Ventilation for Calves and Youngstock

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Introduction

Providing a proper environment for calves and youngstock is very critical to the success of raising replacements, besides providing proper nutrition and sanitation and other health-related programs. On most dairy farms, calves are taken from a maternity area soon after calving and placed in a special calf-raising area. After weaning, they are often grouped in pens, free stalls or outside lots. The environment which they encounter should permit them to not only survive, but to develop into health animals as well.

High humidities are especially detrimental to animal health. And it is the animals themselves that produce the moisture that may cause high humidities if adequate ventilation is not provided. Thus, in the winter, ventilation is required to remove the moisture generated by the animals. This may be mechanical ventilation (fans) or natural ventilation. In the summer, ventilation is required to remove both heat and moisture produced by the animals. Again, either mechanical or natural ventilation may be used. But the design and construction of the housing facility very much depends on whether ventilation is to be accomplished by mechanical or natural means.

There is no in-between in terms of environment, especially in winter. Either animals must be raised in a controlled-environment building with proper mechanical ventilation, heating, and insulation (moisture removal by mechanical means), or they must be raised in an area where the temperature and relative humidity are always about the same as those of the outside air (moisture removal by natural means).

In the first case–warm housing–air is moved through the building by fans, picking up moisture on the way, and is exhausted. But, for calves, in order to maintain a warm environment (40-50°F) in the winter, supplemental heat must be provided. The calves simply do not produce enough heat to properly warm the amount of ventilation air required to remove the moisture produced. The ventilation and heating systems require carefully adjusted controls.

The success of the latter type of housing–cold housing–depends on natural ventilation and may be achieved in a building sufficiently open to allow adequate natural ventilation (openings under the eaves and an open ridge) or in calf hutches. In certain older buildings intended to be operated as cold facilities, such as stanchion barns, some mechanical ventilation may be necessary to assure moisture removal. In any case, ambient temperature for the calf should be no more than 10-20°F above outside temperature in the winter for the facility to operate properly from the standpoint of environment.

Ventilation for Calves

Cold Housing

Calves often do as well or better in cold housing than they do in warm housing. In addition, cold housing costs less to build and operate than warm housing. One of the main reasons for warm housing is the dairyman's comfort. Winter conditions are more uncomfortable for the person caring for the calves than they are for the calves themselves.

Calf hutches are being used successfully by many dairymen in Michigan, as well as most other northern states. The calf hutch is typically a 4' x 8' unit and 4' high with only one calf occupying each hutch. One end is left partially open or provided with a wire enclosure so the calf can move outside. The hutch has no bottom. They should be located in a well-drained area and the amount of bedding and bedding schedule should be such to maintain clean, dry conditions for the calves. When a calf is moved from a hutch, the hutch should be cleaned, repaired if necessary, and moved to a new location. Calves should be housed in individual hutches up to 6-8 weeks of age.

Cold housing can be provided in a naturally-ventilated building, also. This building should have an open ridge and openings under the eaves so that natural ventilation removes the moisture produced by the calves. To minimize drafts, provide solid-sided pens at least 4' x 6' with sides 4' high. For especially drafty locations, half of the pen can be covered to give the calf additional protection. Construct the pens so that one or more sides can be removed in summer. For larger dairies, where tractor cleaning of pens may be desired, construct pens 8' long with removable partitions. Large adjustable sidewall openings in the building should be provided to give additional summer ventilation. As with hutches, calves should be in individual pens until 6-8 weeks of age. It is a good idea to have more pens than the normal number of calves. Pens may then be left vacant for a period of time before being used again.

Stanchion barns have been converted to cold housing. A positive-pressure ventilation system designed to maintain an inside temperature only 10-20°F above

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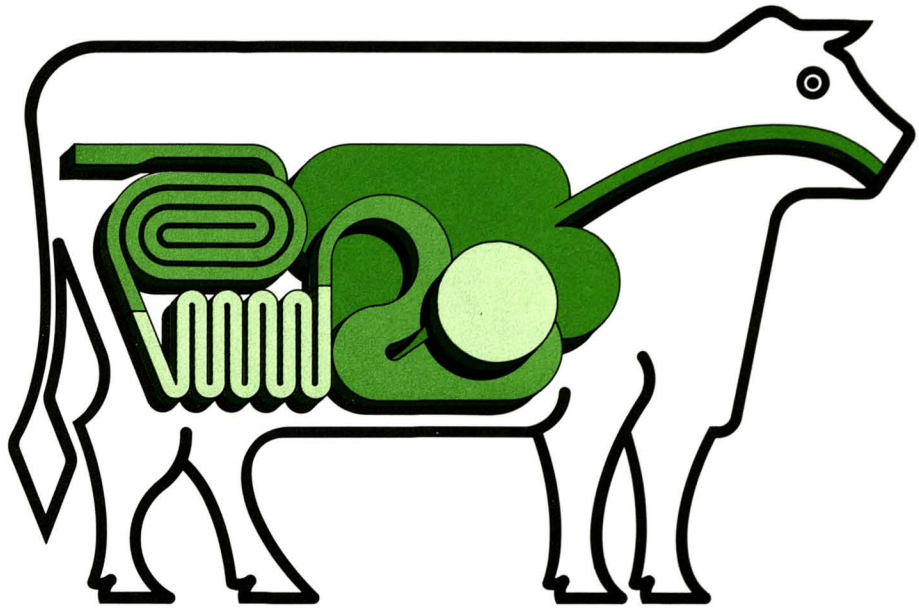

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outside temperature in the winter assures that moisture generated by the calves will be removed from the facility. The ventilation system consists of a fan located in an outside wall which draws air from the outside and forces it through a plywood duct constructed with carefully sized and spaced openings. The duct extends throughout the length of the barn to more or less uniformly distribute fresh incoming air. Air leaves the barn through doors and windows left open for that purpose. A two-speed fan with thermostatic control and adjustable openings in the duct help compensate for seasonal changes. Pen construction is similar to that for a naturally-ventilated building. Stanchion supports and stall dividers can be left in place and serve as supports for the pen partitions. Manure and used bedding can be scraped into the gutter cleaner for removal from the barn. And water lines and waterers must be protected from freezing.

Calf nutrition deserves special attention when calves are raised in cold housing. Additional energy in the ration will allow calves to maintain their body temperature in the cold environment and not suffer from malnutrition.

Warm Housing

Warm housing refers to a facility that is designed to provide a relatively uniform environment throughout the winter. All of the following factors are essential: 1) Ventilation: Removes moisture generated by the calves. 2) Heating: Heats the ventilating air. Heat produced by the calves is insufficient. 3) Insulation: Minimizes heat loss, reduces possible condensation on walls and ceiling. 4) Controls: Thermostats for control of the ventilating and heating systems. 5) Management: Proper setting of the controls in addition to proper nutrition, sanitation and other health-related programs.

Three levels of ventilation must be used depending upon seasonal conditions. Three fans could be used to achieve this. The first fan provides a minimum continuous rate to assure that moisture removal will take place even under the coldest of conditions. As the weather warms up, the outside air picks up less moisture as it moves through the building, so more air must be moved to keep humidities down to an acceptable level. The second fan serves this purpose. When outside temperature rises above 25-30°F, the second fan comes on and increases the ventilation rate. Note that this second fan is controlled by *outside* air temperature. In addition, it will be controlled by inside temperature. The third fan is primarily for additional summer ventilation.

Sizes for the three fans are determined according to the expected number of calves to be in the building. Use the following rates given in terms of cubic feet of air per minute (cfm) for each hundred pounds of calves (cwt):

Fan 1: 15 cfm/cwt — Total Ventilation 15 cfm/cwt
This is minimum continuous ventilation. No thermostat or timer.

Fan 2: 25 cfm/cwt — 40 cfm/cwt
Comes on when outside temperature rises above 25-30°F. Also comes on when inside temperature rises above 50°F.

Fan 3: 60-100 cfm/cwt — 100-140 cfm/cwt
Primarily for summer. Comes on when inside temperature rises above 55°F. As an alternative, summer ventilation could be provided by opening windows which provide good cross ventilation.

Fans should be rated to deliver their rated capacity at 1/8" or 1/10" static pressure. An AMCA (Air Moving and Conditioning Association) label on the fan assures you that the fan has this capability.

Air inlets should be located so as to provide uniform air distribution throughout the building. An adjustable slot inlet along the wall and near the ceiling keeps cold air off the calves and provides good air distribution.

Supplemental heat must be provided. Ceiling-hung unit heaters equipped with a fan for circulation are recommended. Thermostats for heaters should be set so that heaters will come on when inside temperature drops below 45°F. A convenient way to estimate the total heat required in a well-insulated facility is to multiply the cfm of Fan 1 by 150. This will give required heater output in BTU/hr.

A warm calf housing unit must be well insulated. Insulated walls should have an R value of 12-16. A minimum would be a 3½-inch batt. The ceiling should have an R value of at least 18. A minimum of six inches of insulation should be used. Be sure to cover the warm side of all insulation with a polyethylene vapor barrier.

Floor-level, bedded stalls are preferred over elevated stalls. Much of the calves' urine is absorbed and removed with the bedding rather than being evaporated into the air and creating an additional load on the ventilation system. In addition, no moisture is added to the air because of hosing or flushing, common methods of manure removal with elevated stalls. A stall measuring 2' x 4' will accommodate a calf up to 6-8 weeks of age.

Ventilation for Youngstock

Cold housing is generally preferred for youngstock. If a naturally-ventilated building is used, requirements are the same as for calves. An open ridge and openings under the eaves provide winter ventilation which is supplemented in warmer weather by large adjustable sidewall openings. The width of the open ridge depends on the width of the building according to the following table:

Building Width	Min. Ridge Width
40'	6"
50'	8"
60'	10"
70'	12"
80'	14"

Summer sidewall openings are often 3' x 6' or 4' x 8' pivoting, hinged or sliding doors in both sidewalls of

the building to provide good cross-ventilation.

If an existing building with a ceiling is to be used for cold housing, mechanical ventilation will likely be required, especially if animals are confined to the building. A positive-pressure ventilation system as described for cold calf housing in a converted stanchion barn is being used. Ventilation rates are adjusted upward to account for the greater moisture production of larger animals.

Epilog

Providing the proper winter environment for a calf or heifer basically comes down to controlling the moisture that the animal produces. This can be done in a warm housing unit with the proper mechanical ventilation, heating, insulation, and controls. But an attractive alternative is cold housing where moisture control is accomplished by natural air movement at considerably lower cost–both initial cost and operating cost.

In either case, aim toward dry, draft-free surroundings for the animal. Any attempt to house animals in an enclosed building without adequate ventilation will result in excessively high humidities that complicate problems associated with the quality of the air the animal breathes, disease transmission and condensation. The net result is generally unhealthy conditions. If a calf barn smells like a calf barn, it most likely lacks proper ventilation.