



SWINE UPDATE

October, 1985

AIR QUALITY IN SWINE FACILITIES

As we move into winter, the ventilation, or air exchange rates in our swine facilities are greatly reduced. As a general rule of thumb, as the air exchange rate is lowered, the level of noxious gases, airborne particulates, and humidity increases, i.e. air quality. The effect of air quality on production parameters such as daily gain and feed efficiency has not been extensively researched, plus the impact upon people who must work in these facilities on a continuing basis.

Research into the matter of air quality in an early-weaned nursery has recently been investigated at the University of Minnesota's Department of Agricultural Engineering and the College of Veterinary Medicine and supported by the National Pork Producers Council. The study, done in laboratory chambers, revealed no significant difference in daily gain and feed efficiency for early-weaned piglets (15 -30 lbs), with ventilation rates at the normal level (2 cfm/piglet) versus below normal airflows (1/2 cfm/piglet).

Air quality in the below normal level chambers was "poorer" than in the chambers with normal ventilation rates. Ammonia levels varied from 5 to 15 ppm in the 2-cfm chambers, while ranging from 20 to 30 ppm in the below normal case. Although ammonia concentrations were considerably higher with the low ventilation rates, they were still below a tolerable limit of 50 ppm, determined by past researchers. Carbon dioxide levels, again were predictably higher in the below-normal cases, reaching a maximum of 12,000 ppm at the end of 4 weeks, while the normally ventilated chambers only reached a CO₂ concentration of 6,000 ppm at the end of 4 weeks, both well below the tolerable limit of 20,000 ppm mentioned by the Midwest Plan Service. Dust concentrations in the laboratory chambers did not vary significantly between the normal and below normal ventilation levels. A slight decrease in dust concentrations was observed in those chambers ventilated at the lower level (1/2 cfm/piglet), probably due to the higher moisture levels in these chambers which tends to settle out smaller particulates.

Veterinarians also determined that the level of ventilation does not have a significant effect on incidence of common pneumonia in young pigs. Of the two trials completed where half of the pigs were inoculated with pathogens, pneumonia resulted randomly in a few piglets and at a low level, showing no clear advantage to the normal ventilated chambers over the below normal ones. Thus, ventilation was not shown to be a major "stressor" of young pigs, which could predispose them to common respiratory problems.

These trials were done under laboratory settings in environmental chambers, and it is planned for the upcoming year to repeat these experiments in a production-like facility, monitoring both air quality and the health effects of the pigs under normal minimum ventilation rates and below-normal levels. Thus, it would be premature to suggest that good air quality is not important in nursery facilities or any phase of swine production. However, it does seem from the cited research and from practical experience that the pig is probably not affected to as large an extent as are people who must work in these facilities on a continuing basis. This fact was noticed in some preliminary work done during the past year at the North Central Experiment Station in Grand Rapids, and will be investigated during the next year of research.

In conclusion, air quality in swine facilities has not been well documented as to both the particular contaminant, be it noxious gas, dust or pathogen, and also to the quantity of any one of these airborne materials. More work is needed in air quality measurement, not only as it relates to swine production parameters, but also human health effects, both on a short and long term basis.

THE EFFECT OF STABLE FLIES ON SWINE PRODUCTION

Most swine producers have at one time or another, been concerned about the infestation of flies in their swine facilities. Most producers make some attempt at eliminating or controlling flies in their confinement facilities. The effect that flies have on swine production and health is not known, making decisions on economic return of control options impossible.

Recent research at the University of Minnesota (Departments of Agricultural Engineering and Entomology), investigated the effect of "stable" (blood-sucking variety) flies on weaned piglets. Results of two trials where half of the piglets were exposed to concentrations as high as 7 stable flies per pig, did not show any adverse affects in average daily gain or feed efficiency. These concentrations are probably well above standard stable fly populations of stable flies on most farms in the state. Thus, although stable flies are not as numerous as the common housefly, effects on pigs should be greater. Still, large numbers of any type of flies are unsightly and difficult to clean up after, but their presence does not seem to be detrimental to the growth of young piglets.

Another aspect of large fly population is the possibility of disease transmission from one pig to another or from other insects to the pig. This was not investigated in the above mentioned study, but is a concern to many swine producers. To date, no hard evidence exists linking swine health and flies. Entomologists generally recommend that the best control measure is to eliminate places where flies can breed (generally stagnant manure and moist feed) rather than exclusive use of baits and electronic fly controllers.

CONSERVING ENERGY IN SWINE HOUSING FACILITIES

A recently completed slide/cassette tape entitled "Conserving Energy in Animal Confinement Facilities" is available through Communication Resources Distribution. The set consists of 43 slides and a 10 minute tape explaining how energy is lost from swine facilities and what can be done to minimize it. Topics covered include: ventilation, insulation, supplemental heat requirements, condensation, and alternative energy options.

The slide set can be used as part of a swine management course, or as the feature topic at a pork producer meeting. Please contact Larry Jacobson in the Department of Agricultural Engineering at area code (612) 373-0764 if further questions.

HEATING OF SWINE FACILITIES

Many types of heaters will be used in swine facilities during the upcoming heating season. Even though heaters are necessary in many swine facilities, proper selection and maintenance of equipment and conscientious management can minimize energy costs, while still maintaining acceptable environments.

The first question to ask should be, "is a heating unit necessary in this facility?" In the upper midwest, supplemental heat is generally only necessary in farrowing and nursery facilities. Pigs that are 60 pounds or greater generate sufficient heat themselves to maintain reasonable environmental temperatures in well insulated structures. Exceptions to this would include half-full facilities, which may need temporary additional heat and naturally ventilated units where radiant heaters in conjunction with hoverers may be necessary for 60 lb. pigs during extreme cold temperatures.

The next question to ask is: "what type of heater is necessary for my particular application?" There are two basic types of heaters for livestock housing use. One type heats air, and is usually referred to as a supplemental air heater. The other is a radiant heater, which does not heat air, but rather surfaces, such as the floor in a farrowing crate. Both types of heaters are generally necessary in a farrowing unit, where a constant room temperature (generally 60-70°F) is maintained, but a much warmer microclimate for the baby piglets of 90°F is necessary in the creep area. It is by far more economical in the long run to have both types of heaters in a farrowing unit, than to overload on radiant heaters with the hope of maintaining or capturing sufficient heat to maintain air temperature also. In contrast, radiant heaters are generally not needed in nurseries, especially if deck systems are used, but supplemental air heaters are necessary to maintain the relatively warm temperatures of an early weaned piglet facility (80°F).

The air inside a swine facility can be heated by several different types of supplemental air heaters. The first and most common type is the hanging, unvented unit heater, such as an L.B. White, which simply heats inside air and delivers it into the room. This type of heater is generally L.P. gas fired, although some electric heaters of this type are also used. Another type is the make-up air heater, which is a similar style heater except that it is mounted outside of the building and takes outside air, heats it up and delivers it into the barn. By doing this, it becomes an integral part of the ventilation system, contributing to the air exchange rate and requiring either special outlets or an exhaust fan to assure continuous airflow. Both of these heaters deliver the products of combustion, such as carbon monoxide and water vapor, into the animal housing room. This does not present a problem if there is sufficient continuous ventilation moving through the barn as is recommended. Only in cases where no or very little continuous airflow was present, has there been problems with excess carbon monoxide or any of the other products of combustion.

Another type of heating system which is used to warm the inside room air is a vented heater, where products of combustions are allowed to go up through a stack in much the same manner as a furnace in a residence. This system does eliminate the products of combustion being delivered to the room, but also presents some problems in regard to the ventilation system, in backdrafting down the stack into the barn. Because of this concern, most vented heaters must have a forced stack system (one with a fan in it) to overcome any air being sucked down the stack and into the barn.

Radiant heaters also come in a variety of different styles and shapes. The most common is the conventional heat lamp, which still is being used successfully by many swine producers. Other more common ways of heating surfaces include; catalytic heaters and infrareds. Rather than having heaters hanging from a chain or cord and delivering radiation to a solid surface, many radiant heaters are placed in or on the floor. Some of the more common types include; fiberglass floor mats, which have electric cables embedded in fiberglass, or buried electric wires or hot water pipes in the concrete. All radiant heaters are trying to maintain a certain floor temperature without heating the air. This reduces significantly the heat loss of the younger animals, who are extremely sensitive to "chilling".

Finally, not only is it important to select the correct type of heater, but one needs to maintain and control that unit correctly. Heaters should be checked and cleaned periodically (possibly monthly) for proper operation. Dirty heaters are not only fire hazards, but also waste fuel. Heaters need to be properly controlled (generally accomplished by thermostats) so that their operation does not conflict with larger ventilation fans (those other than the continuous running or minimum rate fans). Large quantities of fuel and money can be rapidly wasted if thermostats of fans and heaters are not set far enough apart (suggested 7 to 10°F).

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