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Field experiences with air filtration: Results and costs

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Introduction

It has been over three years now since we installed air filtration into the first farms in our practice. We now have 25 farms with air filtration. Six farms implemented filtration in 2005, five in 2006, eight in 2007, and six so far this year. Application of filtration systems in our practice has been previously described.^{1,2,3,4} I will review what has been learned from these experiences.

Filtration system options

There is no “one size fits all” to air filtration. We have found it necessary to work up each farm on a situation by situation basis. All of the farms have utilized Merv 16 Camfil Farr filters to date. We have also utilized some of the new filters from Camfil Farr, called the PB L6 filter. There are 17 boar studs, 6 sow farms, 1 finishing site, and 1 research barn. We have done small and large farms. Three of the sow farms are 2500 sows. The other three are 500 - 1200 sows. Five of the boar studs are air conditioned.

Our current breakdown of types of filtration are 15 with 100% filtration and 10 have some sort of partial filtration system or bail out system, where air is 100% filtered at lower temperatures, but as the ventilation system needs to move more air (typically 70-80 degrees F outside temperature), the air comes into the barn unfiltered.

For the Camfil Farr Merv 16 filter, now revamped to the PB L9 filter, we are figuring 600 cfm of air will go through the filter at 0.2 inches W.G. For the PB L6 filter, we are figuring 1000 cfm of air go through the filter at 0.2 inches W.G.⁵ Most of the sites have been able to run the static pressure to 0.2 without any trouble, although it is important to know which fans you have and how they perform at these higher loads.⁶

Results

An important consideration for us from the start has been that we shouldn't expect to never have a PRRS break just because we installed air filtration. However, if we can reduce the incidence of PRRS breaks significantly, it would be a good return on the investment. This has proven to be the case, in our experience. Most of the farms that have filtration had a previous history of PRRS breaks. Since

implementation of air filtration, we have had three PRRS breaks on farms using partial filtration. All three were infected when the air was not being filtered. We have had one PRRS break on a 100% filtered farm, although we did discover damaged filters as well as another possible route of virus into the farm via trucking. We have had two Swine Influenza breaks on 100% filtered farms. We have not had any *Mycoplasma hyopneumoniae* breaks on any of the filtered farms, although most are vaccinated.

Filter options

There have been many inquiries from producers about cheaper filters. I have found that not all filters are equal, and that the current rating systems are not necessarily applicable to what we are doing. For example, we are running the barns typically at .05-.20 (inches W.G.) for static pressure. When these types of filters are tested, they are done so at much higher pressures. As a result, quality of materials, frame integrity, etc. become much more important to make sure no air can bypass the filter material itself.

There has been some redesign of the frame and also a new filter which has better air flow, but may have a breaking point and allow virus to pass through at very high concentrations. Our strategy right now is that we will use the same filter as in the past (now called L9 filter since the new frame design) for farms that have a poor history with PRRS, have farms within about two miles, or have a large number of pigs within three or four miles. We will use the higher air flow filter for lower risk farms.

Partial filtration continues to be utilized due to cost. The problem is with just putting filters on the ceiling inlets and having no filtration for cool cell pads, most of those farms are unfiltered for about 4 months of the year. We've had one farm switch from partial filtration to 100% filtration just by switching the filter bank to the new higher airflow L6 filter.

Trouble shooting and challenges

A number of things have been learned in the last three years. I will provide a laundry list of issues that have come up and concerns we have had to address:

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- Partial filtration – not good enough to only filter ceiling inlets in hog dense areas.
 - Air restriction of the filter – the new filter will help, but for high risk farms, there really doesn't appear to be an answer other than you just have to have lots of filters.
 - Air locks – for any doors where animals go out or in, dead or alive, we have put air locks in place.
 - Back drafting through non-operating fans – positive pressure reduces this risk but can be hard on buildings when pushing cold air in the winter. For the negative pressure barns, we leave the fan covers on as long as possible and in some cases put them back on if risky weather conditions are approaching.
 - Proper installation of filters – we have a third party inspect the installation- often the installers have a “good enough” approach. Air conditioning experts and ventilation people are not used to having to have 100% seal on duct work or inlets.
 - Damage on installation – a number of the sites have had filters damaged during installation – important to have the third party inspection. No one wants to be blamed for damaging expensive filters. The best approach has been education up front to make sure they don't handle the filter material itself.
 - Changing of pre-filters – we've tried to have them changed every six months, but sometimes people forget – it is important to change every six months or at least inspect. This is a good time to look for air leaks or damage to the more expensive filter underneath.
- ♦ For the wean-finish site we filtered, we are estimating \$1.70 per marketed pig. This system currently has filtration capacity up to about 40 cfm per pig.
- 100% filtration
 - ♦ Air conditioning – there are five air conditioned boar studs in our practice. The cost of the air conditioning system with 100% filtration is \$350 - \$500 per animal.
 - ♦ For barns where all the air goes through a cool cell, up into the attic, then down through ceiling inlets, the cost has been around \$85 per sow or boar. We are estimating around \$1.50 per weaned pig over 10 years.
 - ♦ For barns that have air come through ceiling inlets in the winter, then switch to tunnel ventilation for the summer, the cost has been \$185-\$200 per sow or boar. The reason for the extra cost is filter banks need to be constructed in front of each cool cell pad so there is extra construction cost. Also, more filters are needed overall as one has to cover both the winter and summer ventilation scenarios independently. The cost estimate for these sites is around \$2.40 per pig over 10 years.

Costs

Because there are different building designs and different applications of filtration, there are different costs. I will summarize what we have seen to implement air filtration systems.

- Partial filtration
 - ♦ For farms that have tunnel ventilation in the summer and just put filters on ceiling inlets, the cost per sow or boar has been about \$35–40 per animal. As mentioned previously, we have only been able to filter up to about 70 degrees F with these types of systems and typically around 80 cfm per animal in a boar stud or gestation barn. The estimated cost is \$.70-.80 per weaned pig over 10 years including filter replacement and associated labor.
 - ♦ For the bail out farms, it really depends at what temperature the farm bails out of the filtration system.

Summary

Air filtration systems have been in place in our practice for over three years, in a wide variety of farms, both large and small. For boar studs, filtration has become the standard, except for studs with no history of PRRS and located five miles or more from other pigs. For sow farms, we are ranging from \$1.50 - \$2.40 per weaned pig. The cost of a PRRS break has been shown to easily exceed this. As a result we expect the application of filtration to continue.

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