companies for their developments in agricultural, food, and biological systems. The winners take center stage in this issue, which is dedicated to the gifted engineers and co-workers who creatively harness and manage company resources and talent to pursue exciting innovations.

AE50 is the only awards program of its kind. From the many entries submitted each year, an expert panel selects up to 50 products for recognition. The award-winning products are those ranked highest in innovation, significant engineering advancement, and impact on the market served. Formal presentation of the AE50 awards will occur

at ASABE's Agricultural Equipment Technology Conference (AETC) in Kansas City, Mo.

And beginning this year, **ASABE is partnering with AEM's AG CONNECT Expo and Summit** to honor the "best of the best" from among the products selected for AE50 awards. The new Gold and Silver awards will be presented at the AG CONNECT Expo, co-located with the 2013 AETC, and will be highlighted in a special display throughout the event.

A panel of agricultural equipment editors from leading farm publications along with ASABE member engineers selected the Gold and Silver award winners from the previous two years of AE50 awards. The Gold and Silver awards will be presented every two years in conjunction with the biennial AG CONNECT Expo and Summit.

Congratulations from the Resource staff!

If you have questions about the AE50 Awards program, visit the ASABE website (www.asabe.org/publications/resource-magazine/ae50-new-product-award.aspx) or contact Sandy Rutter (rutter@asabe.org or 269-932-7004).



2114 HIGH-CAPACITY CONVEYOR WITH DRIVE-OVER SWING-AWAY

KS i Conveyors, Inc., Cissna Park, Ill., USA
www.ksiconveyors.com

The KS i Model 2114 high-capacity conveyor with drive-over swing-away moves high-value seed, grain, and other fragile commodities gently and efficiently. Its 72 cm (30 in.) wide drive-over belt and 53 cm (21 in.) wide incline belt with 10 cm (4 in.) molded cleats transport up to 10,000 bu/h in a 36 cm (14 in.) tube. The dual drive system powers the belt to inclines of 36 degrees while maintaining even tension across the belt width. The conveyor is designed for 30 Mbu life and has a completely enclosed belt return. The drive-over tows beside the incline conveyor during road transport and rotates under hydraulic power into position for semi-hopper unloading. The conveyor comes in lengths of 26, 30, and 35 m (85, 100, and 115 ft) with PTO drive standard. An electric drive option is available.



3376 SERIES CLEANLOAD™

Pentair,
New Brighton, Minn., USA
www.hypropumps.com

The 3376 Series Cleanload™ provides new performance and safety features with the CycloRinse™ tank rinsing system. The CycloRinse™ feature increases the meltdown and incorporation of dry flowable agrochemicals into the tank solution mix by providing a continuous sheeting action on the tank walls. Faster incorporation means less time for mixing and more time for spraying. Other features include an eductor with three nozzle sizes tuned for optimal performance according to the application: turf, crop sprayer, or transfer. The newly designed ball valves provide easy-turn action for ease of use and ergonomic value while reducing stack height of the Cleanload™ assembly.



605 SUPER M CORNSTALK SPECIAL BALER WITH INLINE™ RAMP

Vermeer Corporation, Pella, Iowa, USA
www.vermeer.com

The 605 Super M Cornstalk Special Baler is built to make baling cornstalks more efficient with added capability via the innovative Inline™ Ramp. The optional Inline™ Ramp makes picking up cornstalks more efficient by turning the bale 90 degrees upon ejection so bales are lined up along the rows for easy loading, eliminating driving across rows, ridges, and stalks. The Inline™ Ramp also means less damage to bales by reducing the need for operators to move bales for loading. In addition, the 605 Super M Cornstalk Special Baler offers enhanced durability and a unique and patented powered windguard design to provide better starts, faster operating speeds, and clean uniform intake of cornstalks. The 605 Super M Cornstalk Special Baler is built for handling cornstalks just like hay, even in the tough conditions and tight timeframes of late-season cornstalk baling.



9307 SERIES PUMPS WITH FORCEFIELD™ TECHNOLOGY

Pentair,
 New Brighton, Minn., USA
www.hypropumps.com

Hypro brand 9307 Series Pumps, with ForceField™ technology, are designed for today's rugged environment. They offer a unique isolated seal chamber that improves reliability, robustness, and extends the life of the pump. The product solution pump of a crop sprayer conducts a myriad of compounded chemistries through its system. The seal chamber of this pump is designed with a passive pressure compensating system to safely protect the mechanical seal faces against all chemistries without the need for monitoring or maintenance.



840CD RIGID DRAPER HEADER

New Holland Agriculture, New Holland, Penn., USA
www.newholland.com

The New Holland 840CD rigid draper header is an all-new product in the New Holland stable of combine headers, perfect for harvesting small grains where cutting off at the ground is preferred. It is available in cutting widths of 7.6, 9.1, 10.7, 12.2, and 13.7 m (25, 30, 35, 40, and 45 ft) with features that include the patented SynchroKnife™ drive, a patented fully integrated transport system, an isolated hydraulic system that allows for individual adjustments in draper belts and knife speeds, industry-exclusive infeed draper belt delay following reversing, and new Auto Header Height control software that maintains a simple header-to-combine coupling and optimum cut performance. The header also includes standard hydraulic in-cab control of the header cut angle (four degrees forward, three degrees rear) and extra-wide 2.1 m (83 in.) in-feed belts to handle large crop volumes.



ABS SUPERSTEER™ FOR NEW HOLLAND T7

New Holland Agriculture, New Holland, Penn., USA
<http://agriculture.newholland.com>

The New Holland ABS SuperSteer™, available on New Holland T7 Series tractors, is the first use of an anti-lock braking system on a conventional tractor. It delivers the same on-road safety features as ABS fitted to a passenger car: improved vehicle stability and controlled steering while braking. The system monitors wheel rotation and braking force to eliminate wheel lock-up, even on low-friction surfaces such as wet or icy roads. It provides straight-line braking if wheels on one side are on a different surface than the other side. ABS SuperSteer™ allows steering around an obstacle when braking hard. For improved safety, an electronic latch automatically activates at speeds greater than 12 kph (7.46 mph) so that either pedal operates all four brakes. The system can automate the control of the rear independent brake control to reduce the tractor's turning circle by as much as 50 percent over the standard T7 for field operations.



ADVANCED OPERATOR-CONTROL SYSTEM FOR H8000 SERIES SPEEDROWER® SELF-PROPELLED WINDROWERS

New Holland Agriculture, New Holland, Penn., USA
<http://agriculture.newholland.com>

This advanced operator-control system includes a multifunction handle (MFH), software that provides additional operator feedback, and an IntelliView™ touch-screen monitor. The MFH provides fingertip control of all header adjustments, including draper header requirements, and includes a return-to-cut control that allows a double click of a button to raise the header at the headland and a single click to return to the previous cut-height setting. Software advancements provide feedback on fuel consumption, including a horsepower-hours/gallon calculation that allows the operator to consider engine speed and ground and header speed adjustments. All readouts are available with the IntelliView™ monitor option on six-cylinder models.



AG Pro 12-20 ADJUSTABLE-WIDTH DOZER

Grouser Products, West Fargo, N.D., USA
www.grouser.com

The Grouser AG Pro 12-20 adjustable-width silage dozer gives the operator the ability to hydraulically extend the blade up to 6 m (20 ft) wide when working on the silage pile and retract the blade to 3.7 m (12 ft) wide for transport. The blade was developed with input from custom operators in the forage industry, who wanted easy transport of a packing tractor from job to job and compliance with local road regulations. The AG Pro 12-20 provides width adjustability while retaining the load-carrying capacity of a non-adjustable blade with silage end plates. Individual hydraulic control of the left and right ends of the blade allows flexibility when working on a forage pile. The operator can easily adjust the width of the blade to allow the tractor to get closer to the bunker wall for full coverage packing and improved maneuverability.

AXIAL-FLOW® CAB FOR 30 SERIES CASE IH COMBINES



Case IH Agriculture, Racine, Wis., USA
www.caseih.com

The redesigned Axial-Flow® cab for Case IH 30 Series combines, the largest and quietest cab in the industry for large-model combines, has been made even better with best-in-class temperature control, ergonomics, and operator conveniences to make it a comfortable, efficient mobile office. Operators can stay tuned in and connected on-the-go with Bluetooth connectivity, iPod plug-in, multiple power outlets, convenient holders and storage for mobile phones, and a unique bottle storage space in the headliner. Complete redesign of the HVAC system provides ample, uniform heating and cooling throughout the cab. This is the only cab with an easy-to-access portable electric refrigerator/cooler. The cab mounts provide reduced vibration and noise, and the roof light trim bezel holds eight lights, available in a variety of halogen or HID packages, positioned for improved visibility while adding to the styling of the cab exterior.

BIGBALER SERIES LARGE SQUARE BALER

New Holland Agriculture, New Holland, Penn., USA
www.newholland.com



The New Holland BigBaler Series large square baler brings new levels of productivity with increases of up to 20 percent in capacity and 5 percent in bale density. The MaxiSweep™ pickup puts high-capacity crop flow into a feeding system that operates 14 percent faster from pickup to plunger, due in large part to the new 48 spm gearbox. The MaxiSweep™ has distinctive S-shaped side shields that work with crop guides to improve crop flow and windrow separation. Roller windguard, new dual counter-rotating augers, and a feeder assist roll are all standard. SmartFill™ feed indicators use sensors in the pre-compression chamber to sense incoming crop and guide the operator via the IntelliView™ display, ensuring square-edge bales with balanced side-to-side density. The BigBaler styling ensures smooth airflow over the machine for minimal debris buildup, and the one-piece front flywheel cover opens wide for easy access for service and maintenance.



BPX9000 BALE PROCESSOR

Vermeer Corporation, Pella, Iowa, USA
www.vermeer.com

The BPX9000 bale processor from Vermeer combines simplicity, durability, and versatility to meet the needs of today's cattle producers. With exclusive cut control bars in combination with a self-cleaning rotor, excessive buildup of net and twine on the drum is eliminated. In addition, the optional large square bale kit gives producers the flexibility to process both round and large square bales, with offset loader forks to position square bales to the right side of the processor and a moveable sidewall. The easy-to-operate machine is built tough, with a unique, T-style frame. The slat and chain bed design, in conjunction with the offset rotor, produces even and consistent feed with minimal maintenance. The BPX9000 bale processor is built to maximize bale processing and minimize operator stress.



C-MOTION JOYSTICK

CLAAS of America, Inc.,
Omaha, Neb., USA
www.claas.com

The C-MOTION is an ergonomically designed joystick developed to improve operational efficiency and comfort during operation of a CLAAS LEXION self-propelled combine harvester. The design enables three-finger operation of the joystick rather than the typical single-thumb operation. The joystick's unique shape and layout improve response time and accuracy while reducing the amount of stress often associated with conventional single-thumb joysticks. The C-MOTION joystick has its functions divided over three right-hand fingers (thumb, index, and middle). The thumb is used to control functions such as header height control, reel height control, auto-pilot, and automatic feederhouse and header stop. The index finger is used to control unloading tube swing-in and swing-out and engage/disengage. The middle finger controls the rocker switch for manual header tilt control and the MAX FLEX head cutter bar flexibility or the VARIO head's retractable (fore/aft) cutter bar position.



CENTURION CDA600 CULTIVATOR DRILL

Great Plains Mfg., Inc.,
Salina, Kan., USA
www.greatplainsmfg.com

The Centurion CDA600 cultivator drill is a combination cultivator and grain-seeding machine with air delivery of seed. By using the on-board weighing system to weigh the product in the hopper, down-pressure is automatically controlled to ensure constant seeding depth and seed-to-soil contact. The sequencing of the cultivation and seeding units saves time on headland turns and is an industry first. All row-to-row operations, from raising and lowering in sequence to turning seeding on and off, are done by one lever in the cab, improving operator comfort. The modular design of the seed distribution tower makes turning individual rows off much easier, and the built-in-head design of the modules decreases blockages in the seed tubes. The transport axle raises the machine to a higher service height, making maintenance simpler. Unique to the market, side covers on the drill protect the electronics and hydraulics, yet hinge easily for inspection and maintenance.



CHAIN COMMANDER 130 PORTABLE CHAIN CONVEYOR

Hutchinson/Mayrath, a division of Global Industries, Inc.,
Clay Center, Kan., USA
www.hutchinson-mayrath.com

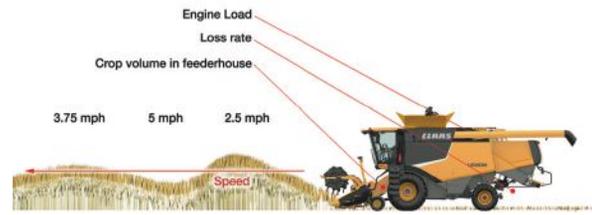
The Chain Commander 130 is a portable chain-and-paddle conveyor for grain handling in farm and commercial facilities. At a maximum power demand of only 68 horsepower, the conveyor operates at approximately 125 percent of the efficiency of conventional augers of similar size. With a total length of 40 m (130 ft) and a maximum operating angle of 42 degrees, the Chain Commander 130 can reach a maximum discharge height of more than 24 m (80 ft) while maintaining capacity of 10,000 bu/h. It can fill both large grain bins up to 22 m (72 ft) in diameter and flat storage bunkers or ground piles up to 46 m (150 ft) wide. The Chain Commander 130 is designed to be powered by either tractor PTO or an electric motor. With a transport height under 4 m (13.5 ft), it can be legally towed on public roads.



COBALT MULTI-USE CAB

Crenlo Cab Products, Rochester, Minn., USA
www.Crenlo.com/cab

Cobalt is a multi-use, off-the-shelf, fully integrated cab that provides a fresh look and design flexibility for agricultural OEMs and others seeking modern styling, flexible branding, a variety of color schemes, multiple entry configurations, and modern features free of the design and tooling costs normally associated with a new cab model. Cobalt offers user comfort not normally available in an off-the-shelf cab, including increased visibility, spacious feel, premium fabric air suspension seat with adjustable and foldable armrests, mechanical lumbar support with an operator presence switch, and an optional climate-controlled seat with pneumatic low-frequency suspension, auto weight adjust, and a high back with pneumatic lumbar support and armrests. A comfortable trainer seat, easy-to-reach manual or auto HVAC and lighting controls, spacious entry, AM/FM radio with CD player and weather band, and a two-way multiposition steering column further enhance the cab.



CRUISE PILOT

CLAAS of America, Inc., Omaha, Neb., USA
www.claas.com

The CRUISE PILOT is an automatic combine throughput control system that optimizes combine harvest performance based on three different modes of operation: constant ground speed, constant throughput, and constant throughput with losses. The constant ground speed mode operates like an automobile's cruise control. Constant ground speed is used to maintain productivity in the form of area (acres or hectares) per hour, while the constant throughput mode maintains productivity by maintaining a constant volume or weight (bushels or tons) harvested per hour. The CRUISE PILOT's third mode, constant throughput with losses, measures fluctuations in crop flow density within the feeder house and uses that information, along with feedback from the combine's grain loss sensors, to actively modulate the harvesting ground speed according to changing crop conditions, thereby minimizing grain loss and maximizing harvest efficiency.



DISCO 9100 C AUTOSWATHER

CLAAS of America, Inc., Omaha, Neb., USA
www.claasofamerica.com

The DISCO 9100 C AUTOSWATHER is a 9 m (29 ft, 10 in.) triple-disc mower conditioner with a swathing belt that can form one, two, or three windrows. The mower runs with or without mergers, which can be detached or individually folded out of the way using hydraulics. With its lightweight design, the DISCO 9100 C AUTOSWATHER uses less fuel and is highly efficient. The ACTIVE FLOAT hydropneumatic suspension system allows suspension adjustment at any time, even on the go, for varying field conditions, and decreases crop contamination via soil by 17 percent. The P-CUT cutter bar, which can be operated at a reduced speed of 850 rpm, is protected by the SAFETY LINK module and a hydraulic collision protection device that lifts the mower over obstacles. The COMMUNICATOR II system operates all mower functions from the cab using ISOBUS.



FIELDSCOUT® GREENINDEX+

Spectrum Technologies, Inc.,
Plainfield, Ill., USA
www.specmeters.com

The FieldScout® GreenIndex+ app enables growers to manage the nitrogen needs of crops using the smartphones that they already have. The grower simply takes a picture of a plant leaf against a standardized color backboard. The app adjusts for light levels and computes a dark green color index (DGCI). In addition, the app makes nitrogen application rate recommendations for corn at

V6 to V10. The DGCI correlates with indexes from more expensive handheld measurement devices, so published methods for computing nitrogen requirements can also be used. All results are georeferenced, logged, and can be emailed for archiving or further analysis. The FieldScout® GreenIndex+ is an instant, cost-effective solution that enables growers to apply the right amount of nitrogen in the right place at the right time for increased yield and profit.

GREENLINK® Pr55/6R FRONT HITCH SYSTEM

Laforge Systems, Inc.,
Concord, Calif., USA
www.fronthitch.com



The GreenLink® Pr55/6R is an integrated, bolt-on front three-point hitch with 5.5 metric ton lift capacity and unrestricted capabilities, designed specifically for John Deere 6M and 6R Series row-crop tractors. Installation time and complexity have been reduced because the individual, precision-machined side plates form parallel faces with the machined weight bracket mounting points of the tractor's front support. The well balanced complete hitch mechanism can be easily lined up. The tapered design of the main frame, in combination with the sculpted side frames, enable an unhampered turning radius even with large front tires. The cast-iron main frame is tailored around the front end of the tractor to allow for loader compatibility and minimum overhang. This also enables incorporation of storage devices for the upper link and hitch balls, as well as options like mower hooks, extra hydraulic receptacles, a remote up-and-down switch, electric connector, ISO-bus connector, etc.



HARVEST IDENTIFICATION, COTTON

John Deere, Moline, Ill., USA
www.johndeere.com

John Deere Harvest Identification, Cotton simplifies the production of round cotton modules by eliminating the need for cotton producers to manually tag round modules produced by the 7760 Self-Propelled Cotton Picker. Utilizing radio-frequency identification (RFID) tags embedded in the round module wrap, John Deere Harvest Identification, Cotton reads the unique serial numbers of the modules and compiles them in a file that is sent to the gin. Information contained within the file includes the client, farm, field, variety, and machine information from which the cotton was harvested, as well as the GPS location, time, and date that the round module was ejected from the 7760 Cotton Picker. John Deere Harvest Identification, Cotton increases the productivity of producers.

INSTALAB® 700 GRAIN ANALYZER

DICKEY-john
Corporation,
Auburn, Ill., USA
www.dickey-john.com



The Dickey-john Instalab® 700 (IL700) Grain Analyzer combines the stability and accuracy of the Dickey-john Instalab® 600 (IL600) NIR filter-based technology with an easy-to-operate, multilingual user interface, built upon a Windows-based operating system. A robust analytical-results database reduces calibration development workload by allowing cut/paste of data into common regression packages. Also, a proprietary tool is available to easily create calibration files that can be loaded into the IL700. Additionally, users of the IL600 are able to seamlessly incorporate the IL700 into their operations because calibrations developed for the IL600 are compatible with the IL700. Sample variation is also minimized with the IL700's sophisticated auto-gain feature.

INTEGRAL AUTOMATIC CLUTCH

Weasler Engineering, Inc.,
West Bend, Wis., USA
www.weasler.com



The INTEGRAL automatic clutch offers a level of implement overload protection not possible

with other types of clutches. The efficient design disconnects the power source from the drive train when overload occurs, and it does not reconnect until the speed is reduced. During disengagement, the patented design minimizes damaging torque spikes and heat. Performance benefits include repeatable overload protection, minimal torque spikes when disengaged, a maintenance-free clutch and overrunning, audible operator notification, and consistent torque at various universal joint angles.



INTELLIFILL™ SYSTEM FOR FR SELF-PROPELLED FORAGE HARVESTERS

New Holland Agriculture, Zedelgem, Belgium
www.newholland.com

The New Holland IntelliFill™ System is an automatic trailer-filling system offered as an option for New Holland FR Series self-propelled forage harvesters. It uses an infrared 3D camera to fill a truck or trailer accurately and with minimal losses, no matter the size or type. The operator can focus on achieving optimal crop flow and field speed. Deflector position and spout orientation are automatically controlled, based on the information collected by the 3D camera, to consistently fill trailers to the level specified. The system functions equally well in bright sunlight and in the dark on long harvesting nights. As infrared light is reflected from the trailer, collected by the lens, and passed onto a matrix, the IntelliFill™ System measures the trailer edges and filling degrees. The operator is notified when the trailer is full.



KMC 6400 LITTER WINDROWER

Kelley Manufacturing Company, Tifton, Ga., USA
www.kelleymfg.com

The KMC 6400 litter windrower forms windrows for composting bedding material in poultry houses, inverts the windrows, and spreads the bedding material for the next flock. Operators realize greater than 30 percent reduction in work time. The KMC 6400 is PTO-powered to maximize horsepower transfer from the tractor. Blade angle and position are adjustable with hydraulic cylinders. Hydraulic rear gauge wheels adjust the blade height, preventing floor gouging and allowing an even spread of litter. A floating hitch link keeps the blade parallel to the floor. The dual overlapping auger system has a rotation direction that reduces the dust thrown toward the operator and discharges material into the windrow instead of pushing it forward. A discharge grill and chopper-blade system breaks up large clumps of litter, releasing trapped ammonia and homogenizing moisture for more uniform composting.



ISOLYNX PRECISION AG SUITE

Ally Precision Industries,
Sioux Falls, S.D., USA
www.allyprecision.com

The ISOLynx controller is designed specifically for use with the best products available in GPS/RTK steering, CAN-based control systems, variable-rate section control, fleet management, remote monitoring, and data transfer. API's Precision Ag suite is dynamic; users have the flexibility to choose the receiver and steering controls they want to use with the ISOLynx. The ISOLynx controller also features FieldLynx telematics remote monitoring, diagnostics, and fleet management, including turn-by-turn directions and wireless data transfer in real time. The operator can track utilization and machine settings remotely, knowing in real time where the machine is, how far along the job is, and if the prescription plan is being followed. The ISOLynx is ISO certified, and the controller can be used as a VT.



MACHINE SYNC

John Deere, Moline, Ill., USA
www.JohnDeere.com

This automation, coupled with industry-exclusive harvesting logistics information, upgrades the harvesting experience. Facilitating on-the-go unloading and in-network logistics are two features that allow Machine Sync to pack more efficiency into harvesting. From the cab, the combine operator can take control of the grain cart tractor to synchronize speed and lateral position while unloading on the go. John Deere Machine Sync also provides in-network logistics information, such as tank fill status, for multiple combines on the GreenStar™ 3 2630 display. With a quick glance at the display, any tractor operator can decide which combine will need unloading first. The other operators can easily calculate their next most productive move by watching the display, all without taking their focus off the field in front of them.



MAGNUM 244 GIN STAND

Cherokee Fabrication Co., Inc., Salem, Ala., USA
www.cherokeefab.com

The Magnum 244 saw gin stand has the highest capacity of any known gin stand. It has the same heavy-duty construction plus unique high-capacity and ease-of-use features found in the patented Cherokee Avenger 174 saw gin stand: a powered roll box door, automatic seed roll retainer to prevent seed roll loss when ginning is interrupted, and ease of access for saw cylinder changes. In addition, the Magnum 244 has intuitive touch-screen controls, a 3.7 m (12 ft) nominal width, and the highest number of saws found in any single machine on the market today. When joined in series with the new Magnum extractor feeder, the Magnum pneumatic jet lint cleaner, and the Magnum 142 saw-type lint cleaner, the Magnum 244 gin stand leads the industry in both innovation and capacity, breaking the 30-bale-per-hour per gin stand barrier.



ML SERIES AIR DRILL

Versatile, Winnipeg, Manitoba, Canada
www.versatile-ag.com

The Versatile ML Series air drill offers independent shank performance using a mechanical linkage. There is no need for hydraulic cylinders to control packing pressure or shank trip force. The air drill utilizes Versatile's patented ALIVE (Active Level Independent Vertical Emergence) seed placement and seed furrow control technology that gives growers the opportunity to choose a desired seed furrow profile (seed placement position) from the tractor cab. The air drill automatically adjusts packing pressure to maintain the specified seed placement and furrow profile regardless of furrow type selected (shallow, medium, or deep), field terrain, or ground conditions.



MICHELIN® YieldBib™

Michelin North America
Agriculture Tires
www.michelinag.com

Michelin® YieldBib™ is the first standard-size tire in the North American HHP tractor market with Very High Flexion (VF) technology. This technology allows operators to carry the same load at 40 percent less air pressure than standard-technology radial tires. Michelin® YieldBib™ is capable of operating in the field at air pressures as low as 8 psi, reducing soil compaction and improving traction in all conditions. The unique RIW lugs and 45 degree lug angle provide better traction and less slippage and contribute to increased durability against stubble. Better traction results in reduced fuel consumption, and farmers thereby reduce fuel expenditures over the life of the tire. Michelin® YieldBib™ is specifically designed for stubble resistance. The anti-stubble belt in the tread area of the tire and the specially engineered tread compound contribute to the superior stubble resistance of Michelin® YieldBib™.



MOBILE FARM MANAGER

John Deere, Moline, Ill., USA
www.JohnDeere.com

John Deere Mobile Farm Manager provides users with instant on-the-go access to all of their agronomic data. Users may view historical applications, analyze historical reports, and use an iPhone or iPad GPS to track their position within fields. The value of Mobile Farm Manager extends into the field with features that enable note taking, soil sampling, and data sharing. The note feature allows users to document what's happening in a field geospatially, making it easy to come back to that point at any time. Users can also generate grid zones and perform soil-sampling tasks to help make better application decisions, improving the bottom line. Sharing data is as easy as a click of a button with Mobile Farm Managers as users are able to electronically share information to key stakeholders to enable more timely decisions.



MOBILE WEATHER

John Deere,
Moline, Ill., USA
www.JohnDeere.com

With John Deere Mobile Weather, operators can view in-field weather conditions without the need to stop and check prevailing weather conditions. Monitoring temperature, wind speed, wind direction, delta T, and relative humidity on the go allows operators to quickly and easily understand if the weather conditions are favorable for product

application. Built-in alerts make it simple for operators to set operational parameters to identify when unfavorable weather conditions are present. Having weather information in the cab allows operators to increase product efficacy and decrease the risk of chemical drift.



NUTRI-PLACER 920

Case IH Agriculture, Racine, Wis., USA
www.caseih.com

The Case IH NUTRI-PLACER 920 is an advanced pull-type liquid-fertilizer applicator with the smallest transport envelope in its class, reduced maintenance requirements, and operational speeds up to 13.7 kph (8.5 mph) for maximum efficiency in-season. The 18 m (60 ft) working-width applicator is offered with either 23- or 25-row side-dress coulters units to match 24-row planters. The outer wings can be folded over to run 17 coulters units to match 16-row planters. The hydraulic wing frame X-fold design allows for narrower transport width and a transport height of only 4 m (13.3 ft). The five-section flex applicator toolbar frame, mounted to parallel arms for level lifting and lowering, is controlled with active hydraulic down pressure, ensuring consistent fertilizer placement across the width of the machine. All wing hinges and linkage pivot joints have self-lubricating composite bearings to eliminate the need for daily grease maintenance.



MODULAR TOWER DRYER

Sukup Manufacturing Co.,
Sheffield, Iowa, USA
www.sukup.com

The Modular Tower Dryer provides the capacity and vacuum-cooling advantages of tower drying without the expensive setup costs of a built-on-site tower dryer. Alignment pins are used to stack the factory-built sections rapidly, and centrifugal inline blowers provide quieter, higher-pressure airflow. A crew of four to six can assemble the

modules in 6 to 10 hours. The rapid assembly time makes the dryers affordable on farm sites, where the need for a crew to be onsite for several days makes traditional tower dryers cost-prohibitive. The use of a centrifugal inline blower instead of an axial fan provides more airflow at higher pressures and quieter operation than competing brands. A Sukup Modular Tower Dryer can dry up to 1,500 bushels of corn per hour. As grain yields continue to increase, so does the need for affordable, state-of-the-art on-farm drying systems.



PIVOTING SPOUT FOR GRAIN TANK UNLOAD AUGER FOR 230 SERIES CIH COMBINES

Case IH Agriculture,
Racine, Wis., USA
www.caseih.com

The pivoting spout for the grain tank unload auger for Case IH 230 Series Axial-Flow® combines is an industry-exclusive option that saves time and grain

by allowing the operator to move the unloading grain stream in or out with an in-cab control. The operator can position the unloading spout where needed over the cart or truck instead of moving the combine. Software learns and retains that position, load after load, until the operator commands it to go to a new position. The discharge location of the focused grain stream can be moved up to 0.6 m (2 ft) while unloading, with no impact on unload rate or input power, whether the combine is stationary or filling a cart on the go. The pivoting spout also functions as a grain saver, automatically pivoting upward to shut off grain flow from the unload tube when disengaged or being retracted.



PRECISION DISK 500 DISK DRILL

Case IH Agriculture, Racine, Wis., USA
www.caseih.com

Case IH introduces the next generation of disk drill opener technology with the Precision Disk 500 disk drill, combining the accuracy and ground-following of a parallel-link row unit with the broad operating range of a single-disk opener. The Precision Disk 500's parallel link is capable of moving in a range of 0.5 m (19.5 in.) to follow changes in terrain and maintain the same angle on the blade and scraper. Existing trailing arm designs compromise their seed placement accuracy the moment the arm begins to move up or down. The opener also incorporates a variable-pitch spring that gradually increases the pressure to the opener when the need arises. When things get tough, it is ready to apply the extra force needed to maintain depth. Combined with in-cab hydraulic pressure control, this spring allows the operator to easily set the right amount of down-pressure for the operating conditions.

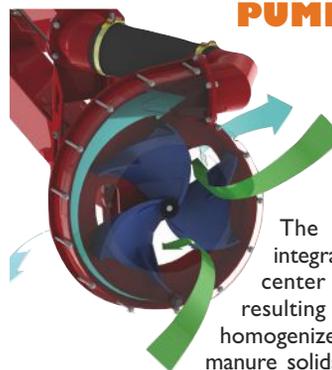


QJS NOZZLE BODY

Teejet® Technologies,
Wheaton, Ill., USA
www.teejet.com

The QJS stackable nozzle body provides a highly customizable nozzle body platform for agricultural sprayers. The modular design of the stackable

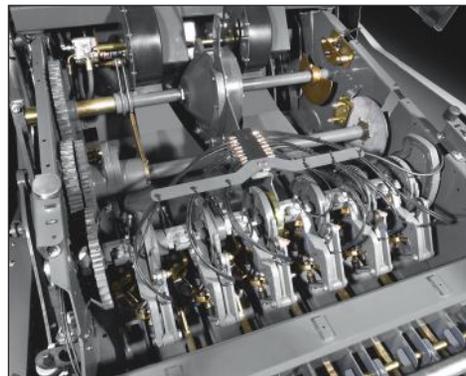
nozzle body allows the number of nozzle connections and the orientations of the connections to be easily configured based on sprayer design and application demands. The choice of spring-loaded, manually, electrically, or pneumatically actuated ChemSaver® tip shutoffs allows further customization and flexibility. This nozzle body system is designed to be an integral part of automatic boom section control and individual tip control systems. By allowing rapid activation and deactivation of various combinations of spray tips, droplet size and/or application volumes can be quickly and easily adjusted from the cab when used with an appropriate control system.



PUMPELLER HYBRID MANURE PUMP

Jamesway Farm Equipment,
St. Francois-Xavier,
Quebec, Canada
www.jameswayfarneq.com

The PUMPELLER turbine integrates a propeller mixer in the center of a volute pump. The resulting hybrid ingests and homogenizes even the most difficult manure solids while taking less time and fuel. The turbine produces two outputs simultaneously: a high-pressure cannon discharge and a high-volume propeller wash. Manure is actively pushed into the impeller blades around the outer edge of the turbine by the outward flow from the propeller core, providing improved cannon and load-out performance in thicker slurry. The turbine housing features large openings in the back wall that permit the excess flow exiting the propeller core to travel straight through the housing. The combined discharges of the cannon and the propeller create a high suction at the turbine inlet that pulls solids toward the pump. The PUMPELLER homogenizes solids as they pass through the turbine instead of relying on the cannon jet pressure or an external propeller.



QUADRANT 3300RC

CLAAS of America, Inc., Omaha, Neb., USA
www.claasofamerica.com

The single tie knotter on the QUADRANT 3300RC baler is designed to take tension off the twine as it ties the knot to avoid twine fractures and to produce perfect, high-strength knots without twine residue. The simple design features a rotating bill hook and clamping wheel and a universal drive shaft. To ensure a tension-free knot, six high-strength knotters simultaneously swing up and back to ease the tension of the twine and ensure reliable pickup by the knotter bill hook. The accelerated up and down movement of the needles results in a 25 percent decrease in the time needed to make a knot. The single tie system eliminates twine residue, resulting in safer bales for feeding livestock.



R962i TRAILED SPRAYER

John Deere, Horst, The Netherlands
www.JohnDeere.com

The R962i is a versatile and highly productive trailed sprayer for the application of crop protection products and fertilizers. The 6,200 L (1,638 gal) solution tank, 40 m (131 ft) suspended boom, suspended axle with steering, and high-capacity application system provide the capability for long, in-field working time. These features are configured in a compact package that is highly maneuverable in the field and in transport while offering exceptional machine stability. Integrated implement steering guidance, boom height and roll control, boom section control, headland management, tank fill calculation, and application documentation systems give the operator an exceptional level of precise application control and record-keeping using a single interface. The R962i has an automated solution application system, which allows single-panel control of loading carrier and chemicals, agitation, multistep rinsing, dilution, and boom circulation. Many other features make this sprayer a top choice for European producers and contractors.



REMOTE DISPLAY ACCESS

John Deere, Moline, Ill. USA
www.JohnDeere.com

John Deere Remote Display Access allows a farm manager or a dealer, with the owner's permission, the ability to view the in-cab display and provide remote support. From an internet-connected device, such as laptop, smart phone, or tablet, users with Remote Display Access can view the operator's GreenStar™ 3 2630 display screen. This functionality enables the Remote Display Access user to identify a problem and help the operator navigate through the steps needed to resolve the issue. Remote Display Access improves communication and offers quicker resolution of problems to increase uptime. By managing issues remotely, users can save trips out to the field and ensure that the equipment is up and running as intended.

RESULTX™ DATABASE, USER INTERFACE, AND CONTROL SYSTEM

MeasureTek,
Albany, Ore., USA
www.measuretek.com



ResultX™ is a database, control, alarm, and monitoring system for automated measurement stations and networks. It combines Microsoft's SQL Server database with web-based and hosted graphical user interfaces to provide access to both real-time and historical system information. ResultX™ allows users to display, report, or graph any measurement data and can be customized to support virtually any customer requirement. The system is capable of a wide range of control functions, from simple on/off of valves and motors to complex control schedules downloaded to monitoring stations that provide control based on time and/or monitored conditions. The ResultX™ system uses a variety of communications technologies, including wired, wireless radio, and cellular. It also provides a variety of remote alarm capabilities, including voice-synthesized alarm dialing, call-in voice-synthesized reports of conditions, e-mail alerts, alarm acknowledging, and text (SMS) alerts and acknowledging.



ROLLANT 455 UNIWRAP

CLAAS of America, Inc., Omaha, Neb., USA
www.claasofamerica.com

The ROLLANT 455 UNIWRAP baler combines baling and wrapping in one machine, increasing production and feed quality while saving time, fuel, and money. The high-tech design of the baler enables high productivity via innovative mechanical and electronic components. The machine's smart system automatically handles the bale density, tying, bale transfer, and film wrapping. The operator stops when the bale chamber is full, and the system does the rest. The baler is designed with heavy-duty drive components to handle all types of baling conditions. The cab-operated hydraulic forward-dropping floor eliminates long downtimes due to blockages. The 25-blade chopping rotor ensures a fine cut for optimum compaction and bale density. The operator can switch from 12 to 13 knives without leaving the cab, with one knife set always sharp enough. Early bale rotation into the chamber, along with the CLAAS Maximum Pressure System, ensures rock-hard bales.

SENTRY 6120 DROPLET SIZE MONITOR

TeeJet® Technologies,
Wheaton, Ill., USA
www.teejet.com

The Sentry 6120 droplet size monitor provides real-time, in-cab display of the droplet size produced by a sprayer. Providing this critical information allows the operator to actively adjust the ground speed and pressure if needed to maintain a specific droplet size spectrum. The in-cab touch screen interface requires the operator to enter the specific spray tip being used (tip series, spray angle, and capacity). Then, using a pressure transducer mounted on the boom and a preloaded droplet size data set, the Sentry 6120 can display the tip being used, operating pressure, and droplet size category (as defined by ASABE Standard 572.1) generated while spraying. By actively maintaining the droplet size within a specified range as recommended by the pesticide label, the operator can optimize the application by ensuring proper coverage and reduced drift.



SENTRY 6140 TIP FLOW MONITOR

TeeJet® Technologies,
Wheaton, Ill., USA
www.teejet.com

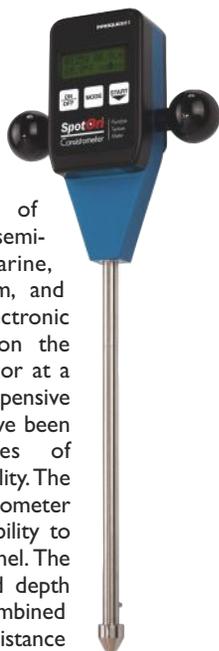
The Sentry 6140 tip flow monitor allows users to identify high- or low-flow rate conditions for individual nozzles across a spray boom. The tip flow monitor utilizes individual flow sensors on each nozzle body to precisely monitor flow rates. An in-cab display provides audible and visual feedback to the operator as to a high- or low-flow situation and identifies the nozzle location. An on-boom LED also provides easy identification of the problematic tip for fast inspection and correction. By identifying plugged, partially plugged, mismatched, or missing spray tips, this product can enhance the productivity, safety, and effectiveness of field spraying operations.



SPOTON® CONSISTOMETER

Innoquest, Inc., Woodstock, Ill., USA
www.spotonproducts.com

The SpotOn® consistometer is a portable food texture analyzer that provides quantitative analysis of consistency (similar to viscosity) for semi-solids such as shortening, margarine, butter, frosting, dough, cheese, jam, and more. The portable handheld electronic design allows for measurements on the production floor, in the warehouse, or at a customer's location. For years, expensive benchtop laboratory instruments have been the standard for these types of measurements, but they lack portability. The introduction of the SpotOn® consistometer brings affordability as well as portability to food industry QA and R&D personnel. The meter offers a non-contact infrared depth and penetration speed sensor combined with simultaneous penetration resistance and temperature measurements. It measures consistency by sensing the penetration resistance of its shaft-mounted tip, allowing measurements at depths well below the product surface. All data are shown on the meter's LCD and recorded for download to a PC, facilitating record-keeping or further analysis.



SWITCHBLADE SCRAPER

GK Machine, Inc., Donald, Ore., USA
www.gkmachine.com

GK Machine's Switchblade Scraper is economical and extremely safe to operate. The recently patented design allows the scraper cutting edge and blade section to move forward and back to change the angle of the cutting blade. A unique auto-transport design requires no operator assembly; push a button and the scraper folds up, saving the operator's time while increasing safety. The scraper's edge adheres itself to the ground, pulling the blade into the cut, eliminating duck-walking and harmonic bounce. Adjustable to a moldboard cutting edge, it produces a rolling action, heaving material to break down organic materials. It reduces the need for multiple passes, saving time per acre and increasing overall field production. The design is the result of collaboration with growers, commercial earthmovers, and engineers for a safe, economical solution for water management and field maintenance.



T9 TRACTOR, HOMOLOGATED VERSION

New Holland Agriculture, Burr Ridge, Ill., USA
www.newholland.com

The New Holland T9 is the first articulated four-wheel-drive class tractor to attain “full type homologation” approval by the European Union for on-road use on public roads in any European country. The New Holland T9 is now available with a special option package designed specifically to allow the tractor to meet the EU road laws for vehicles. The package modifies the tractor steering and braking systems, vehicle width and height, exhaust and lighting systems, and places additional equipment on the tractor to fully meet the laws. Other tractors of this size must have extra equipment mounted by customers and dealers and undergo a country-by-country approval process to be used on European roads.



VOLTO 1100T

CLAAS of America, Inc., Omaha, Neb., USA
www.claasofamerica.com

The CLAAS VOLTO 1100T tedder offers maximum working width and performance with minimum transport dimensions. The 9.7 m (35.1 ft) working width reduces the number of passes required, while the spreading arms with run-down geometry deliver an even, well-mixed crop spread. The VOLTO 1100T tedder’s MAX SPREAD crop flow concept enables better pickup of material for higher working speeds, better passing of material for gentler handling of crops like alfalfa, and wider, more even spreading of the crop for faster drying. The VOLTO 1100T tedder features ten rotors and a small 1.5 m (4.9 ft) rotor diameter, which ensure the spreading quality in all crop conditions. The patented folding system allows exceptional handling and maneuvering in the field, and easy and safe transport on the road. The low-maintenance design includes a 100-hour PTO greasing interval; hermetically closed, maintenance-free gearboxes; and easy-access grease points for quick, effortless upkeep.



TRIANGLE AERATION DUCT

Sukup Manufacturing Co., Sheffield, Iowa, USA
www.sukup.com

The Triangle Aeration Duct is a high-strength product for aerating grain in a hopper bin or other storage structure. Developed to withstand advanced grain depths, the Triangle Aeration Duct exceeds strength and airflow capabilities of traditional round ducts and allows quicker clean-out. Triangular support ribs allow air to flow through the duct. Perforated metal panels are bolted to the ribs using nut inserts. The duct is attached to the inside of a grain structure. An opening is cut in to allow entry of air from a fan outside of the bin. The entrance can be adapted to accommodate use of axial low-speed or high-speed centrifugal fans or inline centrifugal fans. By accommodating a wide variety of fans, aeration can be easily customized. Withstanding grain pressure without collapsing is critical to the success of any aeration system. Sukup’s product provides a better combination of strength and airflow than previously available.



WATCHDOG® CELLULAR ALERT

Spectrum Technologies, Inc.,
Plainfield, Ill., USA
www.specmeters.com

The WatchDog® Cellular Alert is a cost-effective family of portable devices that alert a grower via phone calls or text messages to a critical event, such as frost at remote locations. Models fitted with alternative sensors can signal power outages, humidity level, or flood irrigation completion. The basic model is designed for occasional use. The grower places an inexpensive prepaid cell phone into the Cellular Alert, and when a frost or other event occurs, the unit presses a button on the cell phone, calling a preprogrammed number. The Pro model includes a cell phone module, which can alert the grower by placing phone calls and sending text messages. The WatchDog® Cellular Alert allows the grower to rest easy, knowing that the unit will call if there is a problem.

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Gravity Isn't Free

Helping nature do the work with sand-manure separation

Andrew Wedel

You've heard them all before: "Use gravity where you can because it's non-mechanical, it never breaks, and it's free." Or in the same vein: "Let Mother Nature do the work." Both clichés often guide us as designers of—and our clients as users of—systems that depend on physical or biological processes. Let's look at the process of separating sand from manure—an instance in which the use of gravity and Mother Nature, left to her own devices, can be improved with an appropriately designed mechanical system.

Most dairy operators are content to be cow people—that is, knowing how to get plentiful and healthful milk from cows, lactation after lactation. That's understandable because that's where the money is made (or lost) on a dairy farm. Cow people often see mechanical devices as necessary evils, albeit sometimes convenient. Take milking equipment for example, or better yet, payloaders. There is no problem on a dairy farm that can't be "solved" with a payloader, often in misguided preference to a more refined solution. However, trying to operate a modern dairy farm while avoiding all things mechanical recalls another old saying: "There ain't no such thing as a free lunch."

Water and gravity do most of the work

To back up a bit, at most modern dairies, the cows rest on sand beds. Sand keeps the cows clean, dry, and comfortable, which leads to improved cow health and increased milk production—both very good things. The downside is handling the sand-laden manure that results when cows exit stalls and drag sand into the freestall passageways. Recycling bedding sand represents a substantial cost savings for a dairy opera-

tion, provided that the sand and manure can be separated efficiently and that recovered sand is suitable for reuse, which means it must be free of organic matter. As for the other half of the separation process, the manure effluent should be mostly sand-free so that it can be applied as irrigation, anaerobically digested, or stored.

Sand settling lanes are used extensively on dairy farms to separate sand from manure. The underlying principle appears simple. Mix the manure with a large volume of water (often

used to convey manure out of the barn) and allow it to flow down concrete lanes, say 12 ft (3.6 m) wide and 200 ft (60 m) long or more. As the flow velocity drops, sand settles in the lanes due to gravity, just like sand settles out of a flowing stream in nature. Water, manure solids, and fine sand flow on to storage or another separation process. Sand lanes can be modeled using proven methods for sizing grit chambers in municipal wastewater treatment plants, but not exactly. First of all, in nature and in wastewater treatment, settling sand grains most often conform to

the principles of Type 1 unhindered settling due to the low concentrations of suspended particles. However, on dairy farms, manure slurries contain relatively high concentrations of organic and inorganic particles (5 percent total solids), some of which possess similar Stokes' settling characteristics. The result is settled sand with some manure solids (a.k.a. "wanna be sand"). Sand contaminated with organic solids—and otherwise known as taint because it 'taint sand and it 'taint manure—is not immediately suitable for reuse and must be stockpiled for months while the organic matter degrades. Storage requires large expanses of concrete pads.



Payloader working in a conventional sand settling lane.



Sand settling lane with a collecting auger.

The system does the rest

To this point, gravity and Mother Nature have done their jobs. To remove the sand from conventional settling lanes, payloaders enter the lanes, driving through the dilute sand slurry, hub-deep in some cases, stirring and scooping up the settled sand. This operation is performed daily, often multiple times; otherwise, the downstream basins would fill with sand, and separation performance would suffer. However, this operation is a far cry from being non-mechanical, or efficient. Here's how we can improve the separation process by combining gravity and Mother Nature with an equipment system specifically designed for the task at hand.

The sand settling lane is an effective means of separating sand from manure, so we'll keep that. However, the method by which the settled sand is removed from the lane requires refining. Keep in mind that all sand used in concrete, asphalt, and other building materials is washed free of contaminants (slimes, clay, sticks, leaves, etc.) using mining-duty washing systems that involve settling and augers. These augers are specially designed to withstand the abrasive nature of sand (low speeds, large clearances, and appropriate materials for their construction). In fact, since augers can be designed and operated to resist wear, auger systems are as prolific in sand and gravel processing as payloaders are on dairy farms. Therefore, as an alternative to a payload, a mining-duty auger system can be used to remove the settled sand, making the sand lane self-cleaning.

As with conventional sand lanes, dilute manure effluent flows down a settling lane, which is more like a channel, that can now be substantially smaller: 4 ft (1.2 m)

wide and 72 ft (22 m) long. A smaller physical footprint means less potential for odor emissions as well as less runoff water to capture and consequently store. The depth of the channel is governed by a target horizontal flow velocity of 0.75 to 1 ft per second (0.22 to 0.30 m per second). As the sand grains settle in the lane, they are conveyed to an inclined auger in the bottom of the sand lane that dewateres the separated sand and stacks it on a pad. Operation of the auger can be matched to the manure scraping frequency of the dairy to eliminate "manure sandwiches" that occur with conventional sand lanes—that is, layers of manure solids settling on top of clean sand, settling on top of manure solids, etc.

To minimize organic solids deposition, the horizontal flow velocity through the self-cleaning sand lane can be optimized to match a particular sand gradation by varying the depth of flow in the channel. Depth adjustment isn't a daily activity but instead is part of the startup and commissioning process. In effect, optimizing flow velocity and sand grain particle size dictates the settling trajectory, so the channel length can be kept to a minimum. The result is a compact manure processing facility, in terms of both separation area and sand storage.

So, you can see where some old clichés ring true—or mostly true, with some conditions—when it comes to handling sand and manure. Indeed, gravity never breaks, and we still have some things to learn about how Mother Nature gets things done. How we utilize the forces of nature is what makes us agricultural and biological engineers.

Contrary to popular belief among dairy operators, payloaders are mechanically complex systems, just as milking equipment is mechanically complex, and as such, they are best used for their primary intended purposes—mixing feed and milking cows, respectively. In other industries, sand and gravel processors wash sand free of contaminants all day, all night, all year round using gravity and Mother Nature along with tried and true equipment systems. These systems are directly applicable to separating sand from manure on dairy farms, and hence the development of the self-cleaning sand lane. This insight can be best summed-up by another oldie but goodie: "Use the right tool for the job."

ASABE member Andrew Wedel is an agricultural engineer with McLanahan Agricultural Systems, Hollidaysburg, Penn., USA; awedel@mcclanahan.com.

Note: The Sand-Manure Separator won an AE50 award in 1998, and the Self-Cleaning Sand Lane won in 2011.

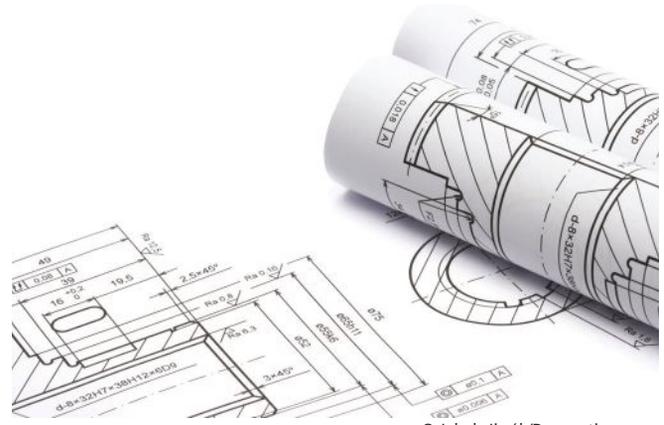


Recycled sand from a self-cleaning sand lane, Schwab Dairy, Delevan, N.Y.

Killer Buildings

The needless endangerment of farmers and livestock

David Bohnhoff



Every year, there is a rash of agricultural building failures in some part of the country, usually as a consequence of an extreme weather event. Often, these failures occur even when no non-agricultural buildings fail in the same area. This disparity in structural performance is frequently explained by the mistaken conclusion that agricultural buildings are simply not designed to withstand the same loads as industrial, residential, and commercial buildings.

But that's not quite right. Agricultural buildings fail in large numbers because they are either not engineered at all or they are only partially engineered. In other words, agricultural buildings fail because they are not "fully engineered."

The "fully engineered" building defined

A fully engineered building is developed by following three structural design steps. First, calculate all the loads and load combinations that the building will be subjected to.

Second, determine how those loads are distributed to the building elements (this is called structural analysis). Third, select components and connections that are capable of handling the forces that they will be subjected to. In practice, the selections made in step three will influence the structural analysis in step two. This makes structural design an iterative process.

It follows that a fully engineered building is a building in which the interactions of all the structural components are fully accounted for during the structural analysis, and the forces resulting from this analysis are used to size all the components. In contrast, the design process for a non-engineered building accounts for neither the imposed loads nor the component strengths. And a partially engineered building is, at best, a compromise that lies somewhere between fully engineered and non-engineered.

A near-death experience

In mid-December 2010, a heavy snowfall caused a rash of agricultural building failures in Pepin and Buffalo Counties, Wis. I investigated six of these building failures. Each failure was triggered by an unbalanced snow load (i.e., drifting and sliding snow) that the structure should have easily withstood. However, in each case, it was obvious the building was not fully engineered.

Dairy farmer Cyril Myren owned one of the buildings that I toured. Cyril and his son Todd were both injured by the collapsing roof. In Cyril's words, they were lucky to be alive, but some of their animals were not as fortunate. When I told Cyril that his building had several major weaknesses due to a lack of engineering, he responded with frustration and anger. He believed that he had purchased a properly designed building. A properly designed building, in Cyril's mind, is what I refer to as a fully engineered building.

Engineers not involved

Failures like those in Wisconsin are too common, and they are almost always associated with construction companies that don't employ professional engineers in the design process. Many of these companies have been established by non-engineers who gained their construction experience



Cyril Myren and his son Todd were injured during the above roof collapse, which was attributed to a lack of diagonal bracing on the continuous lateral bracing used to keep truss web members from buckling.

while erecting buildings for another company that employs engineers and sells fully engineered packages. While I applaud the entrepreneurial spirit of anyone who starts a company, participating in the erection of engineered buildings does not provide the skills necessary to actually engineer a structure.

Defective copies

It can be scary when some of these companies start erecting non-engineered buildings because they emulate the designs that they've seen elsewhere without really understanding those designs. That causes problems.

Simply copying or scaling up an existing design ignores the fact that loads like wind and snow depend on the size, shape, orientation, and location of the building, as well as the local topography and the size, shape, and orientation of any attached or surrounding structures. In addition, snow, wind, and other structural loads act in a variety of combinations, and a building must be designed to handle all the load combinations to which it could be subjected. Ignorance of the applicable loads and load combinations is a hallmark of non-engineered building design, and it explains why so many agricultural buildings are destroyed by wind and snow loads that would not damage a fully engineered building.

Another hallmark of non-engineered structures is weak connections between building components. The stresses that surround mechanical fasteners (bolts, screws, nails, etc.) are complex, and these stresses determine the fastener size, spacing, and placement relative to the ends and edges of the components that they connect. Builders who simply copy the



A non-engineered building that failed when truss webs buckled under the first snow load.

design of another building seldom realize the importance of these connections. Weak or improperly assembled connections are the cause of many building failures.

Unfortunately, most builders are not familiar with the methods available to resist applied loads, and they do not have the expertise needed to determine the proper size, support system, and connections for building components. Too few builders, architects, code officials, and non-structural engineers understand the complexity of a fully engineered building. In a post-frame building, for example, the various building components typically perform multiple functions that are not apparent to those not actively engaged in post-frame building engineering.

Misled consumers

Over the years, during my investigations of agricultural building failures, it has become apparent to me that most of the affected farmers thought they had purchased a fully engineered building when in fact they had not. In some cases, these farmers were intentionally misled, which is highly unethical, if not criminal.

For example, farmers are frequently quoted a "balanced design snow load" (generally given in pounds per square foot) that was used as an input to a truss design program by an employee at the local lumberyard. Given this number, the farmer assumes that the building has been fully engineered. However, these generic truss designs seldom account for all the loads that the real trusses will be subjected to, nor do they account for the manner in which the trusses will connect to other components, receive loads from other components, and be braced by other components. Furthermore, a truss is only one element in the



All but the endwalls and a middle section of this non-engineered building failed when columns buckled under, again, the first snow load. Subsequent calculations showed columns with a near-zero axial design load capacity.

building system, and each element must be properly engineered, with special attention given to the interactions between elements.

Farmers need to understand that a nice set of drawings, by itself, does not prove that their buildings have been fully engineered.

But codes exempt agricultural buildings

The International Building Code (IBC) is the primary non-residential building code in the United States. Although the IBC covers agricultural buildings and has been adopted to varying degrees in all fifty states, most agricultural buildings are not designed in accordance with its provisions. This is because most state and local governments exempt buildings that are “used exclusively for farming purposes” from all building code provisions.

Because of this special agricultural exemption, many builders are quick to tell farmers that their agricultural buildings don’t need to be engineered. While this is technically true, it is also short-sighted, especially if the building is a freestall barn or other large structure, a storage building for expensive equipment, or a facility in which the farmer or employees will be spending much time.

Telling farmers that they don’t need an engineered building because farm structures are exempt from the building code is like telling motorcyclists that they don’t need a helmet in states that don’t require helmet use. It may be the law, but it’s not common sense.

Doesn’t engineering drive up cost?

Many agricultural builders insist that a fully engineered building is more expensive to construct. However, while that may be true for smaller buildings, it’s generally not true for larger buildings. Non-engineered structures typically contain components that are either not needed or are larger than needed, and this needlessly drives up the building cost. At the same time, non-engineered structures are frequently missing critical components and/or have numerous under-designed components, and this places the building occupants in grave danger.

The engineer’s objective is to optimize the size of all structural elements, which saves money without compromising safety. With large structures, the resulting savings can easily cover the cost of engineering.

In fact, builders who sell non-engineered buildings to avoid the cost of fully engineered buildings are selling dangerous buildings. This is evidenced by the increasing number of failures in large non-engineered agricultural buildings. This trend shouldn’t surprise anyone. When the size of a structure is doubled, the number of components in the structure is doubled, and this increases the probability of a structural failure. From a consumer safety perspective, large building failures are more of a concern than small building failures because there is a greater potential for loss of life with larger facilities.



Workers remove roof sections that collapsed due to improperly braced trusses.

What’s a farmer to do?

To ensure that their new buildings have been fully engineered, farmers should ask for written confirmation that their buildings have been designed to meet the structural performance criteria of the IBC. This document should be sealed and signed by a qualified registered professional engineer. For a post-frame building, the document should be sealed by a structural engineer who specializes in post-frame building design. And it wouldn’t hurt to demand a sealed copy of the structural calculations and plans that an engineer would have to provide if the building were not exempt from the building code.

Engineering marvels

Invariably, when yet another non-engineered agricultural building fails, some people will say, “They just don’t build barns like they used to.” If they say it to me, I respond with something like, “Yes, and be thankful for that, because the agricultural buildings of the past do not come close to the performance level of today’s fully engineered buildings.”

The sheer size of today’s agricultural buildings, the clear spaces that they span, and the loads that they safely withstand make them engineering marvels, and the low cost per square foot of post-frame buildings is a reflection of efficient material usage. This efficiency, when coupled with its durability, makes the modern, fully engineered, post-frame agricultural building one of the most environmentally friendly, “greenest” structures in the world. Let’s build more of them.

ASABE member David Bohnhoff is a professor in the Facilities Engineering Program at the University of Wisconsin-Madison, USA; bohnhoff@wisc.edu.



Energy-dense biofuel from cellulose close to being economical

In Brief: A process for creating biofuels, developed at Purdue University, has potential to be cost-effective on a production scale, and move cellulosic biofuel beyond the laboratory setting.

A Purdue economic analysis shows that the cost of the thermo-chemical H2Bioil method is competitive when the price of crude oil is about \$100 per barrel and when using certain energy methods to create the hydrogen needed for the process. If a federal carbon tax were implemented, the biofuel would become even more economical.

H2Bioil is created when biomass, such as switchgrass or corn stover, is heated rapidly to about 500°C (932°F) in the presence of pressurized hydrogen. The resulting gases are passed over catalysts, causing reactions that separate oxygen from carbon molecules, making the carbon molecules high in energy content, similar to gasoline molecules.

The conversion process was created in the lab of Rakesh Agrawal, the Winthrop E. Stone distinguished professor of chemical engineering at Purdue. Agrawal says H2Bioil has significant advantages over traditional stand-alone methods used to create fuels from biomass. “The process is quite fast and converts the entire biomass to liquid fuel,” Agrawal said. “As a result, the yields are substantially higher. Once the process is fully developed, due to the use of external hydrogen, the yield is expected to be two to three times that of the current competing technologies.”

The economic analysis shows that the energy source used to create hydrogen for the process makes all the difference when determining whether the biofuel is cost-effective. Hydrogen processed using natural gas or coal makes the H2Bioil cost-effective when crude oil is just over \$100 per

barrel. But hydrogen derived from other, more expensive, energy sources—such as nuclear, wind, or solar—drives up the break-even point.

“We’re in the ballpark,” said Wally Tyner, the James and Lois Ackerman professor of agricultural economics at Purdue. “In the past, I have said that for biofuels to be competitive, crude oil prices would need to be at about \$120 per barrel. This process looks like it could be competitive when crude is even a little cheaper than that.”

Agrawal said that he and colleagues Fabio Ribeiro, professor of chemical engineering at Purdue, and Nick Delgass, the Maxine Spencer Nichols professor of chemical engineering at Purdue, are working to develop the catalysts needed for the H2Bioil conversion processes. The method’s initial implementation has worked on a laboratory scale and is being refined so it could become effective on a commercial scale. “The economic analysis shows us that the process is viable on a commercial scale,” Agrawal said. “We can now go back to the lab and focus on refining and improving the process with confidence.”

The model that Tyner used assumed that corn stover, switchgrass, and miscanthus would be the primary feedstocks. The analysis also found that if a federal carbon tax were introduced, driving up the cost of coal and natural gas, then more expensive methods for producing hydrogen would become competitive. “If we had a carbon tax in the future, the break-even prices would be competitive, even for nuclear,” Tyner said, “Wind and solar not yet, but maybe down the road.”

The U.S. Department of Energy and the U.S. Air Force Office of Scientific Research funded the research. Agrawal and his collaborators received a U.S. patent for the conversion process.

For more information, contact **Brian Wallheimer** (bwallhei@purdue.edu), **Wally Tyner** (wtyner@purdue.edu), **Rakesh Agrawal** (agrawalr@purdue.edu), or **Keith Robinson** (robins89@purdue.edu).
Photo by Peggy Greb, courtesy of USDA-ARS.

Spraying insecticide? There's an app for that

In Brief: *USDA scientists have released two mobile phone applications, or apps, to make things easier for anyone who needs to adjust insecticide spray equipment.*

The apps were developed by Agricultural Research Service (ARS) scientists and ASABE members **Bradley Fritz** and **Clint Hoffmann** at the Areawide Pest Management Research Unit (APMRU) in College Station, Texas. The apps are designed to ensure that aerial and ground-based crews can hit targets and minimize pesticide drift by keying in specifics on the type of equipment and pesticide they are using.

With dozens of manufacturers producing dozens of different types of spray technology—each with its own nozzle type, flow rate, and pressure range—the equipment setup can get pretty complicated. Aerial sprayers must also factor in wind speed, air temperature, flight speed, and humidity.

The apps incorporate the latest science of spray technology, including spray nozzle atomization models developed at the APMRU. The apps can be used with a smartphone and accessed in the field or in the cockpit of agricultural aircraft. More than half of all aerial applicators responding to a survey by the National Agricultural Aviation Association reported using smartphones. Data also can be saved for later use and e-mailed to colleagues.

One app is designed for ground-based spraying for mosquitoes and other threats to public health. It covers 60 different sprayers made by 19 manufacturers and was developed jointly with the Department of Defense's Navy Entomology Center of Excellence in Jacksonville, Fla. The user selects the appropriate sprayer and is guided through the process of selecting specific operational settings, such as the nozzle type, flow rate, and spray pressure.

The other app, for aerial spraying, walks users through the process of adjusting nozzles and settings so pesticides are delivered at optimal droplet sizes. Droplet size is critical in aerial operations to ensure on-target deposition and minimize pesticide drift. The user specifies the nozzle manufacturer

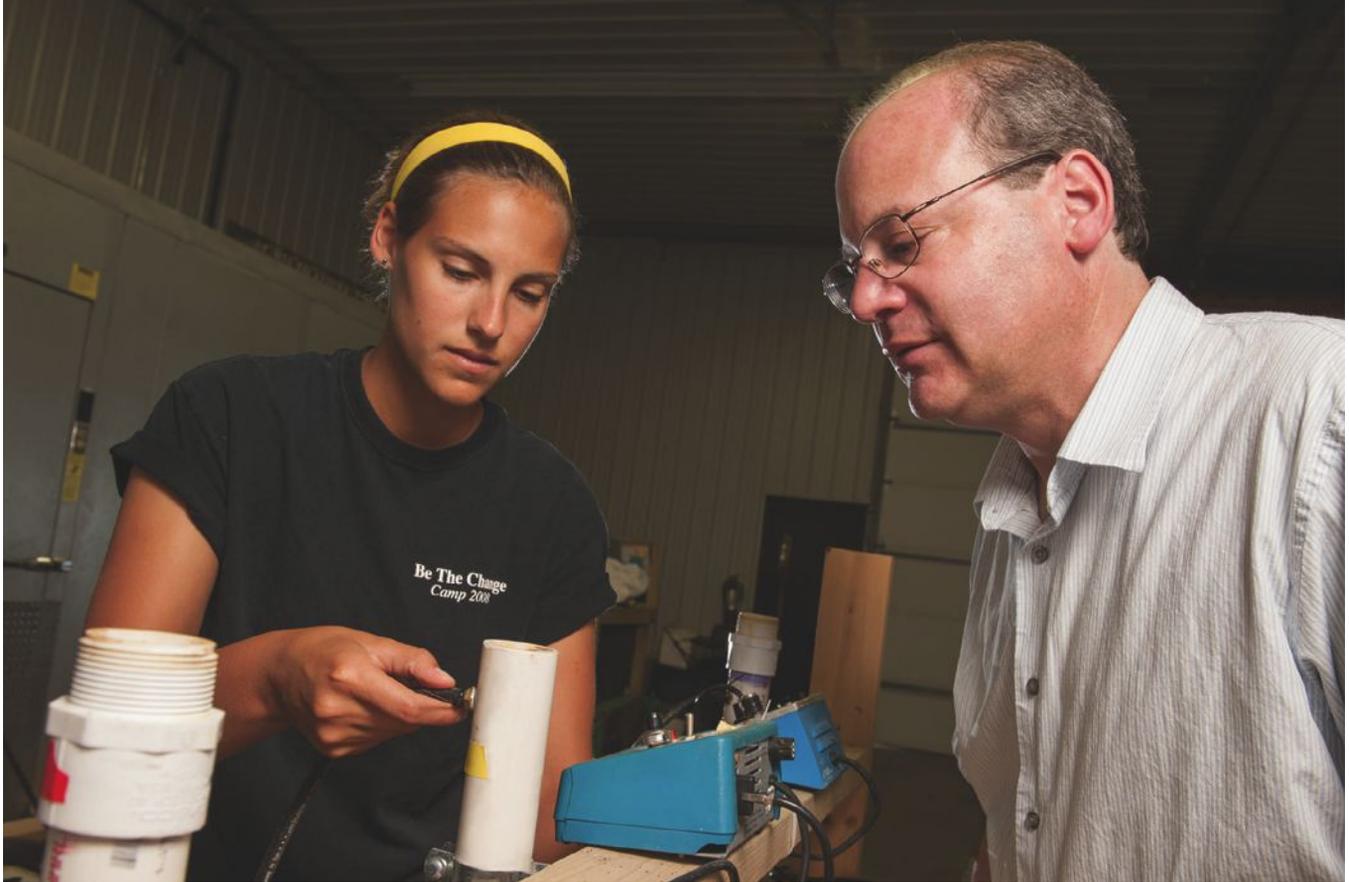


Two new apps developed by ARS scientists in College Station, Texas, are now available to provide aerial and ground-based crews with specifics on best choices—from airspeed to type of sprayer to nozzle type—for applying pesticides. The apps can be used on smartphones or tablets.

from a menu and is steered through a series of screens and prompts that, based on the specific operating conditions, helps the user select the right nozzle size, nozzle orientation, spray pressure, and airspeed.

The apps are available online through the Apple iTunes App Store and the Google Play Android Marketplace by searching for “Aerial Sprays” for the aerial application app and “Vector Sprays” for the ground-based sprayer app.

For more information, contact **Dennis O'Brien**, ARS Public Affairs Specialist, dennis.obrien@ars.usda.gov. *Photo by Brad Fritz, courtesy of USDA-ARS.*



ASABE member Steve Safferman (right), associate professor of biosystems and agricultural engineering, and student Hayley Betker are working to develop a new method of removing phosphorous from wastewater. Phosphorous runoff into lakes and streams can seriously affect the health of the water.

MSU prof helps devise method to remove phosphorous from wastewater

In Brief: A team at Michigan State University is developing a new method of removing phosphorous from our wastewater—a serious problem affecting lakes and streams across the country.

ASABE member Steven Safferman, an associate professor of biosystems and agricultural engineering, and his colleagues at MetaMateria Technologies in Columbus, Ohio, are devising a cost-effective way of recovering the phosphorous, which then can be reused for fertilizer products.

Although its use is regulated in many states for products such as detergents and fertilizer, phosphorous is part of all food and remains a critical problem, as it is always present in human and animal wastes.

Discharge from human and industrial wastewater and runoff into lakes and streams can cause eutrophication—making the water unsuitable for recreational purposes and reducing fish populations—as well as causing the growth of toxic algae.

Over the past ten years, MetaMateria Technologies and Safferman have developed and tested a new filter medium, enhanced with nanoparticles composed of iron, that can more efficiently remove larger amounts of phosphorous from water.

“Phosphorous that is dissolved in wastewater, like sugar in water, is hard to remove,” Safferman said. “We found that nano-media made with waste iron can efficiently absorb it, making it a solid that can be easily and efficiently removed and recovered for beneficial reuse.”

Safferman added that there are indications that their method of phosphorous retrieval is much more cost-effective than processing phosphate rock. “Research suggests that it is significantly cheaper to recover phosphorous this way. So why would you mine phosphorous?” he asked. “At the same time, you’re helping to solve a serious environmental problem.”

The material should be commercially available for use within two years, said J. Richard Schorr, MetaMateria CEO. “Phosphorous is a finite material,” Schorr said “Analyses show that the supply of phosphorous may become limited within the next 25 to 50 years. This is an economical way to harvest and recycle phosphorous.”

This research is funded, in part, by a National Science Foundation Small Business Innovative Research Grant. Safferman’s research is also supported by MSU AgBioResearch.

For more information, contact **Tom Oswald**, Media Communications, Tom.Oswald@cabs.msu.edu, or **Steven Safferman**, safferma@msu.edu. Photo by Kurt Stepnitz.

It's almost ASABE election time!

Online balloting begins the second week of January. Candidates and position statements are available below. More information will be coming via email.



© Feng Yu/Dreamstime.com

President

Terry A. Howell, Jr., P.E.

Product Development Manager, McKee Foods Corporation

"I am extremely proud of our noble profession, a profession dedicated to providing engineering solutions for sustaining life, and of the professional society that unites us. This society is critical for providing forums that allow us to share ideas, knowledge, and best practices. One of my primary goals as president of ASABE will be to encourage our membership networks (whether they be based on expertise area, career stage, or other uniting factors) to press on to continue making a difference in our profession. These networks and connections are a driving force in member retention, and they also provide momentum for key initiatives, research collaboration, and other important progress in our profession."

Board of Trustees

Naomi Bernstein, P.E.

Agricultural Engineer, Frontier-Servco FS

"ASABE will be at the forefront of many upcoming issues in the world. By promoting licensing, degree programs, and the Society itself, we will position our members to take on leadership roles with these issues. As a trustee, I'd provide a fresh perspective on ASABE issues and promotion using the knowledge gained through my day-to-day experiences in the field."

Dorota Z. Haman

Department Chair and Professor, University of Florida

"Technical solutions based on biological systems are at the center of our profession and at the center of many critical technological developments. The potential of biological engineering can attract the brightest young people to our profession. I will work toward strengthening ASABE in order to serve its members and enhance opportunities in our profession for the wider global community."

Kasiviswanathan Muthukumarappan

Professor and Graduate Coordinator, South Dakota State University

"As a newly elected ASABE Fellow, I will strive to fulfill ASABE's mission of facilitating the exchange of technical information and promoting the science and art of engineering in agricultural, food, and biological systems for the benefit of our young professionals. We must work together in enhancing the image of ASABE, growing our expertise in emerging areas, and increasing outreach in K-12, university, and industry."

D. Raj Raman, P.E.

Professor and Associate Chair, Iowa State University

"ASABE is successful because our members are hands-on problem solvers who know how to combine theory with practice. To strengthen the Society, we need to find ways to draw more people to our meetings and to more effectively communicate what we do to the general public."

Sylvia Schonauer, P.E.

Principal Engineer, Advanced Innovation, Kellogg

"As a trustee, I would work to influence the commercial and industrial aspects of ASABE programs that address current global challenges by leveraging my industry background. Promoting the Society by igniting an early passion for engineering, and then nurturing the development of students and young professionals is vital for a vigorous ASABE pipeline."

Neal J. Stoffel

Senior Project Engineer, Konnex Corporation

"Most of my experience with ASABE has been through my involvement with standards development committees. Standards work has been part of this organization since the very beginning. I believe in the value of standards, and I will support the work that is needed to continue to work on existing standards, to allow collaboration with other organizations, and I support eventual harmonization of standards worldwide."

Ernest W. (Bill) Tollner, P.E.

Professor, University of Georgia

"There has never been a better time to be an agricultural/biological engineer. My interests are to advocate for ideas and policies that ensure the continued integrity and viability of our publications, that facilitate information exchange via meaningful conferences and meetings, and that facilitate ASABE's advocacy of the engineering profession."

Gregory D. Williams, P.E., S.E.

Owner/President, Facility Engineering Services, PA

"As a member of the Board of Trustees, I would work to expand ASABE's involvement and exposure with industries related to the food, fiber, and biofuels industries. Agricultural and biological engineers are uniquely qualified to be designers, operators, and managers of many of these facilities."

Nominating Committee

District 2

Timothy E. Buscha, P.E.

Senior Vice-President, IDS Engineering Group

"ASABE must maintain leadership in the education of our young professionals, support research, and support application of that research. Additionally, ASABE should support expanding the job opportunities for students in more typical civil engineering dominated industries. I will strive to encourage candidates with similar vision to enhance the perception of our graduates and professionals."

John P. Fulton

Associate Professor and Extension Specialist, Auburn University

"I feel ASABE must continue to build on its rich heritage while embracing changes that advance agricultural and biological solutions for food, fiber, and energy production in the 21st century. My focus will be to identify future leaders who have the passion and vision for ASABE for its future success."

District 4

Paul F. Burkner, P.E.

Vice-President, Ag Industrial Manufacturing, Inc.

"I feel confident that I can help strengthen ASABE with many contacts in private and public practice. I have been a long-time member, with work experience in both public research and private engineering and manufacturing."

Nadia Sabeh, P.E.

Senior Building Performance Engineer,
Guttman & Blaevoet Consulting Engineers

"ASABE will always lead the development of new food production technologies to meet the demands of increasing populations and depleting resources. Our Society's future vitality and growth require leaders who collaborate across disciplines and with industry to meet new challenges in agriculture, including food safety, urban farming, and biofuels production."

BE Division

Czarena Crofcheck, P.E.

Associate Professor, University of Kentucky

"The members of ASABE are critical to solving some of the most important global problems of today. It is the depth and the breadth of our members that allow for the development of these solutions. As a member of the Nominating Committee, I will strive to make sure the breadth of our society is well represented."

Chenming (Mike) Zhang

Associate Professor, Virginia Tech

"I have been actively involved with ASABE for the last nine years and have witnessed the growth of our professional society, particularly in the Biological Engineering division. For ASABE to stay relevant and be a leader in agricultural, food, and biological engineering, we must have a leader who is forward-thinking and willing to embrace the challenges that we face."

FPE Division

Cale Boriack, P.E.

Project Engineer, CNH

"As demand for limited natural resources increases, the role of agricultural and biological engineering in society will be increasingly important. I will strive to identify visionary leadership that empowers ASABE to be seen as a solution provider for society's problems involving natural resources for food, fuel, and fiber."

Alvin (Al) R. Womac, P.E.

Professor, University of Tennessee

"We must nominate highly qualified, energetic candidates demonstrating a vision, interest, and passion consistent with ASABE member priorities, so I will seek member input into the process. Candidates must balance support for core engineering topic areas while embracing change, and display a passion for building ASABE capacity to address members' challenges."

IET Division

James W. Jones

Distinguished Professor, University of Florida

"During my career, ASABE has evolved through its continual support of agricultural and biological engineering at all scales, from the molecular scale to watershed, national, and global scales. ASABE will continue to evolve to meet increasingly complex problems, providing engineering solutions for agriculture and natural resources through rigorous application of the physical, chemical, and biological sciences."

Hubert J. Montas

Associate Professor, University of Maryland

"Agriculture, the single most vital activity for humans, brought us from prehistory to widespread health and sustenance. As the leading professional society for engineering in the field, ASABE is key to upholding agriculture's past successes and defining its future. I will strive to identify the best leaders to fulfill this crucial mission."

PM Division

Michael Lyons

Project Engineer, Worldwide Tractor Product Safety and Compliance, CNH America

"ASABE has been a proactive leader in agricultural and biological engineering. I share the same passion as ASABE and will work to encourage the most qualified candidates to serve in leadership roles. I will seek input from ASABE membership for any positive influence in the nomination process."

Shannon Rae Prantner

Manager, Product Safety and Compliance, John Deere

"I will work toward further developing and enhancing the Society by building upon fundamental activities, while also focusing on growth. A key mechanism to accomplish this is the identification of strong, diverse leaders with the capacity to leverage the varied challenges within our Society, turning them into key opportunities."

SW Division

Robert T. Burns, P.E.

Assistant Dean and Professor, University of Tennessee

"I would work to strengthen ASABE by assisting with the identification and selection of leaders who are committed to both the future of the profession and the success of ASABE. I believe that ASABE should strive to facilitate a strong and active partnership between industry, private consultants, and academia across the agricultural, biological, and biosystems engineering fields."

Robert O. Evans, P.E.

Professor and Department Head, North Carolina State University

"I have been a strong supporter and advocate for ASABE for over 35 years. A visionary, vibrant leadership is vital to the continuance of the profession. As a member of the Nominating Committee, I will diligently pursue the best possible candidates for leadership roles in the Society."

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The path to becoming a PE

Do We Need the New Requirement?

The question at hand

Jay Harmon, P.E.

Professional Engineers (PEs) are licensed to protect public health and safety. Fundamental to this process, the National Council of Examiners for Engineering and Surveying (NCEES) established a model law that outlines the best practices for the licensure of professional engineers and surveyors. The NCEES model is used by state licensing boards as they develop laws and rules within their jurisdictions.

Currently, the NCEES model specifies that an aspiring PE must meet the following requirements: (1) obtain a bachelor's degree in engineering from an ABET-accredited program, (2) have at least four years of appropriate work experience, (3) achieve acceptable results on the Fundamentals of Engineering exam and the PE exam, and (4) possess a clean disciplinary record. But changes are looming on the horizon. A new model law has been developed that will take effect sometime after 2019 (the earliest implementation date would be January 1, 2020), and each state licensing board will need to decide if it will adopt the new version.

The new model law increases the educational requirements for those who plan to take the PE exam. Specifically, in addition to a bachelor's degree, a master's degree or an

equivalent 30 credit hours of graduate or upper-level undergraduate coursework in engineering, science, math, and/or professional practice topics will be required. At least 50 percent of these additional 30 credit hours must be in engineering courses. These additional credits cannot simply be continuing education credits; they must be taken at a university or through an agency, organization, professional society, or formal employer training program. NCEES and ASCE support the new model law, while ASME and other engineering societies have expressed opposition in a formal position statement.

BS+30

The positions taken on the following pages, by Dan Thomas and Maynard Herron, lay out the cases for ASABE to support the new model law or oppose it. This debate is part of our effort to gather input from the membership on the official position that ASABE should take. To give us your input, please complete the survey at www.surveymonkey.com/s/ZZ77LRB. Or mail or email your comments to ASABE Executive Director Darrin Drollinger, 2950 Niles Road, St. Joseph, Mich., 49085, USA, or drollinger@asabe.org.

We'll let you know the survey results in a future issue of *Resource*, and we'll keep you posted as the discussion continues.

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We Need BS+30 to Produce Qualified Engineers

Dan Thomas, P.E.

I completed an agricultural engineering curriculum back in the late 1970s (yes, some of us are that old), when the expectation for graduates included a broad cross-section of exposure to different technical courses and potential career pathways. We really didn't have options within the curriculum. Every student took courses in water, mechanical systems, plant/soil sciences, processing, structures, etc., and we studied all the core engineering sciences, regardless of whether we later chose a career that might not need some of the fundamentals, like thermodynamics.

We also had a core group of courses that were designed to give us a breadth of exposure beyond our technical curriculum. These "general education" courses were not a large part of the engineering curriculum because we were primarily expected to achieve a degree of knowledge that would prepare us for an engineering career. We also got some limited exposure to the other sciences. In addition, we were expected to take the Engineer-in-Training exam (now the Fundamentals of Engineering exam). The opportunity to achieve a Professional Engineering license and a career that would involve significant design work was the ultimate goal, and I believe we acquired the core knowledge necessary to begin doing that.

The current pressures (funding, ranking, parents, legislatures, etc.) within many academic institutions are pushing a greater number of general education courses into every curriculum, while also pushing to maintain or reduce the total hours required to achieve a degree. With these pressures, some technical coursework that was required in the past has been sacrificed. In some cases, these sacrifices (especially if all curricula are pushed down to 120 total semester hours in a four-year engineering curriculum) could result in BS-level engineering graduates who have insufficient technical knowledge to start performing as engineers.

Within other professional curricula, such as architecture, this problem was recognized some years ago, and architecture curricula were modified nationwide to require five full years to be eligible to become an architect. In medicine, additional training and residency experience are necessary before newly minted doctors can practice medicine. Should engineering be relegated to any less rigor and perhaps fewer expectations when compared to other professions? What are the options to ensure that engineering graduates have attained sufficient core knowledge before they attempt the Fundamentals of Engineering exam?

One solution, proposed by the American Society of Civil Engineers as part of its "raise the bar" initiative (www.raisethebarforengineering.org/seeing-future-looking-back-0), has been adopted by the National Society of Professional Engineers. The idea is to require all engineering graduates, who expect to sit for the Principles and Practices of Engineering (PE) exam in the near future, to obtain a BS degree plus 30 hours of additional coursework or a BS degree and an MS degree (thesis or non-thesis). The goal is to ensure that all engineering graduates have mastered sufficient technical content to start an engineering career.

The positive benefits of the BS+30 initiative include: (1) sufficient technical coursework would be completed regardless of an institution's hourly requirement for the BS degree, (2) engineering as a profession would have more qualified individuals based on higher standards (similar to other professions, although such comparisons should not be the primary reason to make such a change), and (3) global competitiveness continues to require more qualified and better-educated engineers, and this initiative will help us meet that challenge. Regardless of ASABE's support of the BS+30 initiative right now, we must be diligent in maintaining our engineering curricula, to ensure the high standards of our profession.

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We Don't Need More Barriers to the PE

Maynard Herron, P.E.

A proposal has been made to change the prerequisites required to sit for the Professional Engineer license exam. As a licensed Professional Engineer practicing in industry, I feel a need to express an opinion on the subject. I do not think that the increased educational requirements will support either the objective of enhancing the public good or of ensuring ready availability of a qualified engineering workforce.

Several thoughts come to mind when I consider the long-term effects of such a policy change:

- In general, graduate engineering curricula are heavily focused on research rather than on applying engineering solutions to problems. As a result, the students in these graduate programs make minimal gains in their practical engineering judgment, which is crucial for making good engineering decisions.

- With the additional academic requirements, the elapsed time between completion of a BS degree and sitting for the PE exam will be increased, which will reduce the available years in which an individual might work as a practicing engineer.

- Licensure in disciplines with relatively low numbers, such as agricultural engineering, will steadily decrease, and eventually disappear, due to the reduction in eligible candidates below the level that NCEES requires to maintain a discipline's PE exam. These smaller disciplines will be left only with exams outside their field, such as mechanical, civil, or electrical engineering.

- In fact, the number of licensed Professional Engineers in all disciplines will decrease as a result of the additional education requirement. This will affect our ability to provide engineering services that are important to the general public, resulting in increased costs and project delays.

- Emigration of engineering talent will also be a factor. The graduate degree requirement can be projected to result in approximately one-half of all eligible PE exam candidates holding temporary visas. ASEE's 2011 *Profiles of Engineering and Engineering Technology Colleges* reports

that more than 40 percent of current graduate engineering students hold temporary visas, while enrollment in undergraduate engineering curricula has included 7 to 9 percent temporary visas over the past few years (www.asee.org/papers-and-publications/publications/college-profiles).

- Finally, additional educational prerequisites for PE licensure will likely be a deterrent to high school students who are evaluating potential careers. This will result in fewer engineering graduates in coming years.

Without question, the value of the PE license could be enhanced, and the value to society as a whole could be bolstered, but only if the means to do so can be established. Merely increasing the incoming educational requirement is not an effective means of strengthening the value of a PE license. Rather than putting more restrictive requirements in place, which will likely exclude many well-qualified individuals, the profession should look for ways to enhance the experience of engineers who are still in training. Increasing the competency of prospective PE candidates is best accomplished with exposure to and involvement in engineering applications that solve real-world problems.

In my conversations with younger members of the engineering profession, they often say that what they need to know is not always what they were taught. This gap between engineering applications in industry and engineering academia seems to be widening, and there are very limited resources for guiding young engineers through the period between completing the FE exam and sitting for the PE exam. Their experience could be strengthened, and their engineering skills could be improved, by a combination of mentoring, a PE exam with more emphasis on applications, and increased efforts by the engineering societies, including ASABE, to develop application-based exam preparation materials within their respective disciplines.

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