centred on SWINE
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Open House at new Elstow Research Barn March 29

Lee Whittington, BSc MBA

Mark your calendars for March 28, 29 & 30. These three days have been set aside for the western Canadian pork industry to celebrate the opening of our new research facilities. A new conference takes aim at the use of new information available today for ***Optimizing the Production System***. This conference features researchers from Prairie Swine Centre plus internationally recognized nutritionist Dr. Jim Pettigrew. Save the cost of travel and see these speakers present the materials they are asked to deliver at international conferences.

"Our goal with the conference is to feature the newest information available at the Centre " says Dr. John Patience, President of the Centre and one of the speakers on the program. On the topic of who would benefit from this conference, the answer is anyone seeking ways to improve the bottom line. Great gains are often made in our industry in fractions of a dollar. Not all changes require a large amount of capital either, for example, a series of studies indicates a savings of 3-5 days to market under summer conditions with a simple change of settings on the ventilation system. Other studies defining lean tissue growth rates require

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Aerial photo of 600 sow facility under construction
Above photo taken December 21, 1999

In This Edition

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Science in Practice Award 1999

Every year the Allen D. Leman Science in Practice Award is given in recognition of creation and publication of information valuable to practicing veterinarians and the pork industry. Dr. John C.S. Harding, the recipient of the 1999 award, joins a very distinguished group of swine herd practitioners including former Canadian recipient: Dr. Camille Moore of St. Hycinthe, Quebec.

Dr. Harding received his DVM degree from the Ontario Veterinary College of the University of Guelph in 1988 and a Master of Science degree from the University of Minnesota College of Veterinary Medicine in 1997. He was a swine specialist for Animal Management Services in Humboldt, Saskatchewan from 1988 to 1997. Harding serves pork producers in western Canada through Harding Swine Veterinary Service Inc., a solo practice he charted two years ago.

Dr. John C.S. Harding

He is a consulting veterinarian for Genex Swine Group, and in that capacity oversees biosecurity and national heath-assurance programs in the company's genetic-nucleus operations and gene-transfer centre. Harding is also production services manager for Big Sky Farms.

Harding is well known for his expertise on postweaning multisystemic wasting syndrome (PMWS) and has published many papers on the disease. He is a frequent speaker at domestic and international swine veterinary meetings and a reviewer for Swine Health and Production, the official journal of the American Association of Swine Practitioners. Congratulations Dr. John Harding, the 1999 Science in Practice Award Winner!

Open House at new Elstow Research Barn

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some high-tech equipment such as real time ultrasound plus accurate gain records, but for those willing to make the investment the payoff in feed savings and the ability to predict growth can have significant impact on feeding and marketing strategies.

"Some of what we will be discussing will surprise you" notes Lee Whittington, Manager of Information Services for the Centre, for example when Dr. Gonyou began research into the impact of sorting pigs it was accepted that to have a uniform group at market, pigs may have to be sorted several times after weaning. The research results indicate that not only does sorting result in lost pig growth but also the efforts are all but lost in decreasing the final variation in pig weight at market.

At the conclusion of the conference an OPEN HOUSE at the new facility will feature fully functional farrowing, nursery and gestation areas. Everything is ready to go for arrival of bred gilts the following week. Two grower rooms with special manure handling capability will also be finished so that visitors should be able to get a very good picture of how the building will function when finished.

Day three is perhaps the most exciting of all as we open our doors and bring in a few pigs for the school tours. During the focus group meetings held across the prairies to determine the features and functions of this barn it was suggested frequently that the Centre should take advantage of the new site to allow the general public greater access to pork production. Schools from across Saskatchewan have been invited to bring students from all levels to learn about pork production first hand. A viewing gallery is in the planning stages to provide such exposure in the future.

Three Day Itinerary

March 28, DAY ONE –
Optimizing the Production System Conference begins 2:00 PM, ends 5:15 PM
Reception and 'Boar Pit' Positioning Your Business to Profit from Change

March 29, DAY TWO -
Optimizing the Production System Conference continues, 8:00 AM to 11:00 AM
OPEN HOUSE at Elstow barn site (25 km east of Saskatoon) begins 1:00 PM, and runs through to 7:00 PM

March 30, Day THREE -
School Tours, featuring guided tours and introduction of live pigs for public and secondary school students.

A full agenda for the three days is enclosed with this copy of Centred on Swine.

Humidity Control Strategies For Winter Conditions

M. Lambert, S.P. Lemay, L. Chénard, E.M. Barber and T. Crowe

Pig production under winter conditions requires control systems that provide a healthy environment for animals and workers. The main purpose of an environmental control system is to maintain different variables, such as temperature, humidity and contaminants, at an optimum level for humans and animals by delivering outside airflow and supplemental heat when needed. It is believed that contaminants will be adequately controlled if relative humidity (RH) level is maintained below 75 to 80%. Maintaining the RH lower than 75% will also help prevent condensation and building and equipment deterioration.

Most of the control systems that have been and are being used in swine facilities are temperature controlled, relying on a constant minimum ventilation rate (MVR) for RH and contaminant controls during the cold season. A survey completed in the winter of 1998 with 15 growing-finishing farms of the Prairies confirmed that conventional control systems are used and that less than half the farms surveyed used the recommended MVR setting. An underestimated MVR will result in high RH and contaminant concentrations and an overestimated MVR will result in higher energy cost associated with the ventilation and supplemental heating. A system that could automatically adjust the ventilation according to the actual room RH could improve the overall conditions in the building and lower the risks associated with an offset estimation of the MVR taking as well some pressure off the barn workers for control adjustment.

Modeling building control strategies can considerably reduce research costs by predicting inside environmental conditions and energy requirements without expensive full-scale trials. This computer model evaluates the benefits of temperature-humidity control (THC) systems that take into account the RH in the room compared to more conventional temperature control (TC) systems where the ventilation rate is strictly controlled by the temperature.

Lillian Chénard

The comparison of heating/ventilating systems in grow - finish was based on average temperature, energy demand and respective fluctuations of RH and CO_2 concentrations. For THC systems, Proportional (P) and Proportional-Integral-Derivative (PID) controls were simulated for the period from November through March for Saskatchewan winter conditions. Based on simulations, a TC system provides effective RH control if the MVR is adequately set and adjusted throughout the growth period. Figure 1 presents the RH obtained with the three mentioned strategies: TC, THC with a PID control and a RH setpoint of 77% and with a P control with a 75% setpoint and a 5% P-Band.

The THC strategies keep the RH at the setpoint approximately 30% of the time. A much wider variability is obtained with TC strategy. In TC, as the ventilation rate is fixed to a minimum, those adjustments are not possible, causing the RH to fluctuate more.

In THC control, decreasing the setpoint from 80 to 70% increases energy requirements by a factor of two. For a given RH setpoint, PID control requires more energy than P control as it keeps the RH at that setpoint or lower. However when equivalent RH conditions are maintained (75% setpoint with P control and 77% setpoint with PID control), energy requirements are similar or lower with PID control compared to P or TC

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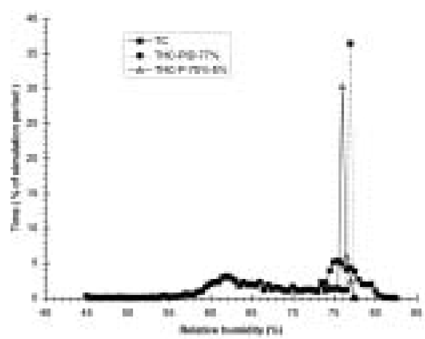


Figure 1. Comparison of the RH level for the different control strategies.

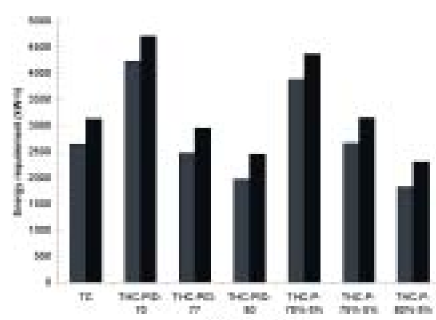


Figure 2. Energy requirement for different control strategies

Control strategy	Energy requirement (kW-h)		Relative humidity (%)		CO2 concentration (ppm)	
	Heating	Total	Mean	Max	Mean	Max
TC	2649	3127	69.5	81.7	2820	3675
THC-P-75%-5%	2667	3145	69.3	76.8	2809	3737
THC-PID-77%	2474	2951	69.7	77.0	2827	3786

Table 1 Differences between different control strategies for a similar control of the RH

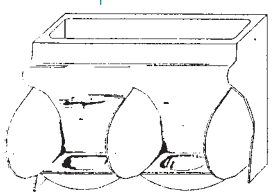
Eating Behaviour and Feeder Design

Getting maximum gain for minimum feed involves more than just calculating average daily gain and feed efficiency, according to PSCI animal behaviour specialist Dr. Harold Gonyou.

In a recent research paper, Gonyou considers age, appetite, feeder design, and the number of pigs in each pen.

In general, the more pigs eat, the more they gain. Under ideal conditions, pigs will eat as much as they want, when they want. Under less than ideal conditions, pigs will modify their behaviour to try to reach this "ideal" level.

A pigs meal, or eating bout, lasts from five to 10 minutes. Growing-finishing pigs housed in groups will eat about seven to nine times daily, while recently weaned nursery pigs will eat 15 to 20 times per day.



Multiple space feeder

Continuous lighting tends to increase the number of meals, although this reflects a change in eating pattern rather than an increase in feed intake. Pigs are diurnal, that is, active during the daylight hours. Given periods of light and dark, they tend to cluster their meals around "lights on" and "lights off", or those periods of the "day" that would correspond to the twilight hours for free ranging animals. However, as more pigs are added (up to 20 animals per pen), and the competition for feeder time increases, pigs will start eating at any time of day or night.

How fast a pig eats depends on the size of the pig and in what form the feed is presented. Larger pigs tend to eat faster, and dry pelleted feed is eaten quicker than dry meal.

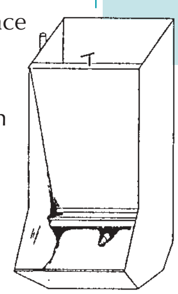
This changes when water is added. Grower-finisher pigs on wet-dry feeders ate nearly three times faster than with dry meal. Although they spent 17 per cent less time at the feeder each day, they ate five per cent more feed, and achieved five per cent higher average daily gain.

Group size also affects both eating speed and frequency. Pigs in groups tend to eat less often, but eat more quickly as they compete for space at the feeder.

As pigs grow from 25 kg to 80 kg, the time they spend eating drops from 100 minutes per day to 70. This means that, seemingly contrary to common sense, more large pigs should be able to eat from a single space feeder than small pigs.

Feeder design is also critical to how well pigs eat. Many manufacturers use trough dividers to determine how many spaces are available at a feeder. However, this can be misleading, as the pigs may not be able to get at all the spaces at the same time. Few feeders have adjustable dividers, so the spaces should be big enough to accommodate the largest pigs: 32.8 cm for 120 kg pigs.

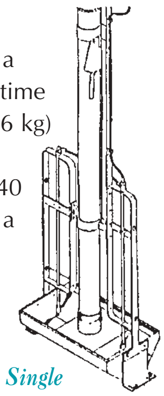
Pigs at an open trough will space themselves out as much as possible to avoid getting into fights with their neighbours. High dividers that cover the head and shoulders of the animal virtually eliminate aggressive behaviour while feeding.



Single space feeder

Feeders that allow the pigs a free range of motion while they eat allow them to chew and swallow with their mouth over the trough, reducing feed wastage.

Smaller pigs spilled more feed than large pigs. They tend to step in the feeder more, and are more prone to try to share a space, leading to fighting and more spillage.



Single space tube feeder

Smaller pigs (22 kg) are in a 20 cm trough about half the time they are eating. Large pigs (96 kg) will step into a trough more readily as it gets deeper (30-40 cm), but will rarely step into a 20 cm trough. While this suggests an even shallower trough would keep the smaller pigs out, it would make it difficult for larger pigs to eat, forcing them to turn their heads sideways to get at the feed. A compromise is necessary, and will be more difficult to achieve in wean-to-finish systems.

The Bottom Line

How many pigs can be fed from a feeding space? The answer is likely related to how often each space is occupied. Research shows that when the space is occupied 90 per cent of the time, productivity begins to drop off. This level would be seen with small pigs at 30 animals per feeding space. The best results seem to come at 80 per cent occupancy. Depending on the type of feeder used, this works out to 9 to 16 pigs per feeder space.

Pigs adapt to higher population density in their pens by eating faster. Additional study is needed to find out more precisely at what level productivity drops off, and how long the pigs are eating. As well, the question of how much pigs will adapt their eating behaviour needs to be answered.

This article is based on "The Eating Behaviour of Pigs and Feeder Design" by Dr. Harold W. Gonyou, Research Scientist, Ethology, PSCI.

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control as shown in Fig. 2 and Table 1.

Overall with those specific setpoints, PID control (77%) compared to P control (75%-5%) provides a higher RH and CO_2 concentrations but differences are lower than 2.5%.

The Bottom Line

Considering the simulation results, the cost of the controllers, the accuracy expected from the controller and from the humidity sensors, we selected the optimum strategy as being the THC with P control, a 75% RH setpoint and a proportional band of 5%.

Sustainability and Water Use

Phil Willson, PhD[1], Lee Whittington, BSc MBA,
[1]Veterinary Infectious Disease Organization, Saskatoon, SK

This article was originally prepared by Phil Willson as a summary of discussions and observations made by the VIDO Swine Technical Group for presentation to the Fourth International Symposium "Rural Health and Safety in a Changing World", held in Saskatoon October 18 to 20. The VIDO Swine technical group meets three times a year to discuss the challenges and opportunities facing pork producers. The group is best known for their 5 production booklets, (the most recent is "Dry Sow Barn Design and Management") and their annual Biosecurity Calendar.

Water is critical in swine production: as a nutrient, for washing and as a component of slurry.

As a natural resource, the amount of water actually used in swine operations is crudely estimated based on trials under non-production conditions. As three-site production becomes more popular, information about the actual amount of water used in various phases of the operation is especially important. Some regions may have water resources that are more suitable for one phase of production or another. Effective planning and siting of production operations will depend on accurate estimates of actual water use.

Clearly, water is a vital nutrient that should be available in sufficient quantity and quality. A review of water can be found in Centred on Swine, Vol. 5 number 2, Spring 1998. Although there are advantages to encouraging swine to drink, wastage of water should be reduced. Some nipples and water delivery systems contribute to significant spillage, which produces additional slurry. Wash water, is an important part of the biosecurity program, is a contributor to total volume used and slurry produced.

The VIDO Swine Technical Group (VSTG) has been conducting a survey of water and time used in washing activities which have shown variation in both of these variables among farms. Differences in washing times (labour) alone account for up to $0.25/pig marketed. The costs of manure removal can vary greatly depending on distance and method of removal; however there is always a cost associated with it. For a finishing operation manure injection costs can be as a high as $1.20/pig marketed. Water that is wasted has to be paid for twice; at the well head and at the lagoon.

The VIDO group identified that water usage is important. The first step in helping a producer gauge efficiency of water use is to benchmark against others. Benchmarking becomes difficult with a nutrient such as water that is:

1. seldom measured on the farm,
2. based on observations of farrow-to-finish production taken decades ago, and
3. not adjusted for usage at various phases of production.

The VIDO group ... did not have a significant impact on the amount of time (p>0.2) or water used (p>0.5) for washing.

Drinking water

Drinking water is intended to provide the nutritional needs of the animals. Not all water passing through the nipples is consumed. In the 1998 PSCI Satellite Conference, Dr. Stéphane Lemay noted that water wastage has been documented to exceed 40% of the water provided by a nipple drinker! This would result in a 5000 head finishing barn needing to add 5.5 million litres (1.2 million gallons) of annual storage capacity just for wasted drinking water (figure 1).

In the calculations that are used throughout the remainder of this article we will assume a comparable scale of operation for each phase. A farrowing facility with 108 crates that is turned 13 times per year (refilled every 4 weeks) will produce about 14,000 nursery piglets. Likewise, a 5000 place feeder barn turned 2.8 times per year will accommodate those same 14,000 pigs.

Production/intake	Assumptions	Results (Litres)
Water consumption (litres/pig cycle)	Weight gain 82 kg FC: 2.9:1 WI: 2.5L/kg feed	595
Water Wastage (litres/pig-cycle)	Drinker wastage: 40%	396
Total waste water produced (L/year)	5000 hd barn 2.8 cycles per year	5,548,620

Figure 1 Potential water usage and estimated wastage in grower barn

How wash water is Used?

Water for washing includes that used to pre-soak pens as well as the water used to pressure wash pens, floors, crates, and feeders. A variety of methods for soaking can be used including flooding the pits, spraying by hand or using a garden sprinkler, or installation of a greenhouse-type irrigation system. The use of detergent

The cost of spreading the additional slurry volume represents another expense due to wasted drinking water. Based on a typical slurry dispersal charge of $1.55 per cubic meter (about $0.6 cents per gallon), drinking water wasted during finishing amounts to $0.61 per pig sold (figure 2).

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Production/intake (L/year)	Assumptions	Results (litres)
Total manure production (L/year)	7.5 L/pig/day 5,000 hd barn 2.8 cycles/year	13, 230,000
Water wastage/manure (%)		41.9
Spreading cost of slurry ($/year)	Spreading cost:$1.55/m^3	8,600
Spreading cost of slurry ($/pig sold)	2.8 cycles/year	$0.61

Figure 2 Potential cost of water removed as slurry

Management of drinking water can improve feed intake

It is not the intent of this article to address the nutritional aspects of water but just to remind readers that restricting water intake is false economy. For example a project done by the VIDO Swine technical Group has shown that topdressing gilt feed with extra water results in greater feed intake. Two groups of about 600 lactating gilts each were provided water using a typical nipple drinker. One group had additional water provided as top dressing on the feed by using a hose on an automatic timer. Gilts with the extra water consumed an average of 6.2 kg of feed per day whereas the group of gilts with only a nipple drinker consumed 5.4 kg or 13% less feed.

Survey of wash water usage

The major contributors to slurry volume are manure, urine, wasted drinking water and wash water. In order to get an estimate of the amount of wash water that is actually used in current production systems, the VIDO Swine Technical Group undertook a survey. The sites surveyed were commercial farms. Production stages surveyed included 12 farrowing facilities, 11 nurseries and 16 finishing barns.

The average time for washing farrowing facilities was 16 minutes per crate, using a volume of 186 litres of water. The wash water being warm or cold did not seem to affect the amount of time needed to wash the facility (85% of farms surveyed used warm water).

Assuming that each crate is washed once per cycle, then the 108 crates in this example will be washed 1404 times per year. Washing the farrowing crates contributes 18.7 litres per pig sold to slurry volume.

Washing the nursery pen takes approximately 1 minute per pig space and uses a volume of 10 litres per piglet.

Washing the finishing barn takes longer and uses more water per pig than any other stage of production. The average washing time is 1.8 minutes per pig space, about twice as long as in the nursery. Here we noticed a considerable variation in washing time, from 1.1 minutes to 4.8 minutes per pig space. The amount of water used in this area of the barn (85.2 litres per pig) represents three quarters of the total (114 litres per pig) used in all three production stages.

How much does wash water contribute to total slurry?

The Bottom Line

- Water is a limited natural resource.
- Management of water can improve productivity and reduce cost of production.

Coming Events

Prairie Swine Centre Conference
"Optimizing the Production System"
March 28 & 29
•
Elstow Grand Opening
March 29
•
Saskatchewan Pork Expo
February 29 and March 1
•
Alberta Pork Congress
March 15 and 16
Red Deer, Alberta

Introducing...

The Prairie Swine Centre would like to introduce Audrey McFarlane. Audrey has been with PSCI since 1992 as steno-receptionist and is the "smiling voice" that greets you on the phone or in person when you visit PSCI . Audrey ensures that every producer requesting information is directed to the appropriate information source.

In the eight years that Audrey has been with PSCI, she has seen the organization grow from 18 to over 46 employees. Audrey enjoys people and that attribute certainly is evident everyday whenever she answers the phone, greets visitors or assists a staff member. New employees learn quickly that Audrey is an excellent source of information and will always take the time to explain how to complete a form or the correct protocol to follow. She is always flattered when a grad student says, "You are just like my mom!"

Audrey and her husband like to escape and take a winter holiday to warmer locations (anywhere south of Saskatoon). In the summer months they are completing the building of a cabin at Wakaw lake. Audrey has 3 children and one grandson. To see her face beam inquire about her grandson, Reid.

Audrey is responsible for the maintenance of the PSCI database and she is the person to contact if you have any changes to your mailing address, fax number or e-mail address. If you are requiring a PSCI publication contact Audrey at 306-373-9922 (phone), 306-955-2510 (fax) or mcfarlane@sask.usask.ca (e-mail.)

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