Manure Gases in Dairy Barns

Group Housed Calves
Area of Ventilation Focus: Calf Nose Zone

Review – Mechanical Ventilation System Options

- Positive Pressure
- Negative Pressure
- Neutral Pressure

Novel Approach to Calf Barn Ventilation

- Mechanical ventilation to control ventilation air streams for cold and transition ventilation seasons using neutral ventilation to ensure predictable, low-velocity air exchange at calf nose level
- Provide a means to temper ventilation air for very cold conditions
- Use positive pressure ventilation for warm and hot conditions
Novel Approach to Pre-weaned Calf Barn Ventilation
(cross sectional drawing)

Novel Approach to Pre-weaned Calf Barn Ventilation
(plan view drawing)

Ventilation Air Inters: Attic Through Engineered Endwall Louvers

Ventilation Air Supply Plenum

Engineered Discharge Holes (size and spacing)

Water to Air Heat Exchanger

Engineered Ventilation Fan (Not Visible)
Engineered Ventilation
Exhaust Air Plenum/Wash-down Gutter

Engineered Exhaust Fan (Both Ends of Exhaust Air Plenum)
New Insulated, Mechanically Ventilated Barn
180' x 66', 10' ceiling height

Demko
Farm Wet Calf Barn
Floor Plan

8 Pens at up to 25 Calves Per Pen
Air Plenums (Stacked) with Discharge Holes
22' Exhaust Air Plenum/Floor Wash Down Gutter
(Below Grade), Bottom Sloped to the East

182'

N

Pos. Pressure Ventilation
Fans (4, Stacked), Both Ends

Air Plenum
Exhaust Fan,
Both Ends

Plate 1
5'

Bedded
Area

Scraped/Washdown Area

Plate 2 Plate 3 Plate 4 Plate 1

Plate 3 Plate 2 Plate 4

Exhaust Fan (typ.)
Mechanical Ventilation System – Positive Pressure Air Plenums and Discharge Holes

South Wall – Positive Pressure Side – 4 Fans on each side blowing towards center

Top plenum, kicks in for Summer (“hot”) season

Middle plenum, kicks in for “warm” weather

Bottom plenum; top/bottom holes for “transition”, top only for “cold”

Ventilation System – Positive Pressure Side of Barn

“Summer” Ventilation Fan

“Warm” Ventilation Fan

2 fans, 2 sets of holes (transition)

1 fan, top hole only (cold)

1 fan, top hole only, tempered air (coldest)

Automated Calf Feeder

Designated Wash-down Area

Engineered Ventilation

Exhaust Air Plenum/Wash-down Gutter

Ventilation System – Negative Pressure (North) Side of Barn

One of two Trench Duct Fans – East Side

Exhaust Fans in Wall for Warm/Hot Ventilation Seasons

All-weather, Trench Duct, Engineered Holes

Ventilation System Controls – Stage Control

8 pens, 22’ x 53’, 20 calves per pen – 52.8 ft.²/calf

Stage Hand

Stage Hand Controls
Improved Efficiency

2012 – Avg. Birth weight = 95 lbs.

Average Daily Gain

Days on Milk

n=18

n=17

n=18

n=17

2013

Avg. Birth weight = 86 lbs.

2012

Avg. Birth weight = 95 lbs.

Increased Weaning Weights

Fall 2012

Fall 2013

Fall 2012

Fall 2013

Fall 2012

Fall 2013

Fall 2012

Fall 2013

Have Fun!

www.prodairyfacilities.cornell.edu

Questions?