

# HOW EQUAL PRESSURE VENTILATION IS FINDING ITS WAY INTO IN FREE-RANGE LAYER HOUSES

*Worldwide there is an increasing demand for sustainable livestock keeping. Animal welfare is increasingly important. Driven by public opinion and market demand the way in which poultry is housed and treated is changing. Together with a plethora of laws, these factors bring forward the development of new innovative ways for housing poultry. Spearheading the sustainability race are cage-free layer houses.*



## **The public demand**

The public interest and involvement in livestock keeping have increased over recent years. There is a strong market demand for a sustainable industry with attention to its ecological footprint. Animal welfare and natural bird behaviour have become public priorities which started to guide poultry farmers in building alternative housing. The public demand is changing followed by more direct involvement of the public in the way our food is produced. This direct involvement is largely stimulated by NGO's and the modern day use of social media connecting the farmers to the end consumers.

## **Improving animal welfare**

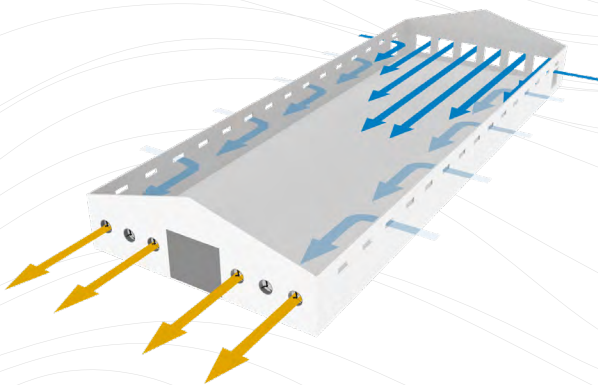
The focus on animal welfare has changed the way in which poultry is housed. With concerns around animal welfare, most European countries, South America, and the United States have largely banned closed cage systems. These systems are replaced with aviaries and nesting systems. With the Chinese poultry sector now also joining the change to cage-free, there are amazing opportunities for equal pressure ventilation systems. Another example of change driven by the public morale is the use of natural daylight allowing more natural behaviour. With respect to the birds there is an increased focus on providing environments that welcome natural bird behaviour. The most modern layer houses are equipped with free-range outdoor areas or called winter gardens. Free-range and cage-free egg production are here to stay.

## **The challenge of climate control**

Free-range layer farms come with their own unique set of challenges. Keeping control over the climate in a poultry house with pop holes in the side walls has proven to be difficult. A climate consists of heating, light, temperature, humidity, air-speed, and air quality. The ventilation system plays a crucial role as it forms the bridge between the outdoor and the indoor climate. Having a good climate depends on how much you can keep out weather influences. In closed poultry housing creating and maintaining a stable climate can already be difficult at times. Keeping control over a partially opened poultry house is another thing entirely.



## “ LOCAL CLIMATE CONDITIONS AND WEATHER EXTREMES DICTATE THE DESIGN OF THE VENTILATION SYSTEM



### Traditional ventilation concepts

In traditional climate systems, the ventilation is mostly done by creating negative pressure. Creating a negative pressure brings the air up to speed when big volumes of air are entering through the air inlet valves or tunnel units. Some familiar concepts using negative pressure are tunnel ventilation, cross ventilation, and longitudinal ventilation.

In free-range poultry housing, these systems cannot keep control over the climate due to pressure loss because of openings in the sidewalls of the house.

### What should a good ventilation system do?

A properly functioning ventilation system plays a crucial role in the welfare and growth rate of poultry. For optimized production results, control over the climate is of utmost importance. There are many factors under the direct control of the ventilation system, below are the primary functionalities:

- Maintaining good air quality (oxygen levels, humidity, temperature, and such)
- Bringing air to the birds in all corners of the house whilst avoiding the aviaries and layer nests
- Providing a continuous exhaust of dirty air to prevent a build-up of ammonia, fine dust, and other such pollutants
- Dealing with the outside climate influences and keeping the climate inside steady and under control
- Offering flexibility to deal with weather extremes and seasonal changes
- Preventing cold air from directly falling onto the animals
- Creating a homogeneous climate throughout the house



## Equal pressure ventilation (EPV)

In poultry houses with pop holes and free-range areas, the negative pressure concept has to make room for something else. Since the early days of livestock keeping the concept of equal pressure ventilation has been around in some form. Starting with natural ventilation, where no mechanical movement of air was used at all, the change has been in taking back control. With natural ventilation there are negative influences from the outdoors disrupting stable and desirable ventilation patterns.

It is important to take into account the power of the sun and wind and their respective effect on the ventilation of poultry houses. The common advice to build a poultry house with the long axis from east to west helps to prevent the sidewalls from catching too much sunlight.

Equal to the sun, the wind also has its effects on ventilation. A strong wind passing by the length of the house can partially cut off a good airflow into the inlet valves. Opposed to that, the wind blowing directly onto the sidewall also has a negative effect. To bring back control to a natural ventilation concept free-range poultry houses are now mostly equipped with mechanical ventilation in the form of an EPV system. In these systems, there are two mechanical power sources driving the air in and out of the house in a well-balanced order.

“ **UNIQUE TO EPV SYSTEMS IS THAT THE INCOMING AND OUTGOING AIR ARE BOTH ACTIVELY CONTROLLED** ”

## Advantages of EPV systems

There are a few advantages brought forward by EPV systems in free-range or cage-free housing.

- Mechanical EPV systems always make use of chimneys equipped with fans, to bring air into the house. The exhaust of air can be organized in a variety of ways. It can be arranged by placing exhaust chimneys in the ridge of the roof, or by placing fans in the end gable. Active control over the airflow is the advantage.
- Since air is brought into the house through ventilation chimneys, these chimneys can be equipped with recirculation elements. The recirculation technique is the cherry on top of an EPV system as it increases the energy efficiency.
- To bring down costs the intake chimneys should have recirculation elements to increase the energy efficiency of the EPV system. In an ideal set-up, there also is active control over the amount of recirculated air mixing with the fresh outside air.
- With EPV systems you prevent air from coming in through the pop holes. This prevents the unwanted cold air from ruining the quality of the litter and reaching the birds at ground level.
- The use of chimneys guarantees a nice and equal spread of fresh air throughout the house. A homogeneous climate in poultry houses with aviaries is not always easily established, but when it is, it will help to reduce the amount of fine dust.

## Challenges on the road ahead

EPV systems bring their own unique set of difficulties and challenges, which need to be addressed. Ventilation concepts with negative pressure are quite easy to control and understand. Computers keep watch of the climate and subsequently make changes to the fan speed in relation to the opening of air inlets. Closed systems can quite easily keep out the influences of the outdoor climate, for EPV systems this is more of a challenge.

In EPV systems the intake chimney is a very sophisticated and high-tech part of the set-up. Three variables of the intake chimney need to be controlled by the climate computer. Within the intake chimney, the opening of the main valve for fresh air can be adjusted. Inside the house, the recirculation opening of chimneys can be opened or closed. The fan speed is the third variable which can be controlled. These three variables together control the throw of the air and the mixture of fresh air with recirculated air.

All three variables need to be continuously controlled and monitored by the climate computer, in accordance with the exhaust fans. This makes EPV systems one of the most high-tech and also complex type of ventilation found in livestock keeping. With individually controllable intake chimneys, you create the opportunity to make changes in different parts of the house. That way, small differences in the climate in the house due to solar or wind influence can be addressed.



## “ EPV SYSTEMS ARE AMONG THE MOST HIGH-TECH VENTILATION SYSTEMS IN AGRICULTURE

### Into the future

Concluding this article, the following can be summarised. EPV systems are coming of age, meaning they are becoming increasingly efficient and adjustable. The challenge with EPV systems is in keeping continuous control over the many different factors. Using this type of ventilation system is the only option for free-range poultry houses. Many more houses will be built and also converted to make use of EPV systems which justifies investment and development. As previously stated, the driving factor behind this change is worldwide public involvement in livestock-keeping. The consumer demands livestock keeping with a sustainable and animal-friendly approach.



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