Maintaining Biofilters during the Drought of 2011

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One of the reasons for moving the OSU Swine Research and Education Center in 2004 was to demonstrate that modern hog production can be "essentially odor free."

Filtering out odor

All ventilation exhaust from buildings at the Swine Research and Education Center passes through biofilters before it is released to the outside world. In its simplest form, a biofilter is a pile of organic material. Moisture attached to the organic matter adsorbs odors, and microorganisms living in the filter "eat" the odors before they escape. Biofilters are surprisingly simple to maintain. Ventilation exhaust provides all the warmth, energy, and nutrients microorganisms need to thrive and grow. The main source of concern this summer was keeping the biofilters moist.

The biofilters at OSU are based on low-tech filters developed at the University of Minnesota. If you would like detailed design information on the Minnesota filters check out the factsheet, *Biofilter Design Information,* located on the OSU Waste Management Website (http://osuwastemanage.bae.okstate.edu/factsheets) The Minnesota design calls for a 50-50 mixture of wood chips and compost as filter media. The wood chips keep the filter media loose to provide good air flow. The compost provides a place for microorganisms to live. Filter media is 10 to 18 inch deep. Surface area is matched to ventilation rate, and given typical summer ventilation rates; the surface area of a biofilter is roughly equal to the footprint of the building.

Research has shown that biofilters built to Minnesota's specifications can eliminate 90% of the odor released by hog buildings. The character of the odor changes from a manure smell to a woody, compost smell. The Minnesota filter also removes 80 to 90% of the hydrogen sulfide and 50% of the ammonia from ventilation exhaust.

Use what you have

The filters at the OSU swine farm differ from the Minnesota design in two ways. We designed ours using the same air flow factors, but instead of the wood chip/compost media, our filters are filled with moist wheat straw (figure 1.). And, the straw is held in modular fiberglass units (figure 2) rather than a simple pile.

We do not have hard data to back up what our noses tell us, but the straw-only filters do a pretty good job of reducing ventilation odors. One key to success is that ventilation exhaust is forced to flow up through the media in the air-tight modular filter. In a piled-on filter, air follows the path of least resistance -- usually straight out the sides of the pile. Also, our farm crew adds new straw to the filters twice a year. They have not removed any straw in the last seven years. As the straw rots and deteriorates, it is essentially turning into compost.

Keep it wet

The greatest challenge in Oklahoma is keeping biofilters moist. The filter media needs to stay at 40 to 50% moisture content for microbes to survive. Without moisture, there is nothing to adsorb odors. When the straw of our filters is dry, you can detect a faint -- yet distinctly piggy -- smell coming through.

Filters dry out quickly during the Oklahoma summer. In a long, hot, dry summer like the one we experienced this year, they dry out seconds after wetting. Soaker hoses on

top of our filters were running day and night to keep the straw moist. The soaker hoses are to microbes in the biofilter what misters and drippers are to sows in the building.

Since the biofilters are the only wet spot for miles around, we have to be on the look-out for Bermuda grass and weeds sprouting from the straw. It is important to prevent plants from growing on top of the filter. Plant roots rob precious moisture from the media and can clog air inlets.

Biofilters reduce odors because they are alive. Keeping them alive through the hot Oklahoma summer takes lots of loving care.

Figure 1. Biofilter at OSU Swine Research and Education Center filled with wheat straw. Notice grouting at bottom to keep airtight.

Figure 2. Biofilter without media under construction at the OSU Swine Research and Education Center.