IOWA Pork Producer Headlines

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# Paving the Way to a Strong Future

As our industry grows, pork producers are taking strides at cultivating advancements to improve our systems and methods of swine production for future generations to come. Progressive changes in technology, sustainability and safety are all factors that will lead us to provide quality products for a growing world.

## In this issue:

Over the years, pork producers and industry professionals have made significant strides in the areas of nutrition, genetics, efficiency, quality, and health of swine operations. Although there are multiple areas of swine operations that have excelled, there is still room for improvement. Faculty and research staff at Iowa State University have been working diligently with the Iowa Pork Producers Association to develop and evaluate new and future advancements in environmental measure and control, system design, and environmental stewardship within operations to ensure that the industry will continue to progress for years to come.

*"Facility choice varies by climate, function and management ability, among many other things. However, the best choice for a facility would address the needs of the pigs by providing a good environment during hot and cold weather that promotes efficient growth and in turn provides quality animal well-being and appropriate biosecurity while doing so in an energy efficient and environmentally sound manner."*

- Dr. Jay Harmon
  Department of Agricultural and Biosystems Engineering


Dr. Jay Harmon

## Shell Integrity:

The design and construction of hog buildings have constantly been improving as producers look toward bettering the internal environment that they're raising pigs in. The team of engineers at Iowa State University suggest that having a tightly sealed building shell is crucial to allow for creation of optimal temperature and environmental control during all four seasons.

To ensure that the buildings are being constructed to their full potential, Dr. Harmon reminds producers to always work alongside a qualified engineer while making decisions on shell design, barn layout, site selection and ventilation design.


*image provided by New Modern Construction*

## A Breath of Fresh Air:

Air quality and flow are important considerations when constructing and remodeling hog barns to provide efficient, productive growth, animal well-being and producer safety.

The ISU team reminds producers that the number one factor in effective and optimal ventilation is the design and alignment of all other segments inside the barn so that it is constructed as an integrated system. Filtered systems are particularly complex and require proper design.

**Notable ventilation improvements:**

- Controller Advancements in …
  - Filtration Systems (pressure design)
  - Entry and Exits
  - Loading Areas
- Fan and inlet designs
  - DC-driven motors on large fans allowing them to be operated at a variety of speeds, which in turn improves energy efficiency and allows finger control.

### Recent improvements that Iowa State's Agricultural Engineering Research Department have made include:

- Effective Temperature Sensors:
  - Allow for better analysis of the pig's environment.
- Analyzing advanced approached to cooling
  - Determining what system is most Effective (evaporative pads or spray cooling)
- Shell integrity advancements
  - To reduce infiltration
  - Tighter seals
  - Improving static pressure and promoting better air mixing.

### Progress with Positive Pressure Systems:

- Positive air pressure systems are gaining popularity inside filtered barns due to advantages with building shell leakages. Instead of leaking unfiltered air from the outside (which occurs with negative pressure systems in filtered air barns), any leaks in the positive air pressure systems actually leak filtered air out to the external environment, reducing the possibility of biosecurity risks.

# Additional Internal Advancements:

### 1. LED Lighting:

- Advantages:
  - Increased longevity
  - More efficient
- Disadvantages:
  - More expensive
  - If lights aren't being used, the extra expense isn't benefiting anything.

For more information, check out http://farmenergy.exnet.iastate.edu/wp-content/uploads/downloads/2011/11/PM-2089R.pdf

### 2. Alarm Systems:

- Significant improvements have been made over the last several years in this area.
- Future advancements include:
  - Analyzing and measuring a more complete thermal environment that will provide producers with more accurate results of the air quality.

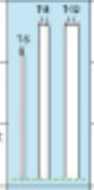
| Lamp | Example | Typical Lamp Size (W) | Efficiency Lumens/W | Average Rated Life (hrs) | Minimum Start Temp (F) | Ballast? | Relative Cost | Typical Application |
|---|---|---|---|---|---|---|---|---|
| Incandescent |  | 25-200 | 10-15 | 1,000-4,000 | Below 0 | No | $ | Indoor/outdoor |
| Compact Fluorescent |  | 5-57 | 50-80 | 6,000-12,000 | 0 | Yes | $$ | Indoor/outdoor |
| Cold Cathode Compact Fluorescent |  | 5-15 | 41-49 | 10,000-25,000 | -10 | Internal | $$$ | Indoor/outdoor |
| LED |  | 6-20 | 4-150 | 35,000-50,000 | Below 0 | N/A | $$$$$ | Indoor/outdoor |
| T-5 Fluorescent |  | 13-28 | 54-104 | 5,000-20,000 | 0 | Yes | $$ | Indoor/outdoor |
| T-8 Fluorescent | | 15-58 | 58-98 | 5,000-20,000 | 0 | Yes | $$ | Indoor |
| T-12 Fluorescent | | 14-60 | 42-98 | 7,500-30,000 | 50 | Yes | $ | Indoor |
| Metal Halide |  | 35-1,000 | 80-80 | 7,500-10,000 | Below 0 | Yes | $$$$ | Indoor/high bays, outdoors |
| High Pressure Sodium |  | 35-400 | 50-140 | 15,000-24,000 | Below 0 | Yes | $$$ | Indoor/outdoor |
| Mercury Vapor |  | 40-1,000 | 10-63 | 16,000-24,000 | Below 0 | Yes | $$$ | Indoor/high bays, outdoors |

*table provided by Dr. Jay Harmon*

- Affordable alarm systems that will include readings of several main gases:
  - carbon monoxide
  - hydrogen sulfide
  - ammonia
  - carbon dioxide

(These are currently available, but are more expensive.)

# Underground Updates:

## Floor Improvements:

*Image provided by Aldenburg Construction*

Flooring serves as a major factor in the design of facilities. One of the main concerns that producers are being faced with is the cracking that is taking place along the rails and where the rails meet the header. These cracks create a large safety hazard and are very difficult to fix due to the intensive labor that is required to take out cement flooring panels by hand and replace them.

According to Iowa State's team of engineers, the reason for decreased flooring life inside hog buildings is due to corrosion of rebar. Cracks in the concrete allow the steel rebar to corrode which can lead to flooring failure. Periodic inspection of concrete is an important routine

Dr. Harmon states that for the most part the basic composition of flooring will remain the same for future years, however there are a few advancements that are currently being researched:

- Additions of localized heating and cooling of the floors.
- Implementing a variety of configurations to decrease the amount of manure pit surface area in the barn, which in turn reduces the amount of gas emission from the pit, which reduces the loss of nutrients and decreases odor concerns.

Dr. Harmon predicts that heating and cooling flooring advancements will be seen mostly in farrowing rooms to address the multiple environmental needs present for both the sow and piglets.

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## Making Movements in Manure Management:

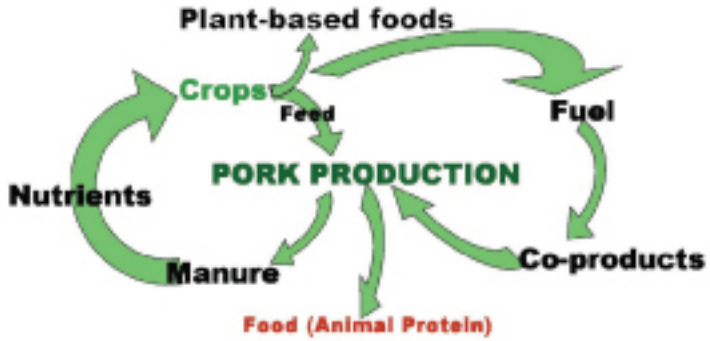
Manure management continues to be a compelling subject for both producers and the public. To ensure safety throughout modern hog buildings, producers have taken great strides to reduce pit foam build-up and chemical emissions from the pits.

To promote the utmost manure management safety measures, the ISU team recommends:

1. The pits should always be pumped on a regular basis to prevent excessive build-up of foam, which can lead to chemical explosions.
2. Always use extra caution when pumping and agitating pits to ensure safety of producers and employees due to large amounts of chemical emissions.
3. Manure haulers should consider wearing personal gas monitors to increase their safety while transporting the manure.

*Image provided by New Modern Construction*

The concerns from the public are in correlation with the odor that is given off from manure pits at large-scale production operations. Pork producers and industry professional have continued to move forward in finding solutions to reduce this issue and respect the public's concerns.




## Looking Ahead:

1. Manure Storage:
   - Moving storage of manure in pits outside of the building to reduce the risk of human and animal exposure to gases.
   - This could be done by installing flush/scrape systems.

2. Advanced Agitation Systems:
   - Break up the manure pit particles at a faster rate, therefore allowing the producers and other employees to reduce their amount of time spent around the chemical fumes being emitted during this process.
   - Allows for more efficient removal of manure particles from the pit, while creating a safer environment.

To receive more information on the topic of manure management plans and safety, please visit: http://www.iowapork.org/wp-content/uploads/2015/06/141222-manure-management-requirements-for-confinement-operations-2.pdf

# Tunnel Ventilation Reducing Heat Stress:

With the heat of summer in full swing, it is crucial that producers are aware of techniques and systems that work toward preventing heat stress as much as possible. Brett Ramirez, a PhD student with the department of Agricultural and Biosystems Engineering at Iowa State University, recently completed a research study comparing temperature and air flow inside of barns, as well as analyzing the thermal data gathered by controllers.

To understand the best way to reduce heat stress inside barns, it is important to understand the ways in which pigs can get rid of excess heat. These sources include:

- Dissipating heat to surrounding air
- Evaporation through respiration (via panting)
- Surface heat loss (via radiation)

Ramirez also reports that there are four key parameters for cooling success/heat reduction:

1. **Air temperature** -- there must be a temperature difference between the air and the pig
2. **Relative humidity** -- high humidity will result in lower cooling success
3. **Airspeed** -- the higher the airspeed/flow, the greater the cooling success
4. **Surrounding surface temperatures** – the greater the difference, the greater the cooling

*Brett Ramirez*

By understanding how each of these factors work and incorporating them into ventilation systems, the amount of heat stress will be reduced significantly!

**Tunnel Ventilation:** This type of ventilation system is becoming very valuable throughout the warm months of summer due to its ability to implement quality amounts of airspeed into a barn. This inclusion of airspeed in addition to the slight difference in temperature allows for an ideal cooling process to take place and, in turn, reduces the amount of heat stress being incurred significantly.

Although sprinkler systems and cool cells have made strides in lowering the amount of heat stress present, these systems still face performance challenges in environments with high humidity due to the decrease in ability to evaporate as needed.

**Thermal Environment Data Collection:** Another aspect that has advanced greatly with ventilation control systems is their ability to gather and collect information regarding the thermal environment of the barns. This information can then be analyzed by producers and engineers in order to make the necessary changes to continue improvements of air quality and temperature regulation inside the barns.

The following figures show differences in the thermal environments of two different barns from information that was gathered by ventilation control systems. These specific figures display the difference between a barn without evaporative cooling techniques and one with tunnel ventilation.

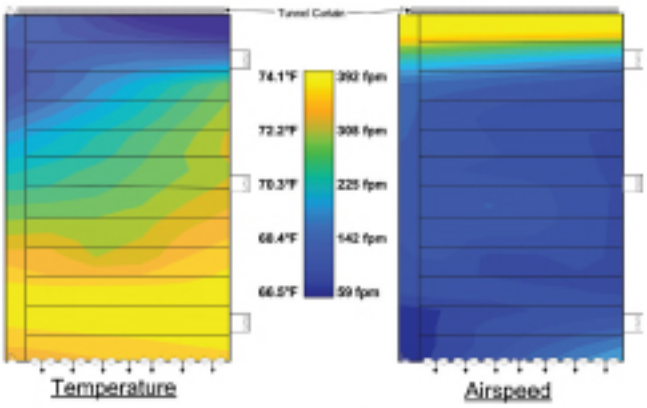



**Figure1**

Figure 1 demonstrates results from a barn with a greater temperature gradient of ~7.5°F, which in turn creates a barn with a hot and stuffy temperature at one end and a drafty and cold temperature at the opposite end. These two separate environments are caused by not enough airflow taking place inside the barns. Overall, the internal environment in this scenario is not ideal.

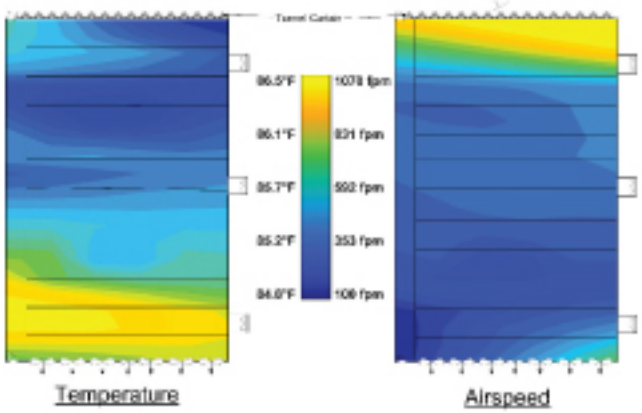



**Figure2**

Figure 2 portrays the results from a barn that has quality airflow taking place and a smaller temperature gradient of ~2°F. These factors lead the barn to having a more ideal environment with air movement that is offered at higher speeds which in turn results in more successful cooling. For this specific barn, the data on the air speeds gathered near the tunnel curtain were very high due to a wind coming out of the southwest. Overall, the internal environment created in this scenario is much more beneficial in reducing heat stress.

*Charts and analysis provided by Brett Ramirez – Graduate student in the Iowa State University Department of Agricultural and Biosystems Engineering*

## Going Green:

The carbon footprint left behind by pork producers has continued to dwindle throughout recent years, as actions of implementing more sustainable practices have increased greatly. When referring to the 'We Care' ethical principles of pork production, being stewards of the land and leaving a positive impact on the environment have always been a facet that pork producers strive for.

**A few more strides of working toward fulfilling this 'We Care' value are listed below:**

Water use **reduced 41%** per lb. carcass wt.

Land use **reduced 78%** per 1,000 lbs. carcass wt.

Carbon footprint **reduced 35%** per lb. carcass wt.

## Solar Energy:

- Building Roof Top Panels:
  - Conserve energy usage and expenses.
  - Assist the barn in becoming more energy efficient while using resources that are more environmentally friendly.
  - Tend to be a little more difficult to install and maintain.

- Ground-Mounted Panels:
  - Serve as another energy-conserving option to implement into site designs.
  - Serves the same purpose as roof solar panels in providing more efficient energy use, while helping to sustain the environment.
  - Offers a little more flexibility than that of roof panels, but also take up more space at the site.

Both installations can be a little expensive, but depending on the operation and producer, can have very beneficial paybacks.

*To learn more about these opportunities, please visit: http://www.extension.iastate.edu/article/installing-solar-arrays-becomes-more-attractive-farmers*

# Precision Livestock Production:

The aspect of precision livestock farming is one that is relatively new to the industry, yet continues to grow rapidly with advancements in technology and design of hog buildings. Some of the main improvements in technology that producers have found outstanding results with over recent years include:

- Micro Climate Control
- Aggression Monitor
- Facility Design Sensors – Thermal Environment Sensor Array
- Facility Performance Testing – Heater Distribution, Controller Capability, Animal Zone Comfort

By using the technology advancements to analyze and monitor factors such as the ones listed above, producers will be ability to implement these improvements and keep working toward creating an optimal environment that will result in:

- Increased production and efficiency levels
- Optimal animal-well being
- Improved producer safety
- Bettering the industry as a whole

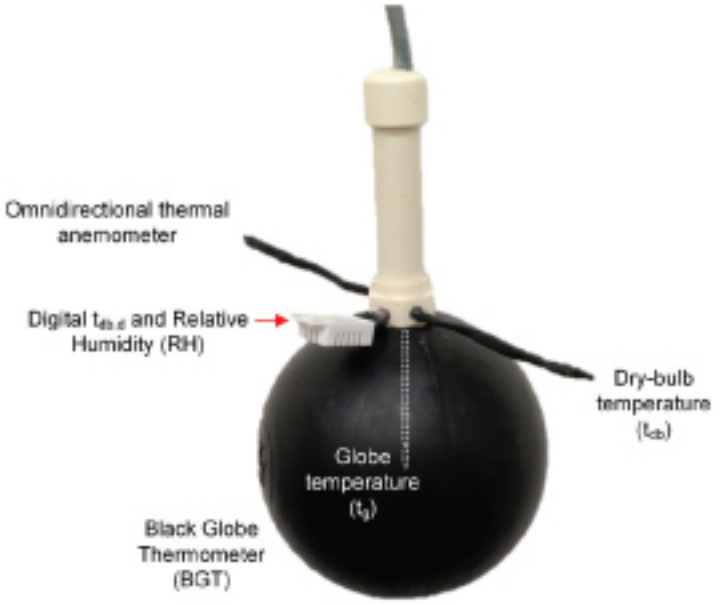



*Image provided by Brett Ramirez*

**The Black Globe Thermometer (BGT)** is a type of Thermal Environmental Sensor Array that works toward monitoring the environment of the pig in terms of humidity, temperature and air pressure.

# Progress in Public Issues:

The production swine industry is continuously transitioning to fit the pleas and wants of the public. Over the last couple of years, the industry has worked endlessly at becoming more transparent to the public as a whole, while taking strides at resolving several other consumer concerns. Pressing issues from the public include:

- Food Safety
- Animal Traceability
- Odor
- Water Quality
- Manure Spreading
- Transparency

These concerns are why the Iowa Pork Producers Association dedicates countless hours to consumers with hopes of educating them on where their pork comes from.

The association has teamed with producers from around the state to fulfill the interests of consumers through on-site farm tours. At these tours, local farmers open their homes and barn doors to the public to spend an evening on a hog farm. The success that producers have had with these tours is phenomenal!

If you have any interest in hosting or attending one of these events, please contact Joyce Hoppes at jhoppes@iowapork.org.

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## About the Author

This *Headlines* issue was edited by Danielle James, the 2017 Pork Checkoff intern. Danielle's roots in agriculture began early on with grandparents that farmed. From there, she took an interest in 4-H, FFA, and livestock judging, which continued to fuel her passion for the agriculture industry. This fall, Danielle will be a senior at Iowa State University majoring in agriculture education with a minor in animal science. Upon graduation, Danielle plans to hold an educational role in an industry position or high school classroom.

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### Mission Statement

The Iowa Pork Producers Association is an industry inclusive organization whose mission is to provide a unified voice to promote and educate for a sustainable, socially responsible, profitable and globally competitive pork industry.

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