SDSU Extension

Producer Ventilation System Planning Worksheet

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Worksheet for calculating barn or room ventilation rates and inlet needs. For more information view the article "Basic Ventilation System Design for Pork Producers" on extension.sdstate.edu.

Step 1 – Determine Ventilation Rates

Table 1: Ventilation rates per animal per weather cfm/head

Pig Weights	Cold	Mild	Hot

Midwest Plan Service, MWPS-32

Table 2: Total ventilation rates per barn per weather cfm/unit

Pig Weights	Cold	Mild	Hot

Table 1 multiplied by total number in barn

Step 2 – Determine Inlet Area Requirement

Design Inlet Velocity is 800-1000 ft/min.
Often we use 900 ft/min for initial calculations.

To calculate area divide flowrate by velocity
Example: Cold weather rate for 75 lb pigs

$$Area\ (ft^2) = \frac{Barn\ Flowrate\ (cfm)}{Design\ velocity\ (ft/min)}$$

Table 3: Total inlet area building per barn per weather (ft^2)

Pig Weights	Cold	Mild	Hot

Divide Table 2 by target inlet rate of 900 ft/min

Step 3 – Determine the required number of inlets to match the smallest area requirement

Inlet #1

max opening: _____

max area opening: _____

max area opening: _____

min area opening: _____

Inlet #2

max opening: _____

max area opening: _____

max area opening: _____

min area opening: _____

Divide the lowest inlet area requirement (Top left cell Table 3) by the minimum area opening
Divide the highest inlet area requirement (Bottom right Table 3) by the maximum area opening

Alternatively, you can also choose to divide the inlet area of the last stage before moving to tunnel ventilation by the maximum area open to solve for the number of inlets.

Table 4: Number of Inlets Required with Comparison

Minimum Ventilation:_____ Minimum Ventilation:_____

Maximum Ventilation:_____ Maximum Ventilation:_____

Total inlets: _____ Total inlets: _____

When choosing the number of inlets in a tunnel ventilated system always select the minimum ventilation rate number to avoid having to close up inlets in the wintertime. Since the barn is tunnel ventilated during hot weather the maximum ventilation rate will be drawn through the wall inlet rather than the ceiling inlets.

Step 4 – Determining Stage Opening of Ceiling Inlets

Table 5 (Inlet #1)

Pig Weights	Cold*	Mild*	Hot*
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

* Total inlet Stage Opening per weather

Table 5 (Inlet #2)

Pig Weights	Cold*	Mild*	Hot*
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

* Total inlet Stage Opening per weather

Divide the total inlet area requirement for each stage by the maximum inlet area times the number of inlets.

The above worksheet can be used for planning new or remodeling old facilities. Steps 3 and 4 are set up to allow the comparison of 2 different inlets, users don't have to compare different inlets.

Producer Ventilation System Planning Worksheet Examples

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Example: 2700 head finish swine 75 pounds to 300 pounds, Upper Midwest, tunnel ventilation hot weather

Step 1 – Determine Ventilation Rates

Table 1: Ventilation rates per animal per weather cfm/head

Pig Weights	Cold	Mild	Hot
75 lbs	*7*	*24*	*75*
300 lbs	*11*	*37.5*	*135*

Midwest Plan Service, MWPS-32

Table 2: Total ventilation rates per barn per weather cfm/unit

Pig Weights	Cold	Mild	Hot
75 lbs	*18,900*	*64,800*	*202,500*
300 lbs	*29,700*	*101,250*	*364,500*

Table 1 multiplied by total number in barn

Step 2 – Determine Inlet Area Requirement

Design Inlet Velocity is 800-1000 ft/min.
Often we use 900 ft/min for initial calculations.

To calculate area divide flowrate by velocity
Example: Cold weather rate for 75 lb pigs

$$\text{Area } (ft^2) = \frac{\text{Barn Flowrate (cfm)}}{\text{Design velocity (ft/min)}}$$

Table 3: Total inlet area building per barn per weather (ft^2)

Pig Weights	Cold	Mild	Hot
75 lbs	*21*	*72*	*225*
300 lbs	*33*	*112.5*	*405*

Divide Table 2 by target inlet rate of 900 ft/min

Step 3 – Determine the required number of inlets to match the smallest area requirement

Inlet #1

max opening: *9 in.*

max area opening: *459 in^2*

max area opening: *3.18 ft^2*

min area opening: *0.17 ft^2*

Inlet #2

max opening: *8 in.*

max area opening: *432 in^2*

max area opening: *3 ft^2*

min area opening: *0.19 ft^2*

Divide the lowest inlet area requirement (Top left cell Table 3) by the minimum area opening
Divide the highest inlet area requirement (Bottom right Table 3) by the maximum area opening

Alternatively, you can also choose to divide the inlet area of the last stage before moving to tunnel ventilation by the maximum area open to solve for the number of inlets.

Table 4: Number of Inlets Required with Comparison

Minimum Ventilation: *123.5 inlets*

Maximum Ventilation: *127.3 inlets*

Total inlets: *123*

Minimum Ventilation: *110 inlets*

Maximum Ventilation: *135 inlets*

Total inlets: *110*

When choosing the number of inlets in a tunnel ventilated system always select the minimum ventilation rate number to avoid having to close up inlets in the wintertime. Since the barn is tunnel ventilated during hot weather the maximum ventilation rate will be drawn through the wall inlet rather than the ceiling inlets.

Step 4 – Determining Stage Opening of Ceiling Inlets

Table 5 (Inlet #1)

Pig Weights	Cold*	Mild*	Hot*
75 lbs	*5.30%*	*18.20%*	*57.10%*
300 lbs	*8.30%*	*28.50%*	*103.7%**

* Total inlet Stage Opening per weather

Table 5 (Inlet #2)

Pig Weights	Cold*	Mild*	Hot*
75 lbs	*6.3%*	*21.7%*	*67.9%*
300 lbs	*10%*	*34%*	*122%**

* Total inlet Stage Opening per weather

For example at 75 lb & cold conditions:

$$\% \text{ Inlet Open} = \frac{21 \text{ ft}^2 \text{ (table 3)}}{110 \text{ Inlets} * 3 \frac{\text{ft}^2}{\text{inlet}}} * 100\% = 6.3\%$$

Divide the total inlet area requirement for each stage by the maximum inlet area times the number of inlets.

The above worksheet can be used for planning new or remodeling old facilities. Steps 3 and 4 are set up to allow the comparison of 2 different inlets, users don't have to compare different inlets.

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