



Hybrid-Positive Pressure System:

A New Design Concept Using Attics,
Inlets, and Centrifugal Mixing Fans





Most poultry houses are designed using a negative pressure ventilation program, but free-range facilities must be thought about differently. Because free-range farms must provide outside access for birds, pop-doors are built into the walls. These doors are often required to be open for long periods of time, if not continuously, when birds are present. With negative pressure ventilation, pop-doors act as air inlets and create cold drafts along the floor during winter, resulting in wet litter by the doors and uneven house temperatures.

To solve this problem, houses can be designed using a hybrid ventilation scheme. This hybrid design combines a natural or negative ventilation scheme with a positive pressure design to accommodate free-range birds during all seasons.

Let's first look at how the systems work individually.

Natural ventilation design uses naturally occurring wind forces and thermal buoyancy to supply fresh air to a building. A naturally ventilated house "breathes" to maintain an equilibrium with the external pressures acting on the building.

Negative pressure ventilation design uses fans to draw air out of the animal area, and the resulting negative pressure pulls air in to the bird area through designed inlets, or any other outside openings.

Positive pressure ventilation is a concept that uses fans to force fresh air into the building and the stale air is then pushed out through all openings.

The new hybrid design that we have developed takes the understood concepts of natural or negative

pressure ventilation and mixes them with the positive pressure concept and builds a new ventilation scheme based on improved technology. Let's explore.

A naturally ventilated house uses two forms of air exchange: wind-induced and buoyancy-induced. Wind-induced exchange is used during warm weather to move air across the building. Buoyancy-induced exchange is used during cold weather when heat escapes through ridge vents in the ceiling and is replaced by the cooler incoming air through the sidewalls.

Negative pressure ventilation frequently creates a tunnel effect during hot weather to remove heat and create a wind chill effect on the birds. In cooler weather, a minimum ventilation program runs fewer fans to draw air in through inlets and along the ceiling to be mixed and warmed.

The positive pressure set up can easily complement any existing natural or negative pressure ventilation design. Because the use of natural or negative ventilation is unchanged during hot weather, we can focus on the specific aspects of cold weather ventilation and how a positive pressure system can improve minimum ventilation management.

The basic principles of cold weather ventilation programs (minimum ventilation) are the same regardless of the ventilation program used.

- Incoming cold air must be adequately mixed with warm house air before reaching the birds.
- The amount of air brought in must be appropriate for the size and age of the birds.

The goal is to remove excess moisture from the house

to maintain acceptable litter and air quality while minimizing heating costs. Positive pressure is clearly the winner for cold-weather ventilation when outside access doors are used. Positive pressure meets all the demands of minimum ventilation and simultaneously prevents cold air from flowing into the house at floor level.

The key to successful positive pressure design is the use of a centrifugal mixing fan. Our Z-Pro™ Hemisphere®, the newest addition to the Hemisphere line, works in any floor bird application. The patented design of the fan pulls air — from above and below — into the center of the fan, where it is mixed and pushed out towards the sidewalls. This creates a constant, slow-moving air current along the walls and floor of the bird space.

There are two positive pressure ventilation options that, depending on house design, will work differently, but still result in improved circulation, even house temperatures, and lowered heating costs.

The first concept is an exclusive positive pressure design that places typical propeller fans in the attic space and orients them so air is blown into the attic and forced down through the attic inlets into the bird space, mixed by the Z-Pro Hemisphere, distributed evenly throughout the house, and eventually pushed out through pop-doors.

The downside to this is that it requires completely sealing that attic so air can only escape through the attic inlets into the lower bird level - no soffitt or ridge vents, and no open eaves.

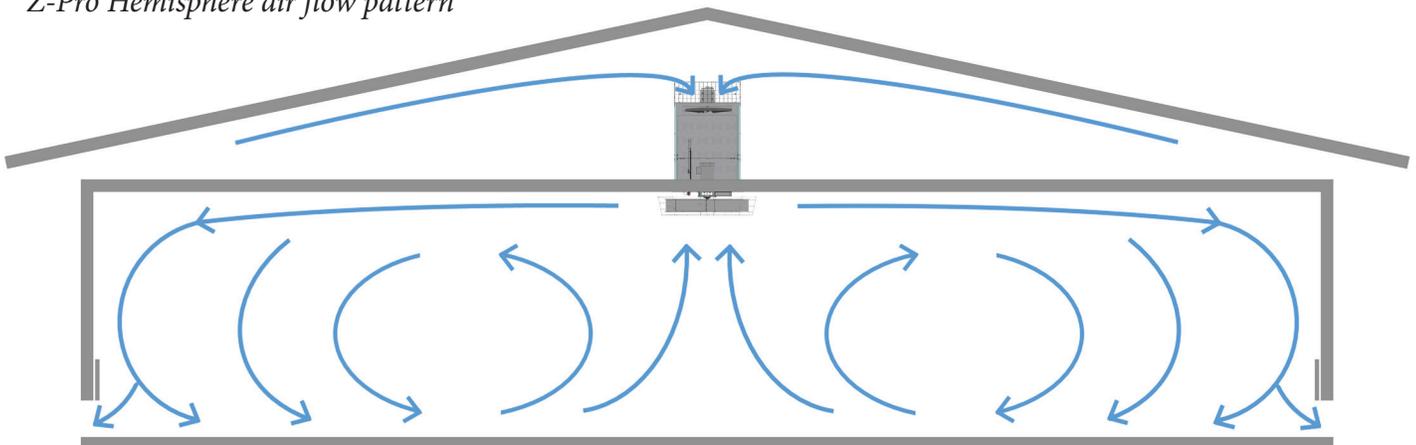
The second design concept combines negative and positive pressure principles with improved technology for a new ventilation scheme. Fans built into the attic inlets draw air from outside — through the soffitt, gable, or ridge vents - to make the attic a negative pressure system. The integral attic inlet fans push the attic air into the bird space, positively pressurizing the barn itself. Cool air is pushed from the attic into the Z-Pro Hemisphere, mixed with warm air near the ceiling, and distributed evenly throughout the house.

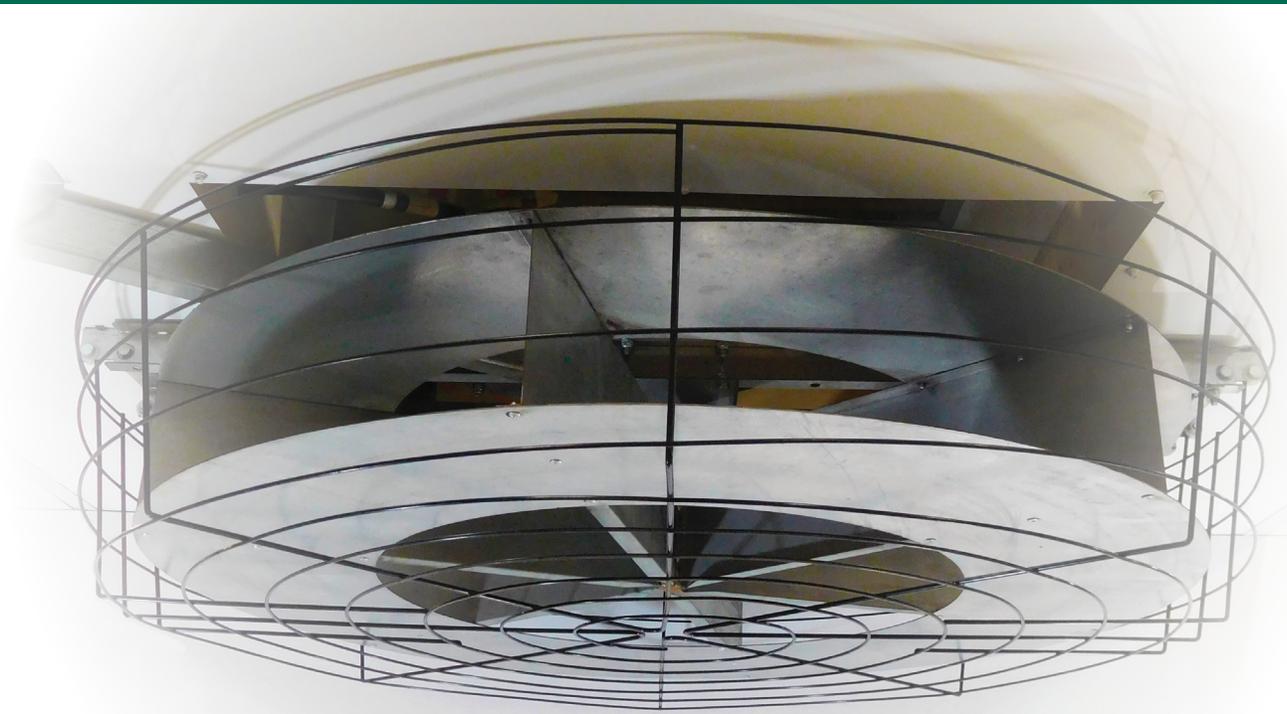
The positive pressure in the bird space satisfies all the goals of minimum ventilation - removing excess moisture from the barn, introducing fresh air to maintain litter and air quality, and doesn't increase heating costs. By running the attic inlet fan continuously using variable speed, a consistent positive pressure is maintained in the barn while not over-ventilating or wasting heat.

When temperatures increase the system easily transitions back to a traditional negative ventilation program by closing off the attic inlets, opening tunnel doors, and turning on end-wall exhaust fans. As wind-speed increases, the Z-Pro mixing fans are shut off and typical airspeeds for bird cooling are achieved. The system can be supplemented with cool pads and fogging systems for additional heat removal.

The end result is the ideal bird environment — a uniformly well-ventilated, comfortable house that balances bird comfort, consistent temperatures, and litter quality.

Z-Pro Hemisphere air flow pattern





Want to learn more about our
innovative ventilation design?

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