

# Reduction of Odour and Gas Emissions from Swine Buildings

## Using Canola Oil Sprinkling and Low Protein Diets

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**O** odour and gas emissions from pig facilities represent major constraints limiting the expansion of the swine industry and excess nutrients excreted in feces and urine are primary components of those total emissions. Dust particles found in swine buildings have been identified to act as important odour and possibly gas carriers. The hypothesis underlying this three year project is that dust reduction combined with dietary manipulation could reduce odour and gas emissions from pig buildings. This strategy, combining engineering and nutrition expertise, is expected to significantly reduce the potential impact of the pig barn on its surroundings.



*The experimental chambers at IRDA*

Over the first year of the project, an experimental setup of twelve independent chambers was built at the IRDA Research Station in Deschambault (Québec). Those chambers are provided with uniform heating and ventilation rates, and with

various instruments to continuously measure temperature, relative humidity, dust, carbon dioxide, hydrogen sulphide and ammonia concentrations, and to collect odour samples. The impact of four different canola oil application

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# Research Assistant - Engineering

**L**iliane Chénard, P.Eng., M.Sc. was born and raised on a dairy farm in Eastern Québec. Following her bachelor degree in Agricultural Engineering obtained at Laval University in 1991, she worked as a research assistant at the Agricultural Engineering Department of Laval University on farm machinery R&D projects. In 1995 she completed her Master degree at Laval University on the development of a model to verify the impact of different control strategies on winter indoor conditions in growing-finishing buildings. Following her graduation, she worked as the coordinator for a research group working on environment oriented projects at the Agricultural and Food Faculty of Laval University and also as an assistant to do the research inventory of the Faculty. Liliane has worked as an extension writer on various project such as the "Environmental Issues Resource Centre" (PSCI in 1997-1998), "Le Glaneur", a monthly technical extension

publication for the swine industry in Québec (GRÉPA in 1998-1999) and "Création d'un élevage porcin: Éléments de décision" a reference guide for future swine producers and existing producers who are making major restorations of existing buildings (CDPQ Inc. in 1998-1999). Prior to her arrival at PSCI in March 1999, she worked for six months as a team leader on the agroenvironmental profile of Québec's farms (GRÉPA).

Liliane is presently holding the research assistant – engineering position at PSCI. She gives support to the Engineering program through work on its various projects. Part of her task is to assure continuity and support for the projects and the research program particularly on projects where no graduate student is involved and also on projects where the work to accomplish exceeds the scope of the graduate students' academic requirements. She is involved with the design of experiments,

the writing of grant proposals, the analysis of the research results, and the preparation of reports, publications and extension activities. She is also an advisor



*Liliane Chénard*

for the update of the Environmental Issue Centre and the database and she translated the document to French in the last year. More particularly, in the last year she has been in charge of the second round of testing of two manure pit additives and of the result analysis of the projects on optimization of canola oil sprinkling and the project on the development of grow-finish with two airspace design. She has also completed the project on the development of a strategy for humidity control in growing-finishing building. 

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rates (no application, 10, 20 and 30 mL/m<sup>2</sup>-day) combined with three specific diet formulations (Diet 1: 18% crude protein, Diet 2: 16% crude protein and Diet 3: 16% crude protein and ground soybean hull) was evaluated on odour and gas emissions from the experimental chambers. Each chamber housed four grower-finisher pigs of a starting weight of 50 kg up to a weight of 80 kg by the end of the trial. Laboratory chamber measurements were collected over four trials, lasting three weeks each.

The preliminary analysis of the data shows that the different diets had no significant impact on the average daily feed intake and the average daily gain. Ammonia emissions were significantly reduced by only the use of Diet 3 and no effect were measured with canola oil



*Odour sampling from the chambers*

sprinkling. The results showed that the oil sprinkling (at the three different rates) had an important effect on dust level providing a dust reduction that varied from 88 to 96%. Odour emission analysis is still in progress and will be completed before the end of December 2000.

Based on the results obtained with the laboratory chamber setup, the most

promising combination of oil application rate and diet formulation will be selected for a full-scale experiment that will be conducted over three growth cycles in four rooms at PSCI starting January 2001.

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# Gestating Sows: All Group Housing is Not the Same, But Neither are All Stalls

Harold W. Gonyou, Research Scientist - Ethology, Prairie Swine Centre, Saskatoon, SK

## The Challenge of Gestating Sows:

The greatest factor affecting the productivity and longevity of sows in a herd is control of their body condition, or, simply put, their weight. Neither thin nor fat sows are able to consistently produce large, fast growing litters over several reproductive cycles. The common feature of all gestation management systems is a means of controlling nutrient intake by the animals. Currently, the most common means of controlling intake is individual penning in stalls. However, it is clear that stalls violate one of the criteria for high welfare systems, that is, freedom of movement. "An animal should at least have sufficient freedom of movement to be able without difficulty, to turn round, groom itself, get up, lie down and stretch its limbs" (Brambell Report, 1965).

The alternative to stalls is some form of group housing. Group housing involves two types of social conflict, which have resulted in limited adoption of such systems. The first is the aggression associated with re-grouping unfamiliar animals. At the very minimum, 15-20% of any group will be replacement animals that are not familiar with the older sows in the herd. The resulting overt aggression may be short lived, but injuries are noticeable for several days, and the newcomers are often relegated to the least comfortable areas in the pen. The second type of aggression is associated with competition for feed, and may result in considerable variation in body condition within a pen. Group housing systems must be assessed on how well



*Sows in group pen housing at PSC Elstow Research Barn*

they control nutrient intake, as well as minimizing the two types of aggression.

## Group Housing Systems

There are numerous group housing systems being used for gestating sows, but they generally fall within four general types. Floor feeding systems involve spreading a limited amount of feed over a large floor area. The

minimize both re-grouping and feeding related aggression.

Another type of group housing provides a feeding site for each sow, and feed is dropped into these sites at a speed slightly slower than the animals can eat it. Each sow stands at a feeding site waiting for the feed, rather than attempting to take feed from another sow. These 'trickle' feeding systems control individual feed intake and feeding associated aggression fairly

well, but animals must still be re-grouped and group size must be kept small.

A third type of group housing provides individual feeding stalls, and an open area for the non-feeding period. Feed intake is very well controlled, as is feeding-

associated aggression. However, such a system still involves re-grouping aggression, requires a great deal of space, and still requires individual stalls.

A final type of group housing system

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*Too often we hear statements concerning "group housing" and "stalls" that imply that all such systems are the same.*

spreading can be done by hand, but modern systems are generally mechanized. In such systems there is relatively poor control over individual feed intake, and results in high levels of aggression during feeding. The animals are often kept in small groups to

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involves the use of electronic sow feeders. In such a system each sow in the group wears an electronic identification tag and feeding is controlled by a computer and an electronic stall. When the sow enters the feeding stall she is identified by means of her tag, her records are checked on the computer, and her daily allotment of feed is provided to her. This system provides very good control over individual feed intake and prevents much of the feeding associated aggression, but still involves re-grouping fighting. The feeding and control equipment is more costly than in most other systems, but the computer can be used in other aspects of management.

Not all group housing systems are the same. Each achieves the goals of controlling individual feed intake and aggression to a different degree. In selecting a system for our new Elstow facility, we wanted to achieve very good control of feed intake with a system that could be applied to both medium and large sized farms. We chose the electronic sow feeder. This system also has the advantage that it can be modified to alleviate a number of common management tasks. For example, the feeding stations can be equipped with a sorting gate that will separate sows when they need to be pregnancy checked or moved to the farrowing room. The system can also be used to detect females as they come into estrous by monitoring their presence near a teaser boar pen.

Electronic feeding systems can be operated with relatively small groups of 30-50 sows on a single feeder, or with several hundred animals fed from several feeders within a single pen. We have chosen to conduct our first study examining two management styles using small groups, approximately one week's breeding. The first management strategy is to minimize the introduction of new animals into a group by keeping each weekly breeding in one pen. This "static" system still requires that replacement animals be added each cycle, and as a result the size of animals



*Electronic sow feeder at PSC Elstow Research Barn*

in the pen varies considerably. The second strategy is to keep animals within a pen as uniform in size as possible. After breeding, the sows are sorted by size and placed into pens that contain animals of similar size from previous breedings. This system involves more re-grouping, but keeps smaller animals away from larger sows. We anticipate running this first comparison over 4 parities, or about two years.


## **Stall Housing:**

Although stall housing appears very uniform, there are differences in the system among farms. Feed may be provided in individual feeders, or, more commonly, in a trough that runs in front of all of the sows. The trough system allows some feed to be pushed in front of adjacent sows and reduces the control of individual intake. Often trough systems have the feed drop tube pointed toward the middle of the stall to reduce this problem. Trough systems are also used to supply water rather than providing individual nipples or drinkers.

Another difference in stall systems is the size of the stall. In general, farms are equipped with only one size of stall, usually 22 or 24 inches (56 or 61 cm) wide. Some farms are equipped with even narrower stalls. The Code of Practice makes the logical

recommendation that the size of stall should depend upon the size of the sow. We used the suggested sizes in the Code to develop a formula for width based on sow weight. We then estimated the demographics of our herd once we reach a stable population. Based on this data, we have included stalls ranging from 22 to 28 inches (56 to 72 cm) in width, in proportions that should match the size of sows in our mature herd. For example, for each weekly breeding group we have four narrow stalls for small gilts, several stalls for second and third parity sows, a few less for 4th and 5th parity animals, and two 28 inch (72 cm) stalls for 6th parity animals. By allotting animals to stalls based on their size, we hope to reduce injuries and improve longevity.

## **Be Careful of General Comparisons**

Too often we hear statements concerning 'group housing' and 'stalls' that imply that all such systems are the same. Group systems in particular are extremely different in how they control feed intake and manage aggression. It is important that we understand which particular group and stall systems are being compared. Gestation housing for sows is more complex than is often implied by generalizations. 

# Why participate in the Management Training Program?

*Mary Petersen, B.Ed.*

**E**mployers faced with the issue of training management staff are often in a situation where they are wondering how to justify the expense of sending a manager to a training course. As an employer you may feel that you are not a “good” employer if you do not send your manager to a training course, seminar or workshop. But you are faced with the dilemma of assessing whether you are wasting time and money, sending an employee for training. How do you determine, if you are getting payback? Payback is difficult to assess but if you look at your payback in the terms of short term or long-term effects you will begin to know where to look for some effects.

## Short-term

Sending an employee to a course may be a great way to tell an employee that he is worthwhile enough for you to send to a course. It increases employee satisfaction. You can be assured that he will learn something, and that he is grateful to be out of the barn for a day or two.

Gaining knowledge and skills builds self-esteem and self-confidence in your manager. Managers, who possess self-esteem, are capable of making sound decisions with more authority and in less time. It makes your role of empowering your manager with decision-making tasks easier.

Managers are more efficient and are able to perform jobs faster and with more accuracy if they are trained in certain competency areas such as analyzing production records. A manager is required to be a thinker not

a do-er and managers often have to be encouraged not to jump in and complete a task that an entry level employee is paid to do. A manager is paid to perform management tasks such as critical thinking, scheduling, analyzing performance records, negotiating with the employer for changes and preventing incidents.

Managers in today’s hog industry have to be well rounded in production skills and knowledge, business matters,

*Encouraging managers to learn and grow personally will ensure that they are the future executive level managers for the industry.*

barn facilities, environment and human resources. Attending courses, which will assist in rounding out the manager’s skills, are to your advantage.

Managers, who are aware of issues that fall into the role of management, can write policies and procedures that can prevent costly incidents. It encourages the manager to take more of a proactive role in prevention. For example, managers who understand and can write a harassment policy, are more able to prevent incidents. If he has thought about the outcome of incidents and the costly repercussions to a company, he is more alert to sensitive issues such as harassment and discrimination and will know how to react quickly if an incident occurs. Safety policies and procedures are another category of issues that fall under management to either develop and/or enforce.

Sending a manager to training prevents a decay cycle, as he does not become stale and apathetic. He attains new ideas and new methodology and can make changes back in the barn to


ensure some improvements or efficiency.

## Long-term payback

Encouraging managers to learn and grow personally will ensure that they are the future executive level managers for the industry. A confident employer will assess his manager’s potential and allow him to grow with the organization. An employer should be able to groom the manager and include him in decision-making. Empowering your manager will encourage him to also empower the employees that report to him. Managers with self-confidence will not be threatened by empowering others.

Managers who are continually broadening their knowledge in all areas of the management role have a better chance of increasing hog production, (swine diseases and calculating sow NPD). Our society has become knowledge based and technology has increased the availability of knowledge to even remote locations. The Management Training Program makes the most current knowledge available to managers and provides a forum for critical thinking, analyzing and discussing current issues.

Manager retention is enhanced when the company invests in the manager. Training is one form of investment. Managers who understand people and have good communication skills will also increase employee retention and reduce employee turnover costs.

Developing a network in the industry is important for managers as it allows them to develop their communication skills, critically analyze new ideas and prevent mistakes that others have experienced. People learn from their peers and by allowing managers to network with others in the industry is a part of personal growth. 

# Hydrogen Sulphide Awareness

Mary Petersen, B.Ed.

The Prairie Swine Centre Inc. has been approached by the hog industry to provide training in the area of hydrogen sulphide gas (H<sub>2</sub>S). Although H<sub>2</sub>S has always been present in hog barns, it is becoming necessary to increase the awareness of the hazards of this dangerous gas. The hog industry over the last five years has changed and there are a growing number of workers in hog barns who have limited or no experience dealing with the dangers of liquid manure. Hydrogen Sulphide gas builds up in liquid manure and is a silent killer as it cannot be smelled or detected by human senses at high concentrations. Five people have already been killed this year – three at Drayton, Ont and two at Acme, AB.

The Prairie Swine Centre Inc. has taken the initiative to develop a one-day workshop, Hydrogen Sulphide Awareness, which addresses the growing need to increase employee awareness of the dangers of H<sub>2</sub>S in a hog barn. This workshop provides

practical hands-on training for the employee.

The course, Hydrogen Sulphide Awareness, is right for the time as it addresses immediate and long-term safety needs of hog barn workers. As employers strive to comply with Occupational Health and Safety Regulations, this workshop is a step in the right direction as it addresses:

- the properties of H<sub>2</sub>S,
- the effects on humans and hogs,
- safe handling of liquid manure,
- establishing and following Standard Operating Procedures,
- compliance with Occupational Health and Safety, and
- detection of H<sub>2</sub>S and rescue procedures.


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## Focus on the Future Conference 2001

As part of the Technology Transfer review completed in the fall of 1998, the Centre has addressed participant response, replacing the Satellite Conference with the Focus on the Future Conference. This year's conference will be held at the Red Deer Lodge in Red Deer, Alberta on February 20-21, 2001. The conference theme, Optimizing the Production System, explores the internal and external relationship between the producer and the consumer, and factors that effect this relationship. Featured guests and presentations include:

- **The Consumer's Point of View**  
Joe Leathers, PIC USA Ltd.
- **Factors Driving the Improvement of ADG**  
John Patience, Prairie Swine Centre Inc.
- **Designing a Super Barn**  
Stéphane Lemay, Prairie Swine Centre Inc.

For further information contact  
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### Coming Events

**Sask Pork Symposium**  
Saskatoon, Sask.  
November 14, 15 & 16, 2000

**Sask Pork Semi-Annual Meeting**  
Saskatoon, Sask.  
November 22, 2000

**Hog & Poultry Days**  
Winnipeg Convention Centre  
December 6 & 7, 2000

**Alberta Pork Annual Meeting**  
December 6 & 7, 2000

**Banff Seminar**  
Banff, Alberta  
January 23 – 26, 2001

**Manitoba Swine Seminar**  
International Inn  
Winnipeg, Manitoba  
January 31 & February 1, 2001

**Focus on the Future Conference 2001**  
Red Deer, AB  
February 20 & 21

**Sask Pork Expo**  
Saskatoon, Sask  
March 6 & 7, 2001

**Alberta Pork Congress**  
Red Deer, Alberta  
March 14 – 17, 2001



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