Better Understanding Cross Vent vs. Tunnel Ventilated Dairy Facilities

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Tunnel/Cross-Vent Ventilation Goals
• Provide Fresh Air Continually Across Ventilation Stages
• Create Effective Cow-side Velocity (ECV)
• Direct Cow Cooling by Soaker System plus ECV
• Ambient Temperature Drop with Supplemental High Pressure Fog (HPF)
• Dynamic Control System to Optimize Operational Efficiency

Why Controlled Ventilation Environments are Becoming Popular
• Wind Shadows from Existing Facilities Hampering Natural Ventilation
• Variation in Ambient Wind Direction, Intensity, Duration
• Wider/Longer Facilities
• Higher Cow Numbers Under a Given Facility
• Higher Milk Production/Cow Requiring more Aggressive Heat Abatement
• Manure Management During Winter in Northern Climates

Air & Heat Exchange Specifications
• Usually designed for 500-2000 CFM per Adult Cow for Heat Transfer (approximately 1500 watts generated/cow/hr)
• Air Exchange/hr (ACH)
• Usually 4X/hr Minimum Winter
• 15-20X/hr Transition Weather
• 40-60X/hr Summer
Tunnel Ventilated Facilities

- Usually Designed with Inlet at the Prevailing Summer Wind Direction
- Local Wind Roses from Weather Sites Indicate Monthly Prevailing Winds
- Target 5–6 mph Cross Sectional Velocity
- As Tunnel Barns Exceed 500 ft Length Air Quality Diminishes Towards the Exhaust Fans
- 4–8 Row Widths Common
- Air Speed is a Calculated value Based on Theoretical Cross Sectional Area Usually Xsection Below a Baffle
- Does Not Reflect Actual ECV Over Cow in Stall Bed Below Neck Rail

Tunnel Air Flow Pattern

Short Circuiting

Consequences of Short Circuiting
Hybrid Tunnel ECV72 with HPF & Soakers

Hybrid Tunnel Arid Climate Application

Cross-Vent Facilities
- Usually Designed with Inlet at the Prevailing Summer Wind Direction
- Local Wind Roses from Weather Sites Indicate Monthly Prevailing Winds
- Common for 1000+ Cow Facilities
- Usually 8-16+ Row Barns (20 row)
- Low Roof Pitch (0.5-1’/12”) Reduces Barn Volume & Construction $/Cow
- Target 5-6 mph at Baffle (No Baffle Designs)
- Designed More for Air Speed at Baffle not Total ACH
- Short Circuiting Through Service Lanes

Cross-Vent Facilities
- Baffles Generally Located Over H-H Stalls
- Trapping of Foul Air Between Baffles (esp winter)
- Retractable Baffles?
- Headlocks & Curbs are Baffles Also!
- Power Baffle Designs with Recirculation Fans
- Must be Mechanically Ventilated 24/7/365
- Adequate Backup Generator Capacity a Must
- Air Speed & Static Pressure (Sp) Must be balanced
Cross-Vent Without Baffles

Cross-Vent with Baffles @ H-H Stalls

Cross-Vent Without Baffles

Cross-Vent with Baffles @ H-H Stalls

Cross-Vent with Baffles @ H-H Stalls
Cross-Vent with Baffle @ Headlock

Back Scrape Alley with Baffle @ Headlock

Cross-Vent with 72" Blast Fan Power Baffle

Cross-Vent with Baffle @ Cows & Headlocks

Cross-Vent with 72" Blast Fan Power Baffle
Cross-Vent with ECV72 Fan Power Baffle

Future Ventilation Designs

- Neutral Pressure Designs for cool/cold conditions
- Full Neutral Pressure Designs 24/7/365
- Greater Use of Variable Frequency Drives (VFD)
- Higher Efficiency Motors
- Inclusion of Programmable Logic Controllers (PLC)
- “Efficiency Modes” for Optimal Electrical Management