



AirWorks is a patented building and ventilation system that has been developed over 20 years of research and testing. The AirWorks design is applicable to both new construction and building renovations. AirWorks is used both domestically and internationally.

AirWorks allows your livestock to express their true genetic potential. Fresh air is directed downward through the floor, thus enhancing air quality in the animal comfort zone. Consequently, **AirWorks has consistently demonstrated a 50% decrease in swine death loss!** Other benefits from AirWorks include improved feed efficiency, increased weaned litter weights, healthier pigs, and significantly lower energy costs.

AirWorks is environmentally friendly. It has reduced energy needs compared to traditional ventilation systems. Energy savings are realized through innovations in tempering incoming air, via a high-volume heat exchange system. This enables warmer tempered air to be moved through the building when outside temperatures are cold. Conversely, the heat exchange system actually works in reverse in warmer temperatures, with a cooling effect on the incoming fresh air.

AirWorks not only lowers energy costs but reduces odor; less odor is obviously better for you and your pigs. Use AirWorks in any stage of production from breeding through finishing. Fresh **AirWorks!!**



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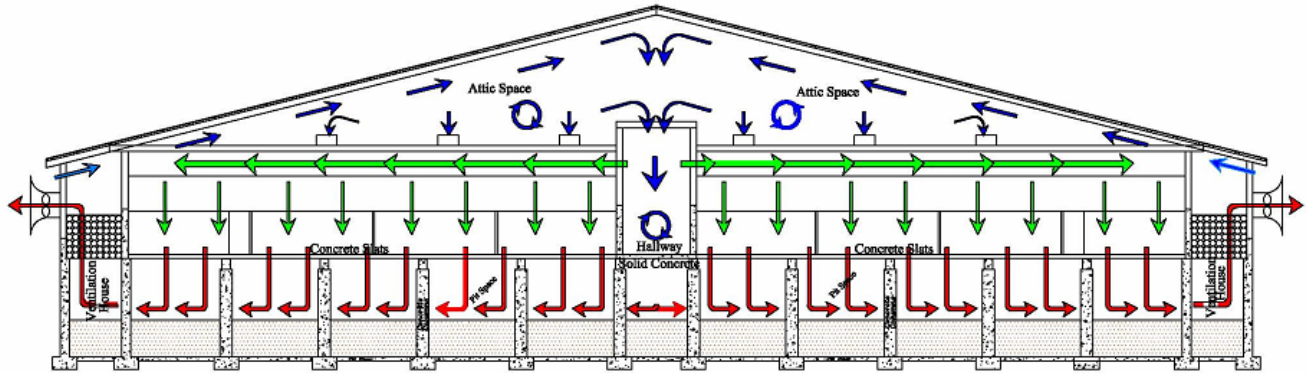
The Fresh *Air* System That *Works!*

1-800-825-2929



The key to AirWorks is the design which creates a comprehensive “*cycle*” of air flow to effectively temper and deliver fresh air to the pigs and people.

Blue Arrows Denote Fresh Air
 Green Arrows Denote Room Air
 Red Arrows Denote Stale Exhaust Air

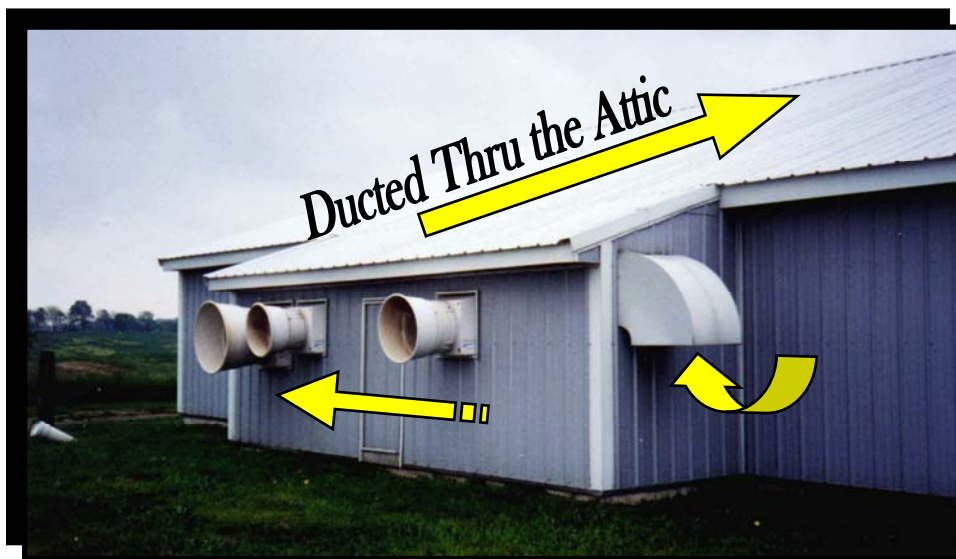


Air-Flow Cross Section

AirWorks System

Patented by
 Whiteshire Hamroc LLC

The cycle of fresh air starts by entering a ventilation chamber through a positive pressure fan. Once in the ventilation chamber, the air travels through a high volume heat exchanger system and is tempered using energy from the building in a way that does not mix or contaminate the fresh air. At the end of the heat exchanger, the air is typically transferred up through the attic in an insulated air duct and dropped into a center enclosed hotel-like hallway.

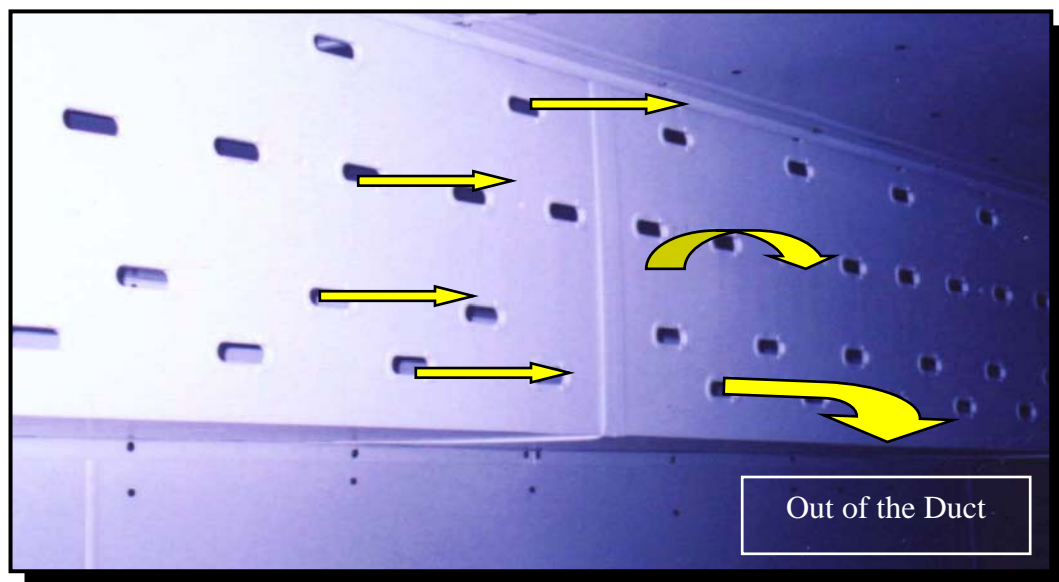
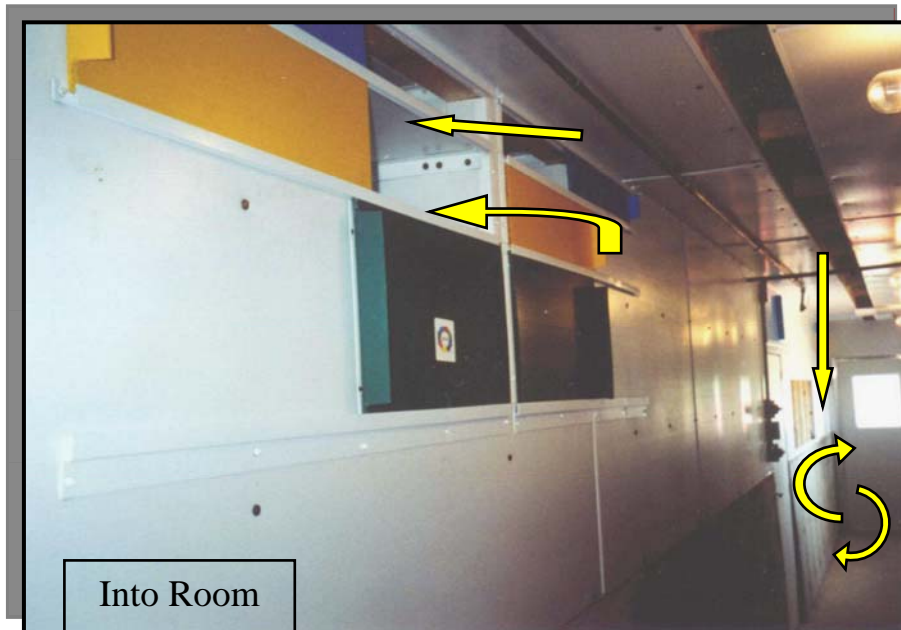


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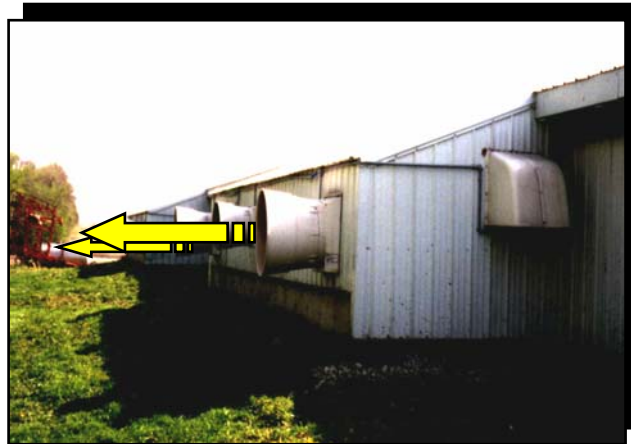
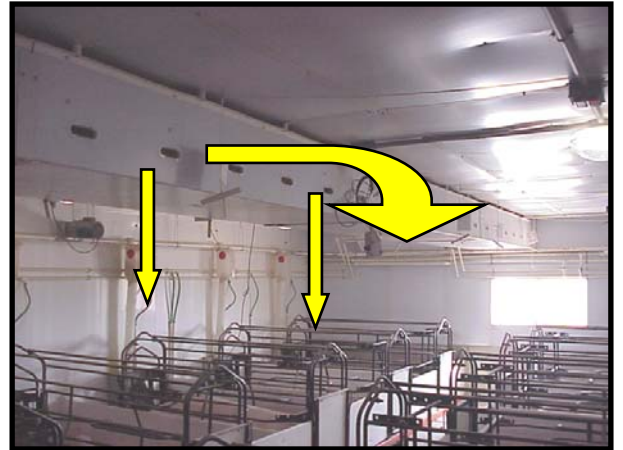


The cycle continues in the hallway where the air is mixed and further tempered. From the hallway air is pulled into ducts with inlet proportioners that work in combination with the systems computerized controls to regulate the volume and speed of air supplied to each room. The multiple level ducts span the entire length of individual rooms and are engineered to allow for the right amount of air to be evenly distributed throughout the space.





As the air flows out of the ducts at the proper speed, it is pulled down, over and past the pigs. The air then flows through the slats and into the pit. This allows for a continuous stream of fresh, tempered air for the pigs, and removes odors, gases and dusts. Finally the air is pulled from the pit through the heat exchanger, into another ventilation chamber, and out through the exhaust fans.



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Advantages of the system:

AirWorks ability to deliver a continuous supply of fresh air effectively removes stale air, resulting in many economic benefits:

Continuous fresh air
(Airflow cycle)

- = Better health & growth resulting in greater profits
- = Superb operator comfort & health

100% pit ventilation
(No stale pit air)

- = Better worker & animal health
- = Greater building longevity and low maintenance
- = Less odor build up and emission
- = Better and more uniform performance

Air ducts & distribution
(No "Dead Air" spaces)

- = Reduction in odors and odor emissions
- = Better and more uniform performance

Maximum use of air
(Down on pigs instead of over the top)

- = Efficient use of air
- = Lower utility cost

One integrated computer control system

- = Low temperature variation
- = Excellent adaptability to extremes
- = Simple, low maintenance
- = Easy to manage

Maximum use of ventilation equipment

- = Efficient use of energy & lower utility cost
- = Better delivery & cooling effect

Heat Exchanger
(Cost effective tempering of air)

- = Captures and reuses energy from the building
- = Lowers utility costs
- = Higher volumes of air at minimum ventilation result in better air quality and performance
- = Odor technology adaptability

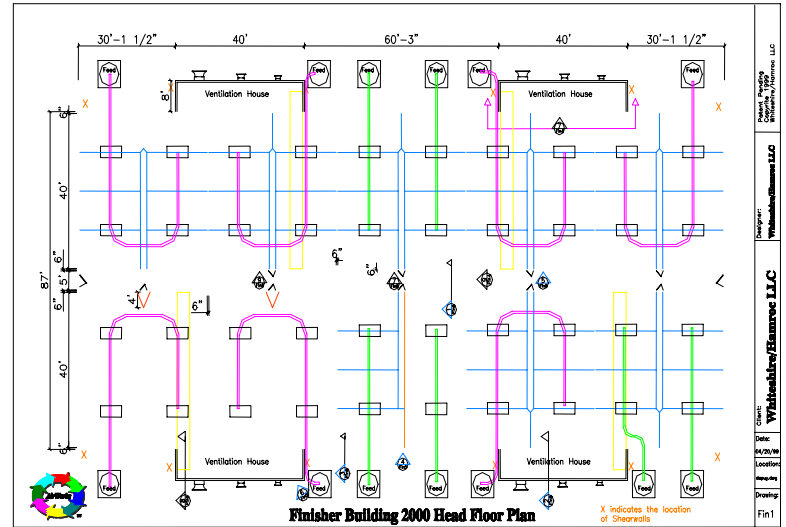
Total concrete containment
(covered by the building)

- = Safe & secure waste handling
- = Environmentally conscious

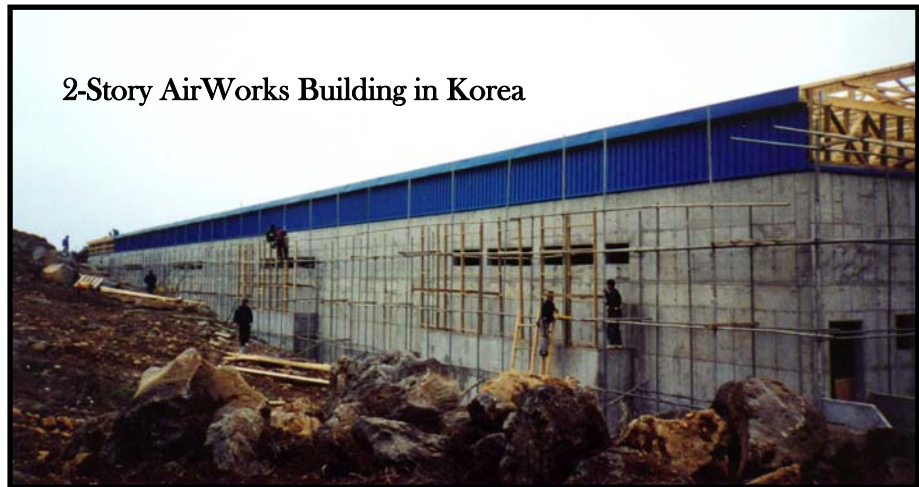


Products & Services

- Ventilation Design
- Building and Ventilation Systems
- Remodeling Consultation



2-Story AirWorks Building in Korea



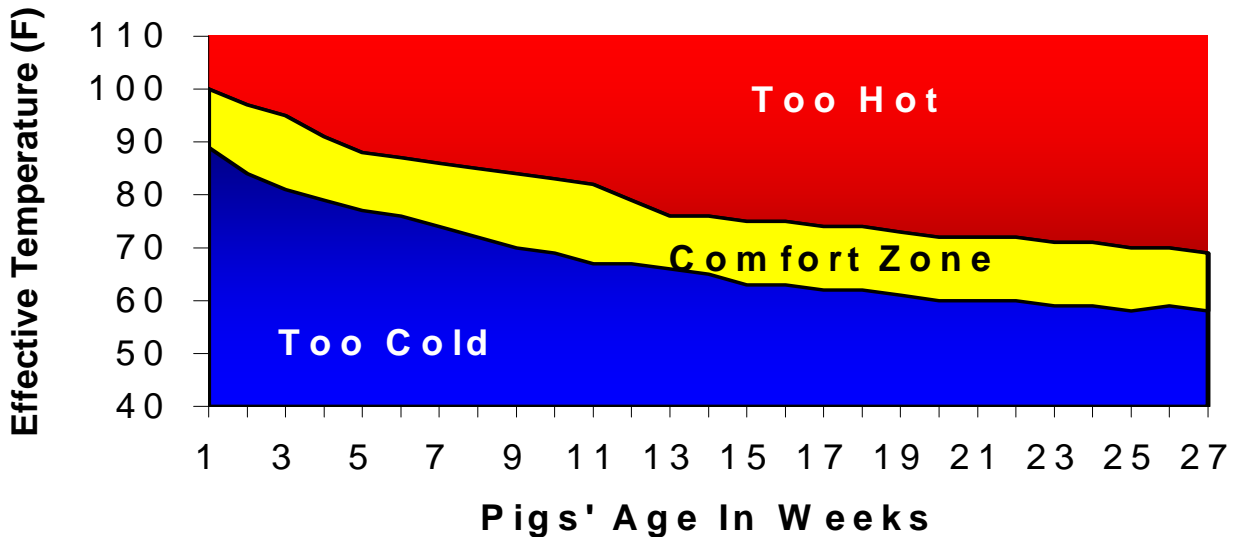
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How do your pigs really feel?

AirWorks Comfort Chart

Effective Temperature Chart for Optimal Health and Efficient Growth



1. First measure the air temperature at pig level.
2. Then adjust air temperature for any of the following environmental conditions that apply:

<u>Floor Type</u>		<u>Air Speed</u>		<u>Building Insulation</u>		<u>Evaporative Cooling</u>	
Lying Mat	5	30ft/min	-7	Good	-1	Pad System	-5
Dry Concrete	-9	90ft/min	-13	Moderate	-3	Fogger/Mister	-6
Uncoated Wire	-9	300ft/min	-18	Poor	-13	Drip Cooling	-10
Plastic Coated Wire	-7					Sprinkler	-10
Extruded Plastic Slats	-7						
Wet Concrete	-18						

3. Now, find where this “**Effective Temperature**” falls on the graph.

- If the point is:
- a) below the comfort zone, your pigs are cold-stressed
 - b) above the comfort zone, your pigs are heat-stressed
 - c) in the comfort zone, your pigs are growing fast, staying healthy, and converting feed as efficiently as possible





How do conventional barns stack up against *AirWorks*?

AirWorks buildings
Result in Higher Herd Health!

Features of *AirWorks* resulting in better Lung Scores:

- Heater
- Manageable sized rooms
- All in - all out
- Mechanical ventilation
- Pit ventilation
- Total slats

Features of conventional barns related to poorer Lung Scores:

- No heater
- Big, unmanageable sized rooms
- Continuous flow
- Single and double curtain sided buildings
- No pit ventilation
- Partial slats

“Respiratory disease decreases growth up to 20% on average.”

Tubbs, R., Deen, J. Economics of Respiratory and Enteric Diseases. Proceedings, AASP, 1997.

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AirWorks= Better Sow Performance!

FARM	VENTILATION	#LITTERS	NBA	#WEANED	21-DAY WT.
1	<i>AirWorks</i>	1,215	10.5	9.1	136.8
1	CONVENTIONAL	1,040	10.2	8.8	<u>126.8</u> 10.0 lb

10.0 pound per litter advantage!!!

FARM	VENTILATION	#LITTERS	NBA	21-DAY WT.	NPSD
2	<i>AirWorks</i>	491	10.3	136.9	42.8
1	<i>AirWorks</i>	1,462	10.2	131.4	47.0
3	CONVENTIONAL	1,083	9.6	122.4	58.0

9.0 to 14.5 pound per litter advantage!!!

“Weaning weight had a significant effect on pig survival in nursery, as well as on pig weight at the end of nursery and/or finisher periods.” - Deen, John; Steve Dlitz; Lee Watkins; Bill Weldon. Weaning weights affects survival, growth, and fat thickness. International Pigletter. September, 1998.



AirWorks = Better Growth!

Adjusted Days to 250#

FARM	VENTILATION	# OF HD	BACKFAT	LEA	DAYS
1	<i>AirWorks</i>	1,522	0.71	7.13	164
2	CONVENTIONAL	1,144	0.71	6.77	172

- IMPROVED HEALTH
- BETTER CUTOUTS
- HIGHER PREMIUMS
- FASTER TURNOVER
- IMPROVED GROUP UNIFORMITY

What does this mean in building costs??

For every 8 days quicker to market, a producer can afford to invest up to **\$12.00** more per pig space. If opportunity costs are included, this balloons to \$66.00 per pig space!!!

Less Death Loss

AirWorks Death Loss –1 to 2% Conventional Building—3.5 to 4%

What does this mean in building costs??

For every 1% decrease in death loss resulting from building improvements a producer can afford to invest up to **\$18.85** more per pig space.



How do conventional barns stack up against *AirWorks*?

Feed Efficiency in Grow-Finish Trials

Trial based on pigs from 55 to 249 pounds

AirWorks **2.37 pounds of feed per pound of gain**

What does this mean in building Costs?

For every .1 pound improvement in feed efficiency resulting from better buildings or building improvements, a producer can afford to invest up to **\$31.95** more per pig space! This is based on \$3.195/year over ten years.

“Most overlooked factor influencing feed efficiency is environmental stressors like air quality and thermal environment.” -Jeanne Bernick. Farm Journal. April 1999

Tired of Repairs? AirWorks Buildings Last Longer!

What does this mean in building Costs?

For every year longer a building can be used without major repairs a producer can spend up to **\$10.00** more per pig space!

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AirWorks ENERGY EFFICIENT!!

9/1/01-4/8/03

<i>BARN SIZE</i>	<i>VENTILATION TYPE</i>	<i>LP (GAL.)</i>	<i>LP/HD</i>
2,200 head	AirWorks	3,410	0.841
800 head	Conventional	9,700	3.936

“Temperature fluctuation is one thing that causes health problems and, of course, costs money.” -Jeanne Bernick. Farm Journal. April, 1999.

Outside Temp (*F)	Heat Exchanger Temp (*F)	Increase in Temp (delta T)	Heat Gained BTU/Hr	Propane Saved Gal/Hr.	Efficiency of system
1.0	39.0	38.0	170316.0	1.86	53.52%
7.0	40.0	33.0	147906.0	1.81	50.77%
14.0	43.0	29.0	129978.0	1.42	50.00%
17.0	44.0	27.0	121014.0	1.32	49.09%
22.0	46.0	24.0	107568.0	1.17	48.00%
24.0	47.0	23.0	103086.0	1.13	47.92%
26.0	49.0	23.0	103086.0	1.13	50.00%
30.0	50.0	20.0	89640.0	0.98	47.62%

Room Temp of 72 degrees F
 40,000 cubic feet of air space
 45,600 lbs. of animal weight

The above table was produced by Engineers at Aerotech with temperature data provided by Whiteshire Hamroc from an actual heat exchanger installation.

To date, Whiteshire Hamroc has recorded a low outside temperature of -20 degrees F, with a heat exchanger output temperature of 38 degrees F.

The colder it is outside, the more efficient your AirWorks system becomes!

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Building Performance: What is it worth?

Pork production is a very competitive business where costs and profitability are affected by many factors. Some of these factors are easily identified and quantified while others are not. The purpose of these comparisons is to use identifiable factors that can be quantified and relate them to the AirWorks production system.

Performance Results:

The use of AirWorks systems results in healthier, more efficient, and faster growing pigs. This is accomplished by improving the quality of ventilation and pig comfort. Due to AirWorks' improved design and better quality materials, the AirWorks systems also results in lower maintenance costs and longer lasting buildings.

On farm tests results indicate that pigs in AirWorks systems grow to market weight 15 days faster with a .1 to .2 feed efficiency advantage over pigs raised in other systems. These same tests show a 1% to 2% pig death loss in AirWorks systems compared to industry averages of 3% to 4%. Additionally, the quicker growth and better pig comfort results in more uniform pigs, quicker building and room cycles, and fewer pigs sold at a discounted light weight.

What is the extra value of an AirWorks system worth?

Feed Efficiency:	.1 pound better (over ten years)	\$31.95
Death Loss:	1% decrease in death loss	\$18.85
Growth rate:	8 days faster growth	\$15.00 to \$82.00
Building Life:	1 extra years life	<u>\$10.00</u>
Total AirWorks Advantage		\$75.80 per pig space!

These calculations indicate that you can afford to invest a minimum of **\$75.80** more per pig space for an AirWorks system over a conventional building!

(Calculations based on Net Present Value Analysis)

To find out more about the details of the above calculations and how AirWorks might work for you, call 800-825-2929.

Background Information for above Data

Sow Performance Data

AirWorks data came from two sources over a 30-month period.

- Farm 1 is a breed to finish farm that has farrowing units with both AirWorks and conventional powered ventilation.
- Farm 2 is a breed to finish unit which utilizes AirWorks completely throughout.

Farm 3 is a breed to finish unit that incorporates conventional powered ventilation and curtain type buildings.

Growth Data

AirWorks data comes from a one site breed to finish farm with AirWorks ventilation system and includes actual weights from 1522 pigs during a one-year period. The average days from birth to 250 pounds were 164 days. This included weights of every pig sold.

Conventional data came from a one site breed to finish farm with a conventional power ventilated and includes actual weights from 1144 pigs during a one-year period. The average days from birth to 250 pounds were 172.

Mortality

AirWorks data comes from actual barn records over a four year time period from weaning to market. The death loss in this breed to finish farm averaged **1.2%** over that time period.

Conventional Data came from two sources.

- Actual deaths from a chimney barn where barrows were fed from 47 pounds to market. This barn's death loss averaged 3.8% of 11,632 pigs over the same four year time period that the AirWorks barn covered.
- 339 groups of Pig Champ data that shows mortality rates of 3.68% in the average group of pigs grown from 11 to 237 pounds.

Feed Efficiency

AirWorks data comes from the same AirWorks breeding to finishing unit. The whole herd (including sow and boar feed, sale boars and gilts etc.) feed efficiency was 2.68. Tests on individual rooms have been 2.37, 2.36 and 2.25, with pigs starting at 46.9 pounds and going to market at 255.7 pounds.

Conventional data came from two sources.

- Feed efficiency trials on 11 groups of pigs in the above chimney building. These trials averaged from 2.74 to 3.28 in feed efficiency. The trials were conducted at random times during the 4-year period.
- 6000 groups of Pig Champ data show the average feed efficiency at 3.08, and the top 10% at 2.64.

Building Longevity

This is primarily from general observations after working with seven chimney barns and two tunnel ventilated barns in our production system and comparing them to the AirWorks building systems.

Energy Efficiency

The data comes from two grow-finish buildings located on the same farm with the same genetics, feed, and management. Each building has its own LP tank. The gallons recorded were actual gallons to fill each tank.