To our Hatchery Friends,

Welcome to the Spring 2014 edition of ChickMaster e-news. The year is off to a great start for the poultry industry and we see intense activity at hatcheries all around the world. We saw great crowds battle the ice and cold in Atlanta, and we look forward to seeing those of you we missed in Utrecht this month.

In this e-news, we are concentrating on our concept of “Hatchery in Harmony” with articles from Dr. Mike Wineland of North Carolina State University and Chip Campbell of our own Hatchery Solutions Team. We want to open a discussion on the value of seeing the whole environment of the hatchery and its effect not only on hatchability, but even more so on the ability of hatched chicks to find their genetic potential as they grow. Dr. Wineland’s sobering comment that less than optimal air flow to the embryo will permanently deplete the muscle fiber of the bird for life, is counterbalanced by the fact that modern energy management systems can assure that embryos have the oxygen they need so they don’t need to burn these precious fibers. This is what we mean by harmony. A hatchery in harmony is well balanced, providing each and every egg in the process precisely what it needs to be a healthy bird.

We hope you enjoy the articles and find them informative. Please have a look at the latest product and people happenings at ChickMaster as well.

We look forward to seeing you in Utrecht and remember, when your chicks are in tune, productivity soars, so let’s work together to keep your hatchery in harmony.

Michael J. Gray
Vice President of Sales and Marketing
ChickMaster International

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Allowing the Embryo to Grow

The importance of proper ventilation

Michael J. Wineland, Prestage Department of Poultry Science, North Carolina State University

The growing embryo utilizes the nutrients the hen packs into the egg which are found in the yolk, the albumen and the shell. The other needed nutrient is oxygen, which is influenced by the property of the eggshell and by how the incubators and hatchery are managed. Temperature is probably the most important parameter of incubation and drives the rate of growth. However, the embryos’ ability to grow is primarily influenced by oxygen availability.

Embryo respiration depends mainly upon the concentration of oxygen and the amount of fresh air in the room and moving through the incubators. The concentration of oxygen in the air (or a more accurate description is the partial pressure of oxygen that is available) can be influenced by altitude, and weather (low pressures). The amount of air in the room and moving through the incubators is influenced by the condition of the air handling units and the static pressure regulation of the intake and exhaust plenums.

Additionally, eggshell properties including the number of pores in the eggshell, the diameter of those pores and the length of the pores (shell thickness) impact the ability of gases to pass through the shell. Abnormalities in the eggshell can result in decreased number of pores and thus reduced oxygen availability. Gases pass through the shell by passive diffusion. In other words, gases move from area/compartment of high concentration to area/compartment of low concentration. Anything that reduces the oxygen partial pressure around the incubating egg decreases the amount of oxygen diffusing into the egg and the embryo’s ability to properly respire. After passing through the pores of the shell, the oxygen is picked up by the blood in the capillaries of the chorio-allantoic membrane and carries the oxygen to the embryo to allow growth. The demand for oxygen by the embryo increases as the size of the embryo increases; thus, anything that depresses oxygen availability can impair proper embryo growth and development.

Many hatchery managers will determine percent moisture loss from their eggs. The percent moisture loss is an indicator of eggshell properties in combination with incubator relative humidity to allow water vapor movement out of the egg. Since water vapor is a gas it can also indicate the ability of oxygen to move through the shell pores and into the egg. We also must remember that there is variation in moisture loss from individual eggs from a flock. Within a group of eggs from a flock the frequency of eggs’ moisture loss is represented in a normal distribution curve, where the majority of the eggs lose near or on the average amount of moisture, while a smaller number of eggs will lose considerably less or more moisture from the egg. The same can be inferred then for oxygen diffusing into the eggs: the majority of the eggs have the ability to allow oxygen to diffuse through the pores, while there is a lesser percentage that allows considerably more or less than the average amount of oxygen.

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Airflow and the Incubation Process
THE BASICS OF INCUBATOR CONTROL

Chip Campbell, Technical Support Manager, ChickMaster International

The goal of the hatchery is to produce as many quality chicks as possible. Management of the overall incubation process is essential in order to allow the embryo to utilize the nutrients that are provided in the egg. Whether you use multi-stage or single stage incubators, the basics of incubation are the same: controlling machine temperature, egg temperature, and relative humidity; supplying oxygen; and balancing the temperature throughout the egg mass.

While various controls for heating, cooling, dampers, and fans will control these set points, it is airflow that plays a key role in the incubation process.

**It’s all about balance**
Many of the common problems with hatchability and chick quality are a result of poor incubation conditions. These conditions are usually associated with poor temperature control such as cold or hot spots in the egg mass, insufficient or excessive moisture loss. The underlying cause is an unbalanced incubator. Airflow is more than just what moves through the setter or hatcher from the intake to the exhaust. How we manage the supply of air to the machines and the airflow through the machines will have an immediate impact on the embryo.

When we look closely at ventilation and airflow in the hatchery, there are three types of air in the hatchery.

**Fresh air**: Outside air
**Conditioned Air**: This is outside air that has passed through the air handler and has a different temperature and relative humidity than the outside air
**Working Air**: This is the air that is in circulation inside of the setter and hatcher that has the required temperature and relative humidity

Since we do not have control over fresh air, the ventilation system of the hatchery plays an important role in supplying conditioned air to the setters and hatchers. The ventilation system is more than just what is needed to maintain room temperature and humidity. The volume of conditioned air supplied to the incubators impacts the amount of oxygen that we can provide to the embryo. Undersized systems may be able to maintain room temperature set points, but will lack the necessary oxygen the embryo may need.

The air that is doing the ‘work’ in the incubator comes from the room. Therefore, the volume of properly conditioned air will directly affect the conditions in the setter and hatcher. If the conditioned air lacks the proper temperature, relative humidity, or oxygen it will have a negative impact on the developing embryo. It is not enough just to supply air to the setters and hatchers, we also have to exchange the working air in the setter and hatchers. Air flows from areas of high pressure to low pressure. If these pressures are not maintained properly (negative room pressures), the volume of conditioned air that can move through the machine is reduced. It is important to properly maintain both room pressures and plenum pressure so that the working air can be exchanged with fresh conditioned air from the room.

**Genetics lay the foundation, but embryonic conditions are the other half of the equation**
Throughout the incubation process, temperature, oxygen, and humidity must be equally distributed throughout the egg mass by the airflow. Hot or cold spots in the machine as a result of inconsistent or non-uniform airflow will negatively impact incubation progression and manifest as some of the common problems that we see today, decreasing chick quality and hatchability. In fact, one of the leading reasons for poor performance at grow-out is the permanent effect of poor or unbalanced incubation conditions.

The developing embryo is dependent on our ability to supply what it needs and remove what it does not need at any point during incubation. The control of the incubator environment is more than set points for heating and cooling; it is also the volume of air supplied and removed from the machines. The volume and condition of air supplied to the incubators is dependent on the design and capacities of the ventilation equipment. Incubation is more than just setters and hatchers; it is the combination of incubators and ventilation that allows airflow to drive the process of incubation and produce top quality chicks.
The CC3-GL Line of Ventilation and Energy Management Systems Expands

Offering turn-key solutions for small and medium hatcheries

As adoption of CC3-GL Ventilation and Energy Management Systems expands, ChickMaster continues to focus on the vital link between ventilation and incubation. Two new offerings, the CC3 2700 and 5400 models, are the latest examples of this thinking. While the original CC3 systems were designed for very large hatchery projects of 500,000 to 1,000,000 eggs per week, we saw a significant need arising in smaller/medium hatcheries, and for a better-tailored "mix-and-match" strategy for very large hatcheries.

The CC3 2700 and 5400 systems are optimized to manage hatcheries or expansions from 190,000 to 380,000 eggs per week. The new systems are configured the same as the larger CC3-GL systems, including energy savings with heat recovery functions to warm up or dehumidify the air, depending on your geographical location. An important additional feature is added however: the CC3 2700 and 5400 models include an onboard water chiller, which reduces the overall investment, maintenance and installation time.

The CC3-GL 2700 and 5400 connect with Maestro for advanced hatchery management. The new additions round out the CC3-GL product line, which now provides for capacities ranging from less than 200,000 eggs per week, to more than 1,000,000 on a single unit. By adding more units, any facility is now infinitely scalable.

The CC3-GL series has proven a great value, with more than 30 units in operation worldwide, and many more on order for shipping throughout the year. The CC3-GL is far more than an HVAC system; it's an intelligent energy management system which offers countless benefits, energy savings and peace of mind. Each CC3-GL has a Zeus ventilation control, water pumps, an air handling unit and a heat recovery system for energy savings. All of this comes in a single platform which is easy to install and simple to maintain.

Technical information and price quotes are available, including a detailed capacities chart for various models. If you have questions or would like more information please contact us.
IN INTRODUCING THE

Hatchery Solutions Team

In a continuing effort to supply all of the tools needed to operate your hatchery in harmony — with optimal cost-effectiveness and unwavering quality — ChickMaster introduces the Hatchery Solutions Team (HST). The team is comprised of top technical specialists, including professionals in incubation and ventilation, and they are here to support our customers at a much higher level than simple equipment repair.

Bringing a combined 80 years of experience to bear, the new team will operate globally and across all products. Adoption of a team approach, along with regular internal communication, means that each and every technical challenge will be met with the cumulative experience of this group of seasoned professionals.

Many of our customers know these individuals already and have benefitted greatly from their efforts, but harnessing the power of their combined talent will increase their effectiveness significantly. While the team is mostly concentrating on large-scale new installations, their experience and technical leadership can be helpful with any technical challenge which goes above-and-beyond a simple technical fix.

To get in touch with one of our HST professionals, please contact your local sales manager to arrange a call or visit.

MEET THE TEAM

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The ultimate goal of any hatchery is to maximize hatchability and chick quality. In most hatcheries however, the various equipment works independently, and responsibility falls on the hatchery manager to make the diverse components work as efficiently as possible. This is a complicated task which requires managing a large volume of information, often manually. In many cases, these systems do not produce real-time information for proactive management.

At ChickMaster, we believe that all the systems in the hatchery should work in harmony to achieve high hatchability and chick quality. A hatchery in harmony is one where the entire production process is tuned to the needs of the embryo. Starting from the egg room where they arrive, to the chick room where high quality chicks are shipped, each embryo or chick should reside in an environment tailored to its needs. Additionally, a hatchery in harmony will use less energy while producing chicks that will perform to full genetic potential on the farm.

ChickMaster’s product offering is designed to work together and get your hatchery in complete harmony. Our setters and hatcher provide eggs and chicks the high-quality environment they need from the CC3-GL ventilation and energy management system. The process is watched over by the Maestro management system, which provides precise control and maximum efficiency thanks to the heat recovery properties of the CC3-GL. Maestro is monitoring all incubation parameters in real-time. When the potential cacophony of hard-to-manage information is gracefully integrated by Maestro, chicks get in tune and productivity soars.

You will be hearing a lot about Hatchery in Harmony in the coming days. This is our belief and our promise: we will bring setters, hatcher, ventilation systems, energy management and world-class support together to keep your hatchery in harmony.

**Recent Seminars**

We appreciate the participation of the poultry professionals who joined us for a day of seminars in Ibadan, Nigeria and Atlanta, Georgia, designed to show how to get their Hatchery in Harmony with ChickMaster’s line of products.

In Ibadan, we enjoyed the company of more than 180 poultry professionals at a seminar organized by our agent region Bnot Harel, where our Sales Manager Ab Broshuis and our Hatchery Solutions Team Incubation Specialist Davide Assirelli presented a full day of instruction.

In Atlanta, we enjoyed the presence of more than 30 professionals as well as presentations from Dr. Mike Wineland from NC State University and Mr. Scott Martin from Cobb, who shared their knowledge and experience with the group.

**Stay Tuned for Upcoming Seminars and Webinars, to be Held Worldwide.**
Allowing the Embryo to Grow
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The need for oxygen increases as the embryo grows, but at approximately 14 days of incubation, oxygen consumption of the embryo starts to plateau until the embryo pips into the air cell, when it will then increase. This is known as the plateau stage of oxygen consumption and is a period during development that the embryo may not be getting as much oxygen as it could use. This is due to the fact that the maximum amount of oxygen that can diffuse through the shell and picked up by the blood in the capillaries of the chorio-allantoic membrane lining the inner shell membrane has been reached. This maximum is influenced by the shell properties (number of pores, diameter of pores and pore length) and will also be influenced by the partial pressure of oxygen in the incubator. As long as the embryo has sufficient oxygen available, most of the metabolism is aerobic and can use the yolk as a source of energy. However, in the plateau stage and especially during the initial hatching process which is very energy demanding, the oxygen is limited. The embryo will have to resort to other energy sources that are anaerobic (do not require oxygen), which would be the glycogen (a carbohydrate) that it produced and stored during earlier development. The glycogen is in limited quantities and when glycogen levels are utilized and becomes insufficient; the embryo may not hatch or if it does hatch appears weak and listless. Another source of energy for an embryo that does not require oxygen is protein. We also need to remember that the embryo has all of the muscle fibers it will ever have at the time it hatches. Muscle growth will occur during rearing of the chicks or poults as a result of increased size of muscle fibers, not the development of additional fibers. Thus, how you incubate can influence the amount of meat produced.

The embryo can take certain amino acids found in the protein and use the components to make glucose. The major source of protein in the embryo will be muscle fibers. It should be noted that a by-product of this process is that the nitrogen molecules must be excreted through the kidneys and will appear in the allantoic fluid as urates. When one sees an excessive amount of urates in the allantois it would indicate protein was broken down in the embryo to produce glucose for energy. We also need to remember that the embryo has all of the muscle fibers it will ever have at the time it hatches. Muscle growth will occur during rearing of the chicks or poults as a result of increased size of muscle fibers, not the development of additional fibers. Thus, how you incubate can influence the amount of meat produced.

When the embryo becomes hypoxic (less than needed oxygen available) the embryo has the ability to redistribute the blood flow throughout the contents of the developing egg. It says it wants to live and redistributes blood flow to the brain and heart, but this is done at the expense of the liver, yolk sac and remaining tissue. This is one reason you will see larger residual yolks in the hatchlings. Also, eggs with lower pore numbers (those that lose less moisture than the average) will show similar results.

So one can see how important the eggshell properties are and how important it is to have sufficient flow of air through the incubators. Remember that your room pressures and oxygen concentration in your hallways are essential to allow for production of quality hatchlings.