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HOG FINISHING FACILITY PERFORMANCE

Because of the relatively high hog market prices and the reluctance of lenders to finance new buildings, there has been a great deal of interest in the remodeling of existing facilities to finish hogs. Many of these facilities are old cattle barns where the hogs are fed on an outside feeding floor and bedded inside. In a recent popular press article (*Successful Farming*, August 1986) a computerized recordkeeping service (*Swine Graphics*) in Iowa revealed that hog performance was actually better in a facility like the old conversion barn than a total confinement unit. It was suggested in the article and by other veterinarians and consultants that some of the reasons for this poorer performance in the more total confinement systems involves a lack of ventilation, crowding, or other stresses on the animal. This raises some interesting questions concerning confinement of finishing hogs and indicates the need for research (both applied and basic) into the differences in hog performance from various types of swine housing. Also I believe it is important to stop and review the requirements or standards for a finishing facility no matter if it is new or remodelled.

Some of the *Midwest Plan Service* recommendations for growing and finishing facilities are listed below:

- 6 to 9 square feet per hog for pigs from 75 lbs up to market weight (230 lbs.) (total confinement).
- 5 to 6 square feet per hog for pigs indoors; 12 to 15 square feet per hog outdoors (open front units).

- From 20 to 30 pigs per pen (total confinement).
- From 40 to 50 pigs per pen (open front).
- One waterer for each 15 pigs with a minimum of two waterers per pen.
- 4 to 5 pigs per feeder space.
- If partially slatted, make at least 30 to 40 percent of the pen floor slatted, locate waterers over slotted area, provide 2 inch step-down from solid to slotted area, and have open fencing over slats and solid fencing over sleeping area.
- Mechanical ventilation to provide from 7 to 10 cfm per hog of continuous ventilation.
- Provide from 50 up to 80 cfm of air exchange for maximum or summer ventilation.
- To provide summer cooling, add sprinklers and/or air circulation fans.

All of the above recommendations will help to reduce the stress on hogs placed in any type of finishing facilities. There are other management factors which can also affect hog performance. Multiple sources of feeder pigs can have a significant effect on finishing barn performance as can continuous operation rather than all-in, all-out systems. Poorly designed or managed feeders can greatly decrease feed efficiency, because of significant amounts of wastage.

The environmental control of a finishing facility, although probably not as critical as in a farrowing barn, can still affect animal performance. Often temperatures are too warm (above 70°F), restricting feed intake and thus gain. If these temperature levels are maintained in the winter, there is a good chance that the barn is being under ventilated. It probably is better if temperatures are below optimum levels (60-70°) in Minnesota so that air exchange can be maintained.

Because of the recent trend to use whatever facility one has to finish hogs, there is more interest in finishing facility performance. There is a tendency to overcrowd existing facilities in the hope of finishing more animals which many times may be self-defeating, reducing gains and feeding efficiencies and also increasing mortality. One needs to consider the labor requirements of various finishing facilities which are primarily dependent upon manure handling and economics as well as pig performance. Although recent surveys have shown less confinement may have better performance at a lower initial cost, labor requirements and some operating costs may be more. No matter which degree of confinement is chosen, one should try to optimize profits rather than number of head through the facility.

AGENT-SPECIALIST TRIP TO 1987 PORK CONGRESS

The 1987 Pork Congress will be held in Indianapolis, Indiana during the week of March 2, 1987. As mentioned in the April Swine Update, we are again tentatively planning to take a van and make a farm and/or industry visit before the meeting. If any county or area agriculture agent is interested, please save these dates on your calendar and let me know. To date I have had only two responses so if you are interested, please drop me a line or give me a call before January 1st.

DUST LEVELS IN CONFINEMENT UNITS

Dust in hog barns is a problem for the following reasons: inhalation of dust by people can result in nuisance and real medical problems, dust tends to foul ventilating and feeding equipment, reducing efficiencies and durability, and it can act as a vehicle for transfer of animal disease. Although classified as a nuisance rather than a serious problem, probably because of limited research and understanding, dust in swine barns is still a concern of the swine industry because of its affect not only on the pigs, but also on people who work in such an environment.

The source of dust in swine buildings are from feed, dried manure, and pieces of pigs skin and hair. Factors which affect the level of dust in a barn are: activity level of pigs; temperature; relative humidity; feed delivery and method; pig density and weight; and airflow rate. The dust concentration in various swine facilities (from farrowing to swine finishing barns) has been measured from both total mass (mass per volume) and number (particles per volume) standpoint, and has been found to be comparable to some of the more dusty environments in industry. However, of the total dust a majority (from 60 to 90 percent) are particles small enough (less than 5 microns) to be respirable or capable of entering the human lung. The limited research into the human health effects of people who work in these facilities has shown a higher incidence of respiratory diseases than in a general population. Greater respiratory problems have been associated with workers who are smokers compared to non-smokers.

Although humans have been affected, it has been reported from several studies that the hogs themselves do not appear to be significantly affected from a performance standpoint. Research seems to indicate that the hog's snout does a better job of keeping particles out of the internal respiratory system than does the human nose. Some studies have suggested however, that dust acts as a vehicle for transporting disease organisms into a swine's respiratory system; thus causing disease. It would appear that, from a dust standpoint, one should be more concerned about the people working in these facilities than in the animals housed.

What can one do to lower dust levels in swine confinement units? It has been found that the addition of fat to the feed can significantly reduce total dust levels in hog units. Three to five percent animal fat in the diet seems to be sufficient to produce significant reductions in dust levels. Another precautionary measure for the worker is to wear a mask to filter out the dust particles. Most of the disposal masks available only filter the large particles (greater than 5 microns) which although helpful still does not prevent the more dangerous small particles from reaching the lung region. Rubber masks with filter holding cartridges are necessary to filter out these smaller particles. However, these are more uncomfortable to wear and in some dusty environments the filters may need to be replaced every few hours. Workers who are allergic to some of the different material in hog dust need to take some special precautions or avoid the swine confinement environment altogether.

Dust levels in swine confinement facilities are of a significant magnitude and quality that they do present a potential health hazard to people who work in those environments, especially those who smoke or have allergies. At this time it does not appear that the hogs themselves are affected as much although there may be links between diseases and dust levels which we are unaware of at this time. Such precautions as wearing masks and avoiding high dust areas are recommended as well as possibly the addition of fat in swine diets to reduce dust concentrations.

PREHEATING HALLWAYS

Hallways, which serve multiple-room farrowing and nursery units, are commonly used as a fresh air plenum for the incoming ventilation air (Figure 1). The main advantage is that the outside air can then be preheated before entering the farrowing and/or nursery rooms which prevents condensation around inlets and the potential of a cold draft. Also, since the hallway serves as access to these rooms, the hallway is more comforable to work in and the ventilation system is less susceptible to outside winds.

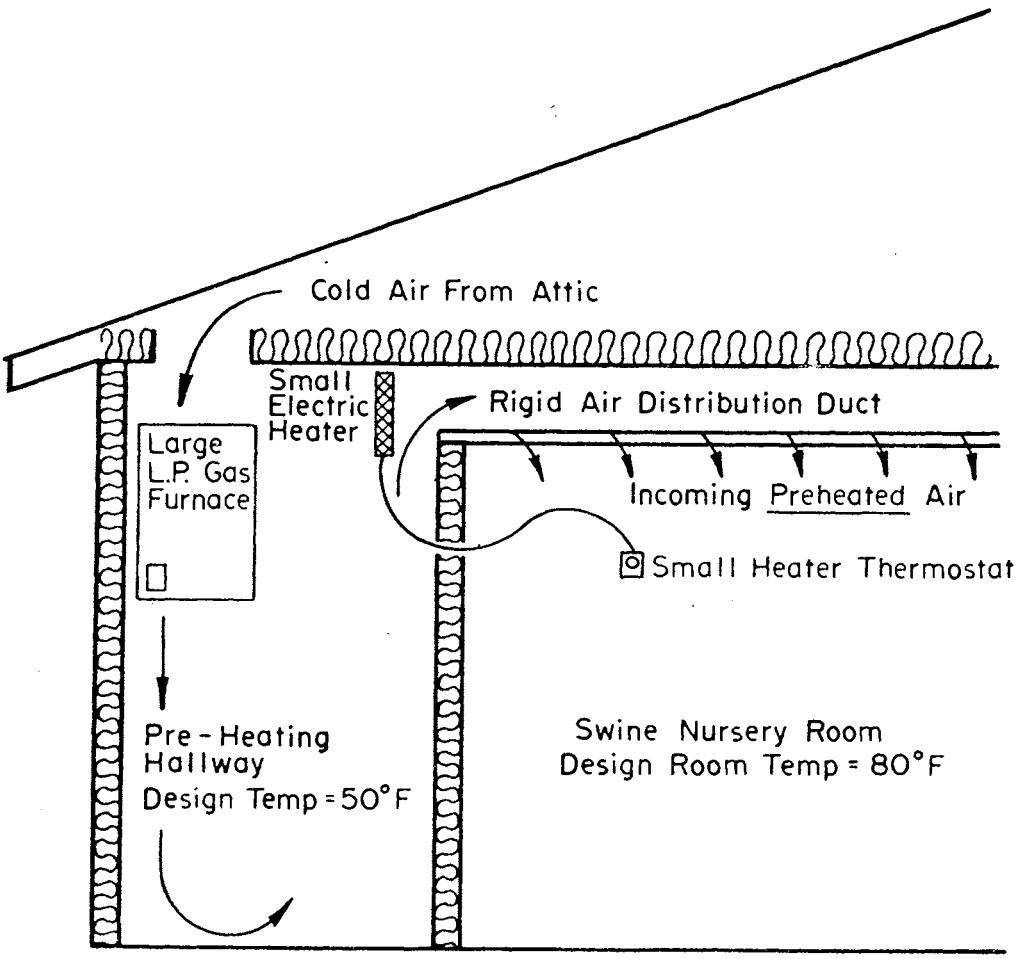

Figure 1.

Limited design information is available on preheating hallways, since most installations are done on an individual basis. Hallways are generally large enough that the air has sufficient time to be warmed up before it enters the various farrowing or nursery units. This can be a problem in very small preheating "rooms" with some suggesting a minimum retention time of 30 seconds to be sure that the incoming cold air is warmed sufficiently before moving into the individual rooms. One should make sure that the air inlet into the hallway has at least 1 square foot of inlet opening for each 800 cfm's of air that is being exhausted in the rooms. It is advantageous to remove this air from the attic into the hallway rather than directly from outside to reduce the adverse affect of outside winds. Air inlets from the hallway into the individual rooms can use this same criteria (1 square foot per 800 cfm's of airflow), as can sizing of rigid air distribution ducts inside the rooms. These openings both into and out of the hallway should be based in Minnesota on the normal winter ventilation rate and not just the minimum or continuous rate. This is because during mild winter and fall and spring days, thermostatically controlled fans will be activated in individual rooms and sufficient air inlet area must be supplied to assure proper airflow. One must make sure that the inlets both into the hallway and into the rooms are unobstructed and not covered with window screens which may plug up and subsequently reduce the effective inlet area.

The size of the supplemental heater in the hallway can be calculated from the minimum airflow rate for each of the individual rooms and the design outside temperatures. A very crucial design feature built into this calculation is the hallway temperature. It is generally felt that a hallway temperature of between 40-50° F is the maximum which one can operate without wasting heat in such rooms as a farrowing barn which may only need a design room temperature of 65° F. If the hallway temperature is 50-60°F, additional thermostatically controlled fans will come on in some rooms because of heat from lights, radiate headers, and the pigs themselves. This will result in heat being added to the hallway and thus wasted in the total system. It is thus suggested that a relatively cool hallway temperature be maintained (not above 50° F in Minnesota) if your hallway serves both farrowing and nursery units. If the hallway serves only early-weaned nursery units, warmer hallway temperatures (60°) could be maintained since higher design room temperatures (80°F) are desired. This heat supplied in the hallway is normally done with one or several gas-fired heaters. It is generally advisable to have two heaters, one running a majority of the time and the other activated only during extreme cold temperatures. This reduces variations in hallway air temperatures. This base level heat can also be supplemented by a multi-room heat exchanger.

No matter how the hallway temperature is maintained, individual room heaters are required for control. These individually controlled heaters can be physically located in the hallway in front of (from 6 to 12") the air opening into the room (see Figure 1). Under most cases this opening has a rigid duct connected to it with evenly spaced holes or slot inlets to give good distribution in the room. An external thermostat on the heater will sense the temperature in the room and activate the heater in front of the duct in the hallway. The advantages of

locating the heater in the hallway are that it is not exposed to the corrosive environment of the farrowing or nursery room and heat is evenly distributed.

Using a hallway to preheat the incoming air is a logical if not obvious option for any multiple-room swine facility. They eliminate condensation and draft problems; are comfortable to work in; and are compatible with possible multiple-room heat exchangers. If the hallway temperatures are maintained above 50° F they may not necessarily be energy efficient, especially if there are a variety of rooms (farrowing through nursery or grower) in the complex. The hallway temperature needs to be base on a compromise between the various room's energy needs and operator comfort. Sizing of openings into and out of the hallway as well as heater size are important to making an efficient, effective ventilation system.

REVISED FAN SELECTION FACT SHEET FOR LIVESTOCK VENTILATION SYSTEM

Agricultural Engineering Fact Sheet # 0956 entitled "Choosing Fans for a Livestock Ventilation System" has been recently revised and is now available through the Bulletin Room. This updated version not only emphasizes the need to select rated fans but also discusses such air delivery factors as shutters and louvers, rpm's of blades, and dirt and moisture accumulation. Fans should be regularly cleaned and lubricated, especially louvers and guards, to maintain adequate airflow. Also, fan exhausting from manure pit areas should be of noncorrosive material to prevent corrosion. Inlet sizing (1 square foot per 800 cfm's) is also mentioned in this handy reference for farm building contractors, equipment dealers, and producers.

Larry D. Jacobson

Extension Agricultural Engineer