

Winter Ventilation

By Timothy Terry, Harvest NY

It's no secret. Winter is here and, as typical for NY, it will be here for a while yet. Also typical is the closing up of livestock facilities, especially calf barns, to minimize the effects of winter. Unfortunately, this action usually proves to be counterproductive as it leads to a stale, humid environment and greater morbidity (incidence) of disease, especially respiratory illnesses.

For this reason the individual calf hutch is still the "Gold Standard" for calf care (even though it may not be considered as such by the caregivers themselves). The primary justification for closing up a barn is fear of cold air, however, a properly designed ventilation system will introduce the minimum volume of air to maximize calf health. Like the calf hutch, a barn can be cold and the calves healthy if they are adequately bedded and properly fed. The minimum volume of fresh air is 15 cfm per calf or 4 air changes per hour (4 X barn interior volume), whichever is greater.

Some may argue that air movement at that rate will produce drafts, and I would agree, if the introduced air is not distributed either through wall/ceiling vents or a positive pressure tube ventilation (PPTV) system. By definition, a "draft" is air moving at greater than 60'/minute, and "still air" is moving at less than 60'/minute. A properly operating system will achieve still (not stagnant) air at roughly 4' above the bedded floor. This is often where issues arise. Caregivers will complain that they feel a breeze on their face, so therefore, the barn must be drafty. However, they forget that they are feeling that breeze at 5 to 6 feet above the floor. Try it down at calf level, and while you're down there, check for any foul odors. If you smell something other than fresh air you may have a dead zone. This is quite common in individual pens, especially if they have solid sides. If possible, replace one or two sides with a livestock panel, particularly if they are perpendicular to the flow of air.

Unfortunately, even a well-designed system can be thwarted if the entrance of fresh air and/or exit of stale air is too small or even nonexistent. Too small of a cross sectional inlet area creates too much resistance to air flow – like choking an engine or kinking a hose. Too small of an exhaust area means stale air can't leave, and if stale air can't leave, fresh air can't come in. Remember, you can breathe through a straw, but you can't breathe through a soda bottle. I have been called out to calf barns with PPTV system problems only to find that the doors have been shut and the curtains closed tight. Once opened an appropriate amount the problem was solved. What's an "appropriate amount"? You want air to enter or exit at 400'–500'/minute (4.5-5.5 mph), so you total the cfm capacities of the fan(s) and divide by 400'/minute. This will get you the minimum required square feet of cross sectional area. For example, if your calculations say you need 200 sq. ft. and your calf barn is 100' long, drop the curtains 1' on each side $((100 \times 1) + (100 \times 1) = 200 \text{ ft}^2)$. If one side is particularly windy, drop it a little on that side and more on the other, as long as the total equals 200 sq. ft. Alternatively, you could install an exhaust fan(s) equal in capacity to the tube fan(s).

I have seen where producers have wanted to use barn attic space as a warming plenum during cold weather. This does work providing the same cross sectional rules are maintained for fresh air into the attic and any duct-work supplying air to the fan. Some contractors may want to install mixing dampers or place the fan offset from the wall to mix warm interior air with the cold outside air – DON'T DO IT! All you'll be doing is spreading humid, pathogen-laden, polluted air faster and farther. One cough will become three which will become eight... You get the idea.

Since these systems (minimum ventilation) operate 24/7/365 they have a life expectancy of only five years, and that's only if they have been regularly serviced. Belt drive fans will need to have the belts replaced and/or tightened, direct drive fans lose efficiency, fan blades get dirty, protective screens become clogged with feed, trash, or snow, and after-market modifications such as heaters and filters can further restrict air flow. So get out there and clean and service those fans. Make sure the inlets and/or tubes are unobstructed and moving freely. If you have an older system, have your equipment supplier evaluate its performance – it may be time to make repairs or do something different.

A couple months ago, Cornell PRO-DAIRY released a set of fact sheets on tube ventilation in pre-weaned calf barns. They have also published a decision tree on evaluating ventilation needs in pre-weaned calf barns. These are available on the PRO-DAIRY website on the “Resources” page, just scroll down (<https://prodairy.cals.cornell.edu/facilities-engineering/resources/>).



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