

# Resources for Ventilation of Livestock Housing

Agricultural and Biological Engineering

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## Ventilation System Information Available at Penn State

- ❖ Inlets for mechanical ventilation systems in animal housing. Wheeler, E. F. 1997. Factsheet G-91. 8 pp.
- ❖ Selecting rated ventilation fans. Wheeler, E. F. 1996. Factsheet G-85. 6pp.
- ❖ Selecting tunnel ventilation fans. Wheeler, E. F. 2002. Factsheet G-103. 4pp.
- ❖ Ventilating greenhouse barns – guidelines for livestock production. Wheeler, E. F. 2000. Factsheet G-102. 4 pp.
- ❖ Self-adjusting baffle inlet to improve air distribution. McFarland, D. F. and Wheeler, E. F. 1998. Factsheet G-92. 8 pp.
- ❖ Ventilation improvements for veal calf housing using 50-calf room example. Wheeler, E. F. and McFarland, D. F. 1998. Factsheet G-93. 8 pp.
- ❖ Make your own ceiling inlet air speed monitors. Wheeler, E. F. and Martin, J. 1998. Factsheet G-94. 3 pp.
- ❖ Ammonia monitoring in animal environments using simple instruments. Wheeler, E. F. 2009. Factsheet G-110. 2 pp.
- ❖ Psychrometric chart use. Wheeler, E. F. 1996. Factsheet G-83. 5 pp.
- ❖ Natural ventilation for dairy tie stall barns. Graves, R. E. 1995. Factsheet G-74. 4 pp.
- ❖ Ridge opening for naturally ventilated dairy shelters. McFarland, Graves, Tyson, Wilson. 2007. Idea plan DIP 811. 5 pp.
- ❖ Natural ventilation for freestall barns. Graves, R. E. and Brugger, M. 1995. Factsheet G-75. 6 pp.
- ❖ Horse Stable Ventilation. Wheeler, E. F. 2003, Publication UB039. 6 pp.
- ❖ Tunnel ventilation for tie stall dairy barns. Tyson, J.T., McFarland, D. F., and Graves, R. E., 2014. Factsheet G-78. 14 pp.

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## **Additional Ventilation Resources**

### **[Evaluating air quality in livestock housing environments.](#)**

Eileen Fabian-Wheeler 2012. Hand-held instruments and their use in ventilation system performance evaluation. Air Quality Education in Animal Agriculture, eXtension. 14 pp.

**[Odor measurement for animal agriculture.](#)** Eileen Fabian-Wheeler, Mike Hile, David Schmidt. 2012. Background on sense of smell, odorants and techniques to properly monitor odor. Air Quality Education in Animal Agriculture, eXtension. 20 pp.

### **[Environmental Control for Confinement Livestock Housing.](#)**

AE-96. 1980. Dated but still useful on-line overview of mechanical ventilation systems for animal housing. Don Jones, William Friday and Sherwood DeForest. Purdue University.

### **[Mechanical Ventilation Design Worksheet for Swine Housing.](#)**

1999. Jay Harmon. Simple evaluations for selecting proper ventilation system components. Iowa State University. 12 pp.

### **[Natural Ventilation for Livestock Housing.](#)**

AE-97. 1980. Basics of wind and buoyancy ventilation systems in an on-line summary. Don Jones, William Friday and Sherwood DeForest. Purdue University.

### **[Natural Ventilation for Freestall Dairy Barns.](#)**

442-763. 2009. Susan Wood Gay. On-line overview of air exchange and control of open sided facilities with additional resources provided. Virginia Tech.

### **[Ventilation and Cooling Systems for Animal Housing.](#)**

A3784-6. 2004. Scott Sanford. Brief introduction to box fans, high volume low speed fans, thermostats, sprinkler systems, and variable speed fans. University of Wisconsin. 3 pp.

### **[Ventilation for Warm Confinement Livestock Buildings.](#)**

1993. Joseph Zulovich. Brief introduction to fans, inlets and their controls with insulation and air flow requirements. On-line and hardcopy. University of Missouri.

**[Dairy Ventilation.](#)** Scott Sanford. On-line resource for energy performance of mechanical ventilation and circulation fans with links to other resources. University of Wisconsin.

### **[Agricultural Ventilation Fans: Performance and](#)**

**[Efficiencies.](#)** An on-line source of unbiased fan performance data for use by designers of agricultural ventilation systems. BioEnvironmental Systems Lab (BESS). University of Illinois.

### **[Livestock Housing Ventilation: Natural Ventilation Design and Management for Dairy Housing.](#)**

2006. Terry Mescher and Michael Veenhuizen. Good on-line summary. Ohio State University.

### **[Choosing Fans for Livestock and Poultry Ventilation.](#)**

2009. Jay Harmon and Hongwei Xin. Includes basic principles of fan quality, rating, performance and installation for typical and special applications. Iowa State University. 4 pp.

### **[Animal Housing-Elimination of Pit Ventilation](#)**

**[Overview.](#)** 2014. Jay Harmon, Steven Hoff and Angela Rieck-Hinz. Short fact sheet outlines the case to reduce gas emissions while providing suitable air quality in the building. Iowa State University 2 pp.

### **[Energy Efficient Fans for Poultry Production.](#)**

PM 2089H. 2010. Dana Petersen. Similar publication also available for swine production, PM 2089E. Iowa State University. 2 pp.

### **[Sizing Minimum Ventilation to Save Heating Energy in Swine Housing.](#)**

PM 2089J. 2010. Jay Harmon, Mark Hanna and Dana Petersen. Proper sizing and use of variable speed fans can reduce wasteful energy use due to over-ventilation. Iowa State University. 2 pp.

### **[Supplemental Ventilation Systems for Modified, Open-front Swine Buildings.](#)**

PM 1761. 1998. Dan Meyer and Jay Harmon. Figures and description on how to modify open-front buildings for better ventilation. Iowa State University. 4 pp.

### **[Troubleshooting Natural Ventilation Systems- Livestock Industry Facilities and Environment.](#)**

PM 1659. 2006. Jay Harmon and Steven Hoff. Using just a few simple tools to better understand performance of ventilation. Iowa State University. 2 pp.

### **[Ventilation Systems for Sheep Barns- Sheep](#)**

**[Management.](#)** PM 0989 15. 1988. Dan Morrical. Basics of natural and mechanical systems for alleviating poor ventilation and associated lamb health problems. Iowa State University. 2 pp.



**Mechanical Ventilation Systems for Livestock Housing.** MWPS-32. 72 pp. 1990. Approx. \$12. Applications and examples are provided for beef, dairy, calves, horses, poultry, rabbits, sheep, and swine.  
Source: MidWest Plan Service (MWPS)

**Natural Ventilating Systems for Livestock Housing.** MWPS-33. 32 pp. 1989. Approx. \$5. Provides guidelines for applying ventilation basics to achieve naturally ventilated farm and livestock buildings.  
Source: MidWest Plan Service (MWPS)

**Heating, Cooling and Tempering Air for Livestock Housing.** MWPS-34. 48 pp. 1998. Approx. \$7. Discusses the implications of combining ventilating systems with supplemental heating and cooling systems in farm and livestock buildings.  
Source: MidWest Plan Service (MWPS)

**Poultry Environment Problems A guide to solutions.** Nottingham University Press. 88 pp. 2002. Approx. \$32. Provides information on the needs and responses of poultry to aspects of the climatic environment.  
Source: [www.annexbookstore.com](http://www.annexbookstore.com)

**Natural Ventilation for Dairy Tie Stall Barns.** DPC 6; NRAES 119. 7 pp. 1998. Approx. \$8. Robert Graves, Robert Milne and John Porter. Detail of components for good ventilation performance.  
Source: Dairy Practices Council. [www.dairypc.org](http://www.dairypc.org)



## Reference Books Linking Agricultural Engineering and Animal Sciences

### **Livestock Energetics and Thermal Environmental Management**

James A. DeShazer, editor  
ASABE Publisher  
2009 hardcover. 220 pp.  
Approx. \$69.  
[www.asabe.org](http://www.asabe.org)

### **Agricultural Building and Structures**

James A. Lindley, James H. Whitaker  
ASABE Publisher  
1997 hardcover. 636 pp.  
Approx. \$50.

### **An Introduction to Environmental Biophysics**

Gaylon S. Campbell  
Heidelberg Science Library  
2013 softcover. 160 pp.  
Approx. \$64.

### **Environment Control for Animals and Plants**

Louis D. Albright  
ASAE Publisher  
1991 hardcover. 453 pp.  
Approx. \$70.

### **Principles of Animal Environment**

Merle L. Esmay  
AVI Publishing Company, Westport, Connecticut  
1983 hardcover. 358 pp.  
Approx. \$5-\$50 used.

### **Ventilation of Agricultural Structures**

Mylo A. Hellickson, John N. Walker  
ASAE Publisher  
1983 hardcover. 372 pp.  
Approx. \$60-\$150 used

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