



by Martin Audiffred Pinedo, Business Developer Manager and Ozgur Korkmaz, Poultry Technical Business Manager, Wisium. [www.wisium.com](http://www.wisium.com)

In the last three decades, world egg production has increased by more than 150%. Much of this growth has been in Asia, where production increased almost fourfold. Between 2008 and 2018, global egg production grew by 24.3% and this increase continues at a rate of 2.2% annually.

Consumption of eggs also continues to grow (around 3% each year) due to the population growth and changing dietary preferences.

Countries around the world are changing their diets with the recognition that eggs are a good source of protein (due to its biological value and amino acid content) leading to increasing egg consumption. Egg is an inexpensive protein source that comes already naturally packaged; it is also one of the animal proteins most consumed, even by vegetarians.

### Worldwide concerns

Currently most genetic breeds have increased the cycle lengths of their layers. Consequently, the amount of saleable eggs produced by hens becomes even more important. Producing a quality egg is not only about keeping the customer happy but ensuring that the laying hen flocks are profitable. Eggs will be downgraded if they are dirty or cracked.

In this context shell breakage is the cause of 80-90% of downgrades and, as we know, shell quality declines as the flock ages and there are more downgrades. In order to ensure profitability, the amount of saleable eggs per hen needs to be maximised; as such, dietary support for hens plays a key role in optimising egg quality.

### Egg quality challenges

Egg quality is based on four main factors:

- The eggshell quality plays an important role in maintaining economic profitability and hatchability rate.
- The egg size often determines the profitability of egg production.
- The yolk colour is one of the criteria consumers use to judge egg quality, and it varies from one country to another.
- The albumen quality characterises the egg's freshness for the consumer.

### A global approach

Wisium has developed a global approach of poultry management for better performance in egg production.

Their 'Egg Quality Concept' includes products and services to provide better performance in egg production across all four factors:

#### EGGSHELL QUALITY:

Egg weight increases with the layer's age thus the ratio of shell and egg weight decreases, resulting in a decrease in eggshell quality.

In this aspect, nutrition management is key for improvement of the eggshell quality, especially the management of levels and solubility of calcium, phosphorus levels, ratio of Ca/P, and also the level and form of vitamin D3.

In the growing period for pullets, the feed delivery system, sanitary conditions and the lighting programmes, etc also influence eggshell quality.

The Egg Quality Concept offers nutritional solutions with specific services to egg producers and poultry breeders, such as:

- Tailored premixes adapted to customer needs.
- External visual analysis where Wisium's expertise will help customers identify eggshell quality issues.
- Egg weight analysis to evaluate its evolution in relation to layer's age.
- Intrinsic shell analysis to identify eggshell defaults.

- Calcium solubility analysis that allows a selection of ground lime carbonates that best meet the needs in calcium of the layers.
- Resistance of eggshell fracture to measure the destruction strength of eggshell linked to eggshell quality.
- Nutritional specialities like Kalikok, formulated to answer precise nutritional targets that helps with a better utilisation of vitamin D3 and a quicker absorption of calcium, contributing to improving the synthesis of the eggshell's structure.

#### EGG SIZE:

Generally, big table eggs are sold at higher prices than small ones, although customer expectations are variable depending on each country and its markets. In the case of breeders there is a close correlation between egg weight and chick weight.

Egg size can be impacted by nutrition, flock management, genetics, body weight and lighting programme.

It is known that the pullet body weight as well as flock uniformity at the end of the rearing period is an important factor for egg size. Heavier hens tend to lay heavier eggs.

Wisium's Egg Quality Concept solutions for egg size are based on the following points:

- Pullet breeding: their nutritional solutions for pullet growth will help customers reach the right pullet weight for laying through the pullet diet formulation control, and feeding schedules and diet changes.
- Protein intake management: Wisium expertise provides the right protein intake management during laying and reproduction.
- Egg weight control: to evaluate the egg weight evolution in relation to the layer's age. Wisium expertise provides nutritional advice to achieve standard references.

#### YOLK COLOUR:

Yolk colour is a consumer criteria to judge the egg quality. The demand for various yolk colours varies by region according to customer preferences.

Yolk colour in laying hens is determined by the content and profile of pigmenting carotenoids present in the feed.

Wisium's Egg Quality Concept solutions for yolk colour are based on three points:

- **Breeding management:** Wisium expertise evaluates the sanitary conditions of the flock identifying the presence of

mycotoxins and diseases, both of which unfavourably influence the yolk colour because of intestinal issues.

● **Nutritional management:** Raw material analysis and control plans are established where Wisium expertise evaluates the risks and defines analytical needs as well as the design formula to include pigments to obtain the right yolk colour.

● **Yolk colour control:** Wisium expertise evaluates the yolk colour and proposes solutions for breeding and nutritional management in order to meet market expectations.

#### ALBUMEN QUALITY:

Internal egg quality refers to albumen cleanliness and viscosity. Albumen thickness allows the freshness of the eggs to be defined, and it is expressed in Haugh Units. Higher values mean good albumen quality, while lower values mean poor quality.

We have to keep in mind that there are various factors that can influence Haugh Units like layer age, storage duration and temperature conditions. Egg Quality Concept solutions offer an evaluation of the Haugh Units to help customers to control egg freshness and propose management solutions.

### Conclusion

World egg production increased by more than 150% in the last three decades and this increase continues at a rate of 2.2% annually.

Concerning egg consumption, it continues to grow, along with the population at a rate of 3%.

On the other hand, most genetic breeds have increased the cycle lengths of their layers, which means the amount of saleable eggs produced by hens becomes even more important.

Producing a quality egg is not only about keeping the customer happy but ensuring that laying hen flocks are profitable.

The main challenges are to ensure eggshell quality, egg size, yolk colour and the albumen quality.

Wisium has developed a global approach to poultry management for better performance in egg production. Their Egg Quality Concept offers solutions to achieve a high standard quality egg. ■

References are available from the author on request





by Niels Krebs, CEO of Sanovo Biosecurity, Sanovo Technology, Italy. [www.sanovobiosecurity.com](http://www.sanovobiosecurity.com)

In recent times, the topic of biosecurity has quickly become more and more important and it is now an aspect that we in the egg and poultry business simply cannot underestimate. International Hatchery Practice spoke to Niels Krebs, CEO of Sanovo Biosecurity, to learn more.

### What is biosecurity?

Biosecurity deals with the harmful micro-organisms that are around us, also in our food, and if you are working within the food industry, then you might think about food recalls.

Food recalls are damaging to food businesses. An average recall costs around 10 million Euros, which receives a lot of public attention and can ruin brands. I guess this would be the first reflection of biosecurity.

### What are the main threats when talking about biosecurity in the egg and poultry industry?

Many times, a company looks at the rules of biosecurity and sees them just as things they must comply with, but there is a bigger reason behind them. Within the egg and poultry sector, the main challenge is there is a change in the public demand. Many more customers go for free-range flocks and want less sugar, salt, and preservatives, and no use of GMOs is a must.

Animal welfare, both regarding public rules as well as personal opinions from customers is something that really is changing the way that you produce your products.

This all leads to a worsened background for being able to produce safe products. When you have all these different things that you must take into consideration when producing your products, then the risk of contamination is greater. Thus, the risk of a recall is much higher than it used to be. This is one of the new challenges that producers are facing today compared to 10-15 years ago.

So, if we are talking about food poisoning and the risk of getting sick from your food, salmonella and campylobacter are the most common foodborne diseases in the EU today.

More than 250,000 people are hospitalised each year and more than 30,000 die each year due to antimicrobial resistance.

Antimicrobial resistance is something we can talk more about, but one very important thing to know in regards to this topic's

relation to the poultry industry is that more than 60% of chickens carry microbes that are resistant to the antimicrobial medicine that we use today. Therefore, it is important for us to tackle this issue.

### Why do you think it is so important for all companies, particularly in this industry, to have an increased focus on biosecurity?

This is because antimicrobial resistance is so dangerous. You could say that before World War II people died from simple wounds and operations. Since then, we have got used to having antibiotics to treat us. Today it is very unlikely that a simple wound could kill you, but if more and more bacteria become resistant this will become a problem. It is said that in 2050 there will be more people that die due to antimicrobial resistance than people that die of cancer today.

In the future, it could be a real risk that your child gets pneumonia and does not reach the age of 20, and this is another reality than the one we deal with today. The pressure on governments and healthcare will be enormous, and this pressure will turn back on the food producers because this is essentially where many antimicrobial-resistant bacteria come from.

For instance, over 400,000 people die due to food poisoning worldwide each year. The WHO



warns against 12 specific bacteria that are resistant to antimicrobials, five of those are foodborne and seven are very critical within health care.

With 60% of chickens carrying these resistant bacteria, it is therefore extremely important for food companies, especially within poultry, to take responsibility and implement preventative measures.

### What is SonoSteam and does it interfere with the efficiency of production?

SonoSteam is a very clean process using only steam and ultrasound. The steam is doing the killing, it is the heat that kills the bacteria, and the ultrasound is only a catalyst.

SonoSteam can kill bacteria on the surface of poultry as well as on other different kinds of surfaces and this can be done in-line at the normal production speed (no slowdowns), so you do not have to take any precautions.

It can be integrated into a normal processing line. SonoSteam is also used outside of the food industry, for example in hospitals on mattresses.

SonoSteam is a patented process and the only one of its kind working in this way.

### What has been achieved with SonoSteam and what is the goal of Sanovo Biosecurity?

SonoSteam expanded to the UK several years ago when the Food Standards Agency wanted to focus on campylobacter, since it is the most common food poisoning bacteria in the UK. £10 million was put into this project in 2010-2015.

The goal was to lower the level of campylobacter in poultry. In regard to the Food Standards Agency, SonoSteam has been one of the three main reasons for the lowering of the level of campylobacter in the UK market.

Not only are people getting less sick but the cost of healthcare then goes down so investing in this now can save money in the long run.

The UK was the first to focus on the amount of campylobacter. Then in 2018 the rest of the EU, which is already regulating the amount of salmonella that can be in poultry, added it to their hygiene criteria.

Here in 2021, and towards 2025, the allowed number of campylobacter samples above 1,000 cfu will continue to be lowered.

Overall, the goal of Sanovo Biosecurity is to save lives and increase human welfare. ■



References are available on request [nkre@sanovobiosecurity.com](mailto:nkre@sanovobiosecurity.com)



by Cheng Lee, DVM, and Marc Spackler, MSc, Intracare. [www.intracare.nl](http://www.intracare.nl)

**B**roiler chickens grow bigger and faster compared to a decade ago and the laying rates of layer hens have increased by 20%. To prevent musculoskeletal and eggshell issues, it is of essence to provide a good balance of the essential building blocks: calcium (Ca), phosphorus (P) and magnesium (Mg).

In order for these minerals to reach the bones and eggshells in the first place, their bioavailability must be assured.

Vitamin D3 is the key for these minerals to be absorbed from the intestine into the blood. When in deficit, these minerals can not be absorbed which results in problems with the locomotor system and eggshell quality.

Intra Calferol is a liquid nutrient mixture of highly concentrated and stabilised vitamin D3 alongside organic calcium and magnesium and a phosphorus releaser, which improves the ease of absorption in animal intestines. This supplement is the golden formulation which keeps the animal's calcium, magnesium and phosphorus balance in optimal condition.

### Sunlight is the best source of vitamin D3, but what if there is no sunlight?

On average, broilers and layers require up to 40 IU of vitamin D3 per day to support their growth and health, all while trying to achieve their full genetic potential. When in deficit, softened and weak skeletons and eggshells can be seen on farm resulting in significant economic losses.

To stay healthy, humans need about 10-15 minutes of UVB per day with 40% of our skin exposed. In high performing poultry, vitamin D3 is formed when sunlight contacts

the non-feathered parts such as their legs and feet.

However, as most poultry are housed indoors, a vitamin D3 deficiency can occur. Even poultry in houses with glass windows can suffer from vitamin D3 deficiencies due to the fact that glass filters out the essential UVB rays for vitamin D3 formation.

In general, poultry feed contains sufficient vitamin D3, but these levels can be very sensitive to factors like temperature, time, humidity, oxygen and pH.

While mixing vitamin D3 in a poultry feed with other ingredients, or transporting in lorries, and in containers or at storage in warehouses or silos, these factors can break down the vitamin D3 levels, becoming too low at feeding.

On the other hand, sometimes animals need supranutritional support during critical phases of rapid growth or to keep up the high performance of older animals.

Feed intake can also be depressed during stressful phases, such as when in heat stress. These factors could induce musculoskeletal and eggshell quality problems due to vitamin D3 deficiency.

### Vitamin D3 is the key for bone and eggshell quality



Vitamin D3 is key to the maintenance of essential mineral homeostasis by stimulating its absorption and



uptake. Deficiencies of these minerals can result in sub-optimal skeletons and eggshells.



Development of a strong skeleton in broilers and layer hens occurs during the rearing phase. The bones themselves consist mainly of collagen fibres and an inorganic bone mineral in the form of small calcium phosphorus-based bio materials, also called 'hydroxyapatite crystal'.

Magnesium acts like 'cement between the calcium bricks' and contributes to bone stabilisation, growth and mineralisation.



Eggshells are mainly composed of long columns of calcium carbonate (98.2%), phosphorus (0.9%) and magnesium (0.9%). The layer hen will metabolise and transport the total weight of her skeleton several times to produce eggshells during the course of the laying cycle. Especially in older hens (>40 weeks of age) eggshell quality deteriorates and is mainly reflected in an increase of cracked eggs. The laying hen requires approximately 2.5g calcium in around 20 hours to produce a fully developed egg of 60g.

About 60-70% of the required calcium can be provided via the feed which is not enough to cover the peak in calcium requirement during eggshell formation. All the rest has to be metabolised from the body reserves or has to be supplemented at the right time.

### Timing is crucial to supplement Intra Calferol



While additional precision supplementation via the feed is not possible, the drinking water is a quick and strategic tool for every poultry farmer to mitigate diminished animal performance during challenging periods.

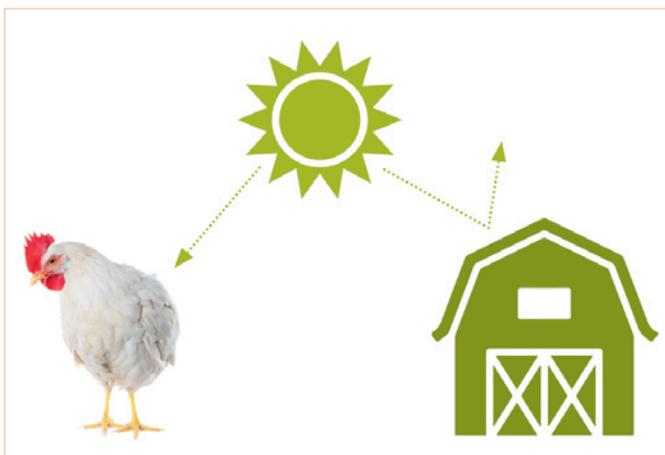
Supplementation is crucial to support the creation of a strong skeleton in broilers and layers during rearing.

Furthermore upon facing bone or eggshell issues in older birds, a protocol with only a few days of supplementation can already provide good support. ■

References are available on request [info@intracare.nl](mailto:info@intracare.nl)

Intra Calferol is a stable, well-emulsified vitamin D3 solution which provides the ability to apply a shot of vitamin D3 via the drinking water for immediate support.

Together with the organic calcium and magnesium and the phosphorus releaser, bone and eggshell quality can be optimised at the right time.





by Antoine Le Calve, Nutrition specialist, Novogen Layers. [www.novogen-layers.com](http://www.novogen-layers.com)

Many parameters affect egg weight (EW). It is linked to genes, for instance EW can vary from 1.0-1.5g between Novogen Classic and Light strains. However, within this genetic potential, many factors can majorly influence egg weight even more than genetic factors, such as farm management and nutrition.

### Body weight

Based on market requirements, it is important to define the desired egg weight before birds start laying.

Indeed, pullet body weight at start of lay is the main factor that influences egg weight. When birds become adults, margins for action are much more limited. Higher pullet body weight (BW) at sexual maturity means higher egg weight, the opposite is also true. One way to manage BW at sexual maturity is the lighting programme and stimulation.

Below are some estimations of BW variation and light stimulation timing on the EW:

- $\pm 100$ g of pullet BW is equivalent to  $\pm 0.7$ - $1.0$ g of EW.
- One week of delay in light stimulation is equivalent to  $\pm 1$ g of EW.

Variations in body weight at sexual maturity or the age at sexual maturity are two efficient ways to adjust egg weight according to market requirements. For those two factors, it is necessary to adjust the management strategy according to the BW of birds and not their age alone. Consequently, the birds have to be weighed on a weekly basis during the whole rearing period.

### Nutrition in production

Once in production, the only way to adjust EW is through nutrition. The older the birds, the less efficient the nutrition tools. In order to analyse it,

we have carried out meta-analyses of nutrition with many institutional publications.

The first criteria are energy and oil/fat. 100kcal more energy will increase the EW by 0.85% on average, when one point more fat (from oil, not fat inside raw materials) will increase it to 1.1%. Adding oil seems more efficient than energy, and it is less risky. Too much energy in the diet could produce fatty birds – the ideal situation is to provide at least 1% of oil with the same energy level.

Protein and amino acids (AA) also affect the EW. From this meta-analysis, we saw that one point more protein will increase the EW to 1.65%. Increasing methionine and lysine 0.01% will also increase EW 0.5% and 0.4% respectively. Protein seems to have a strong impact, but it could only be due to diets with low levels of protein (less impact at the field level used). As for AA, methionine is an important criterion to manage according to EW.

**Table 1. Effect of light stimulation according to age.**

Age at light stimulation*	Effects on production performances	
Early stimulation $\leq 15$ weeks	Earliness: ++ Persistence: --	Egg weight: -- Risk of mortality: +
Classic stimulation 16-18 weeks	Earliness: +/- Persistence: ++	Egg weight: + Risk of mortality: -
Late stimulation $\geq 19$ weeks	Earliness: -- Persistence: ++	Egg weight: ++ Risk of mortality: --

\*Indicative age if growth conforms to Novogen standard

	Egg weight +++	Intermediate	Number of eggs +++
Protein (%)		17.3 <sup>a</sup> / 17.8 <sup>b</sup>	
Dig. Lysine (g)		7.5 <sup>a</sup> / 7.7 <sup>b</sup>	
Met/Lys (%)	60	56	46
M+C/Lys (%)		89	
Threo/Lys (%)		72	
Trypt/Lys (%)		22.5	
Arg Lys (%)		120	
Val/Lys (%)		99	
Isoleu/Lys (%)		93	

<sup>a</sup> NovoWhite, <sup>b</sup> NovoBrown

**Table 2. Protein profile for the onset of lay.**

Novogen recommend a range for the methionine/lysine ratio for the management of your target EW:

- High EW = Ratio  $\geq 58$
- Low EW = Ratio  $\leq 46$

Not enough lysine will negatively affect EW as well as production.

Determining the right amount for your local conditions is crucial. Naturally, EW increases with the age of the flock. Many farmers want to avoid too many big eggs at the end of the flock. This criterion is selected

in the Novogen R&D programme in order to keep EW as stable as possible during the production cycle.

However, nutrition can also help to maintain EW. Typically, it is recommended to invest at the onset of lay to reach a high peak of production and fast EW increase.

Afterwards, it is possible to begin to optimise the feed formula. The target is to decrease the energy intake, the protein intake, and the AA intake (especially methionine) to avoid big eggs. Since lysine and methionine are also involved in the laying percentage, it is necessary to provide enough of both or production could drop faster.

Nutrition is always a compromise between feed cost and results, which depends on each farm condition. Adjusting egg weight is manageable, but with less efficiency when birds are older. It is easier to manage your EW during rearing and not production.

It is also more economical to invest in pullets (less feed intake and more efficiency) than in adult birds (less scope for adjustment). ■

FOLLOW US

## Positive Action Publications Ltd

Publishers of international magazines in the pig, poultry, dairy, food safety & meat production sectors

For the latest updates and information on all of Positive Action Publications' magazines and conferences, please follow our social media channels



[linkedin.com/company/positive-action-publications](https://www.linkedin.com/company/positive-action-publications)



[twitter.com/positiveaction](https://twitter.com/positiveaction)



[instagram.com/positiveactionpublications](https://www.instagram.com/positiveactionpublications)



by HATO Agricultural Lighting. [www.hato.lighting](http://www.hato.lighting)

Colour lighting is gaining more and more attention in the poultry industry. That is well deserved in our opinion, since it can improve life significantly for both the animal and the farmer. Now, what is a light colour, how and when do you use different light colours and what are the benefits? It is time to shine some brightness on this topic!

### What is light colour?

The light colour, also expressed as the colour temperature in degrees Kelvin (Fig. 1), is a specification of the colour ambience of the light emitted. A higher colour temperature, like 6,000K, means that the light spectrum contains more blue light. When the colour temperature is low, 2,700K for example, the spectrum contains more red light.

By providing a light colour that suits the poultry's needs; welfare, behaviour and performance can be further improved.

### How to use colour lighting?

The most commonly used colours in poultry lighting are:

- Cool white.
- Warm white.
- Red.
- Blue.

Cool white or warm white lighting, depending on the animals in the house, should be used as the 'main lighting'.

Both red and blue lighting are not meant to be used as main lighting. The main goal of red and blue lighting is to help in certain situations. Red lighting can be mixed with white lighting or it can be used

monochromatically, depending on the circumstances. Blue lighting should only be used monochromatically.

Be aware: when you intend to use red or blue lighting, we recommend to mix (red only) or dim (both), instead of switching. This prevents startling the birds and keeps their stress levels as low as possible.

### What are the benefits of each light colour?

As you see in the Table, right, each light colour has a different effect on different types of poultry. However, not all colours can be used for all types of poultry. It is very important to use the right light colour in the right situation to reach the best results.

### Improving life through brightness

To summarise, by providing a light colour that suits the poultry's needs; welfare, behaviour and performance can be improved. Different light colours have different effects on the different types of poultry. It is very important to use the right light colour in the right situation to reach the best results. ■

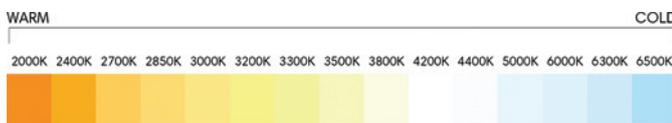


Fig. 1. Colour temperatures in degrees Kelvin.

Fig. 2. Red, warm white and blue CORAX lighting.



LIGHT COLOUR	BENEFITS FOR DIFFERENT POULTRY
<b>Broilers</b>	
Cool white	<ul style="list-style-type: none"> <li>• Broilers &lt;2kg</li> <li>• Improved growth</li> <li>• Improved Feed Conversion Ratio</li> </ul>
Warm white	<ul style="list-style-type: none"> <li>• Broilers &gt;2kg:</li> <li>• Calmer birds (compared to cool white)</li> <li>• Less leg/wing problems</li> <li>• Improved chick and slaughter quality</li> </ul>
Blue (monochromatically)	<ul style="list-style-type: none"> <li>• Makes the birds sit still</li> <li>• Easy vaccinating</li> <li>• Easy catching</li> </ul>
Red (mix with white or monochromatically)	<ul style="list-style-type: none"> <li>• Not applicable to broilers</li> </ul>
<b>Laying hens</b>	
Cool white	<ul style="list-style-type: none"> <li>• Not applicable to laying hens</li> </ul>
Warm white	<ul style="list-style-type: none"> <li>• Improved sexual stimulation and egg-laying performance</li> <li>• Lower activity</li> </ul>
Blue (monochromatically)	<ul style="list-style-type: none"> <li>• Makes the birds sit still</li> <li>• Easy vaccinating</li> </ul>
Red (mix with white)	<ul style="list-style-type: none"> <li>• Camouflages blood/wounds</li> <li>• Less feather pecking</li> <li>• Stimulated egg production</li> </ul>
Red (monochromatically)	<ul style="list-style-type: none"> <li>• Camouflages blood/wounds</li> <li>• Less feather pecking</li> <li><i>Only use in extreme cases of pecking</i></li> </ul>
<b>Parent stock</b>	
Cool white	<ul style="list-style-type: none"> <li>• Not applicable to parent stock</li> </ul>
Warm white	<ul style="list-style-type: none"> <li>• Improved sexual stimulation, egg-laying performance and hatchability</li> <li>• Lower activity</li> </ul>
Blue (monochromatically)	<ul style="list-style-type: none"> <li>• Makes the birds sit still</li> <li>• Easy vaccinating</li> </ul>
Red (mix with white)	<ul style="list-style-type: none"> <li>• Camouflages blood/wounds</li> <li>• Less feather pecking</li> </ul>
Red (monochromatically)	<ul style="list-style-type: none"> <li>• Camouflages blood/wounds</li> <li>• Less feather pecking</li> <li><i>Only use in extreme cases of pecking</i></li> </ul>
<b>Rearing</b>	
Cool white	<ul style="list-style-type: none"> <li>• Improved growth</li> <li><i>Be aware: may increase unwanted behaviour</i></li> </ul>
Warm white	<ul style="list-style-type: none"> <li>• Lower activity (compared to cool white)</li> <li>• Less unwanted behaviour (compared to cool white)</li> </ul>
Blue (monochromatically)	<ul style="list-style-type: none"> <li>• Makes the birds sit still</li> <li>• Easy vaccinating</li> </ul>
Red (mix with white)	<ul style="list-style-type: none"> <li>• Camouflages blood/wounds</li> <li>• Less feather pecking</li> </ul>
Red (monochromatically)	<ul style="list-style-type: none"> <li>• Camouflages blood/wounds</li> <li>• Less feather pecking</li> <li><i>Only use in extreme cases of pecking</i></li> </ul>



by Mauro Balasso, Vice President/Product & Business Management, Egg Processing, SANOVO TECHNOLOGY GROUP, Italy. [www.sanovogroup.com](http://www.sanovogroup.com)

In the early 2000s, Sanovo Technology started researching better ways of increasing the shelf life of pasteurised, liquid egg products, while maintaining the functional properties of the egg. Together with food research centres and universities we evaluated various technologies within food handling and found a promising technology that exposed the liquid product to radio frequency.

Hundreds of tests were performed using radio frequency on liquid egg, with variations in temperature and holding time, but also investigating the effects of radio frequency itself on the egg product.

To our surprise, exposing radio frequency to liquid egg had no relevant impact on bacterial inactivation. Instead, the right mix combination of temperature and holding time was decisive for achieving the best egg pasteurisation results.

However, we still faced problems in the functionality, performance, and energy efficiency of the technology. That is why we continued our research and developed a pasteurisation technology that utilises ohmic heating.

Based on our research, there are three reasons why ohmic heating is more efficient than radio frequency:

● **REASON 1:**  
**Energy consumption**

Considering dissipation, radio frequency yields around 65% and requires 50% more power than ohmic heating. With ohmic heating,

producers achieve energy efficiency of 95%, meaning 50% lower energy consumption, resulting in less overall production costs.

● **REASON 2:**  
**Precision, stability, safety**

The high current and voltage involved and heating by the dissipation of electromagnetic field could lead to electrical shock problems in the product and sometimes also externally on the pipes, especially, when the liquid egg product shows irregularities (like air bubbles). This is quite common as liquid egg is not always uniform.

Ohmic heating works at a much lower current and voltage and the electric field is not generated by dissipation but by contact, which ensures stability, even if the liquid is not uniform. This avoids the risk of electrical discharges and increases production safety.

● **REASON 3:**  
**Cost and maintenance**

Technologies based on high frequencies use delicate, expensive, and often inefficient, and short lifetime components that are very



expensive and difficult to source and purchase, especially in regard to the thermionic valve, which is the core of the unit.

The ohmic heating system is composed of simple and reliable electronic components normally used in any motor driver. The thermionic valve requires much higher energy for cooling compared to any modern electronic component.

Overall, with ohmic heating liquid egg producers heavily reduce their CapEx and OpEx.

**What about quality control?**

Apart from the efficiency benefits, relying on low temperatures and

radio frequency may cause quality control problems. Temperature and holding time are the only accepted and provable parameters showing the impact on bacteria inactivation in pasteurisation by control authorities.

In fact, the killing rate for bacteria is recognised worldwide with D-value and Z-value that, coincidentally, are linked only to time and temperature.

Sanovo's Wave technology, based on ohmic heating, promises an extended product shelf life >90 days, a 10x times higher bacteria killing rate, no protein denaturation, and high energy efficiency. ■

References are available on request  
[mba@sanovogroup.com](mailto:mba@sanovogroup.com)



by The Technical Team, Chore-Time. [www.choretime.com](http://www.choretime.com)

For years, egg producers have struggled to find, and keep, a talented workforce. And, unfortunately, it does not appear that this trend will be reversing any time soon, as the type of work involved appeals to fewer people. In this environment, facility owners need to be savvy about their equipment – reducing labour needs and improving the work environment – to make their cage-free egg collection worthwhile.

Multi-tier aviaries, also known as open or European-style aviaries, are becoming an increasingly popular solution to this issue. These systems decrease labour costs and offer a better environment for workers, when compared with other popular cage-free systems, while also offering better producing birds and higher-quality eggs.

Owners who establish more efficient systems now will have the infrastructure ready as cage-free chickens continue their trend toward becoming the standard.

### An overview of the multi-tier aviary system

Multi-tier aviaries include different levels. They start at the floor level, where birds can display natural behaviours like scratching, dust bathing and ground-oriented pecking. Going up, other levels include living areas with feed and a nest level where watering systems are placed in front of nests, allowing birds to easily find their routes. The top of these systems always includes a perching area, where hens prefer to sleep, similar to nature where birds tend to sleep on tree branches.

The design of these systems is based on the animals' natural behaviours. Intentional aspects of each level 'nudge' birds to participate in particular activities in the desired location.

Most of these systems are outfitted with wire mesh and manure belts at each level to preserve a sanitary and healthy environment. Overall, multi-tier aviaries aim to eliminate manual labour and self-sustain as much maintenance as possible.

Other cage-free options, including combination and floor systems, require significant manual labour for everyday tasks.

Experts estimate that floor systems require two to three times the amount of labour, while combination systems can require up to five times as much, especially with a poor house design.

Workers in these systems will also need to be highly skilled in handling

and wrangling birds. Any money saved from the initial equipment and installation investments is soon lost to overhead costs.

Industry leaders are switching to multi-tier systems to reduce labour requirements for their cage-free chicken rearing, breeding, and egg production facilities. Here are some of the processes that multi-tier aviaries either improve or eliminate the need for entirely:

- Manual hen placement and dispersion.
- Hen organisation and access.
- Egg sorting and sanitation.

### Reduced need for manual hen placement and management

In other cage-free systems, too many birds sometimes congregate together, creating hot spots and overcrowding. These can lead to unsanitary conditions, unnecessary stress on the animals and even the death of otherwise healthy hens.

To counter such issues, more overall house management is needed. These other systems also require an overabundance of nests. This, in turn, can decrease the quality of the eggs and overtax the egg belts in egg collection facilities.

Because multi-tiered aviaries are built to influence hen behaviour, manual bird management is eliminated. Birds enjoy the different levels at different times, allowing for a more even spread of hens throughout the system.

In perching areas, hens naturally spread out, allowing for improved



The Rack-Drive Expulsion system.



Multi-tier aviaries decrease labour costs and offer a better environment for workers, when compared with other popular cage-free systems, while also offering better producing birds and higher-quality eggs.

ventilation without manual intervention. In rearing facilities, pullets can build muscle by moving around in open space and jumping between different levels.

Additionally, the labour learning curve for multi-tier aviaries is much lower than other options. This is because hen behaviour is more consistent and predictable, workers need less training and can be found more readily.

### Easier access and organisation of hens

Accessing and discovering where certain birds are located consumes a large portion of the workday for most cage-free systems. Because birds are not easily contained, chickens intermingle and are harder to manage. Along with requiring more time from workers, this task is frustrating and requires skilled farmhands. Between a lower enjoyment of the work and a higher threshold of skill, this leads to more labour costs and less worker retention. In aviary rearing systems, birds are well distributed, and the use of vertical space allows for easy access and organisation. Birds can be separated by breed, and pullets can be secured away from more mature birds for protection.

### Automating egg collection

In egg collection facilities, multi-tier aviaries can automate much of the manual labour required for egg quality control and collection.

Because hens prefer to lay their eggs in dark, sheltered places, the LED lights at the bottom level dissuade hens from laying floor eggs and encourage them to seek out the nests on the second level.

In other systems, workers need to go in the house and individually collect eggs laid in the wrong place. Besides the lost time collecting these eggs, broken floor eggs can cause messes that need to be cleaned up, further increasing required labour.

In multi-tier aviaries, a gentle collection system on the second level minimises cracking and automates the task. This means more high-quality eggs with less work.

Another innovative feature, which can be found in Chore-Time's VIKE aviary, is a Rack-Drive Expulsion (RDE) system in the nesting area, as shown in the photograph left.

To prevent hens from spending too much time in the nesting area at the end of the day, defecating and sully eggs, the RDE system slowly pushes them out of the second level over time. This reduces time spent cleaning the eggs and manually moving hens.

### The future of cage-free systems

Higher demand for cage-free eggs means greater opportunity for producers. However, demand cannot be met without the appropriate labour. The solution, it seems, is a system that practically manages itself – multi-tier aviaries come close to doing just that. ■