Benchmarking Energy Costs in Swine Barns

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SUMMARY

To assess current energy consumption patterns in swine operations, a survey followed by energy audits were conducted in different types of swine barns in Saskatchewan. Benchmark information showed high variability in the use of energy even among the same type of barns, indicating wide opportunities to improve energy use practices. The next step would be to use computer simulation to evaluate different energy saving measures and to quantify the reduction in energy costs that can be achieved from implementation of these strategies.

INTRODUCTION

Swine production involves energy intensive tasks. With increasing energy prices and concern with greenhouse gas emissions from energy generation, reducing energy use is imperative to reduce overall cost of production in swine operations while contributing to mitigation of greenhouse gas emissions in the process. The goals of the current phases of this study are to gather benchmark information on current energy usage in swine barns, to conduct energy audits to document energy use practices in various types of swine barns, and to evaluate different applicable energy-saving measures using computer simulation.

"Substantial energy savings are possible, as energy cost varied from $3.00 to $12.00 per hog marketed in farrow-to-finish operations studied."

RESULTS AND DISCUSSION

Twenty-eight (28) different swine facilities participated in the energy survey conducted in February 2007. From each barn, information on barn energy use and pig production numbers over the past 3 years were obtained. As shown in Table 1, the average utility cost (electricity and gas) per animal marketed ranged from $6.80 for farrow-to-finish barns to $0.60 for nursery barns. Interestingly, some barns were using twice as much energy as the average for all barns; energy usage between the barns which used the least amount of energy per animal and the most intensive energy users differed by as much as four times.

Over-ventilating a room by just 10% in the winter at current energy prices can cost producers an additional $3.00/hog marketed.

Based on the results of the survey, four barns were selected on which an energy audit and detailed energy use monitoring were conducted. Two of the barns were among the highest energy users (per animal) and the other two were among those which used the least energy per animal. Results of energy audits conducted during summer months showed that the farrowing rooms had the highest level of electrical power consumed per pig (kWh/head) as shown in Table 2. The choice of strategies adopted for creep heating contributed to the wide range of energy used between farrowing rooms in different barns. Barn C used heat lamps only, thus resulting to high electrical energy consumption. Other barns used a combination of heat lamps and heat pads that resulted to a relatively lower electrical energy consumption compared to Barn C. Gestation rooms had the second highest energy usage. Heat generated by the sows combined with high outdoor temperature required almost continuous operation of all fan stages to maintain the required room set-point temperature and keep the sows comfortable.

Table 1. Energy costs per animal for different types of barns

		$/100 kg sold		$/animal marketed	
Type of Barn	**Size Range**	**Range**	**Average**	**Range**	**Average**
Farrow-to-Finish	300 to 1,500 sow	3.50-12.0	6.30	3.00-12.00	6.80
Farrow-to-Finish (excluding feedmill)	300 to 2,000 sow	6.00-11.50	6.30	3.80-13.00	6.50
Grower-Finisher	10,000 to 40,000 feeders	1.20-2.60	1.70	1.30-2.10	1.70
Nursery	130,000 to 140,000 feeders	1.70-2.20	2.00	0.50-0.70	0.60
Farrow-to-Wean	150 to 1,200 sow	8.20-17.80	12.20	0.80-4.30	1.90

Table 2. Daily average of electrical consumption per pig in kWh/head (July-September 2007)

Type of Barn	Barn A (Farrow-to-Finish)	Barn B (Farrow-to-Finish)	Barn C (Farrow-to-Wean)	Barn D (Grower-Finisher)	Average (kWh/head)
Farrowing	3.74	2.70	4.93		3.79
Nursery	0.08	0.16			0.12
Grower-Finisher	0.17	0.14		0.096	0.14
Gestation	0.39	0.53	0.36		0.43

CONCLUSION

Results of the survey and energy audits showed that within each barn type, some barns used significantly higher energy than the overall mean for all barns of the same type while others used substantially less than the mean, indicating that there are significant opportunities for improving energy use practices in some barns to reduce overall energy costs. Production stage, equipment, and practices in different types of rooms in the barn can significantly impact the overall energy consumption. Among the different production stages, farrowing rooms using heat lamps solely for creep heating had the highest electrical energy usage per pig.

Data collected from winter energy monitoring will complete the benchmarking phase of the study. Information from the benchmarking phase will be used to run computer simulations to evaluate various energy conservation strategies and quantify energy savings associated with implementation. Understanding the patterns of how energy is utilized in each barn is valuable in determining energy conservation strategies that would work best for each particular operation. The outcome of this project is expected to help guide pork producers in managing the use of energy in their operations more efficiently, thereby reducing overall energy costs.

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