

## The HatchTech Hatchability Advantage

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### Introduction

Correct embryo temperature and egg weight loss guarantees optimum hatch of fertile and chick quality on a daily basis. This paper will explain how HatchTech Incubation Technology achieves the optimum incubation environment and, therefore, hatch of fertile and chick quality goals for eggs of all breeder flock ages on a year round basis. First the control of embryo temperature will be discussed followed by the control of egg weight loss.

### Embryo Temperature

Research has shown that hatchability and chick quality are maximized when embryo temperature is maintained at 37.8°C throughout incubation. There are three periods during incubation that need extra attention to maintain embryo temperatures of 37.8°C. The first period is the start of incubation, when eggs are warmed to the optimal embryo temperature. The second period is the first 3 days of incubation. The third period is the last week of incubation when the heat production of the embryo exponentially increases.

#### The Beginning of Incubation: The Pre-incubation Warming Period

At the start of incubation, eggs are warmed from the storage temperature to the optimal embryo temperature of 37.8°C. To prevent early embryonic mortality it is important that embryos begin incubation in a controlled time and temperature sequence. The unique HatchTech Incubation Software steers the machine to deliver the correct temperature to the embryos in a stepwise time and temperature controlled profile in the prewarm period. The actual egg temperature in the prewarm period is very uniform because of the HatchTech design, which incorporates laminar airflow, uniform heating capacity, and a gas sealed environment.

#### The First 3 Days of Incubation

The first three days of incubation are crucial. Early embryonic mortality is minimized when the embryo is properly incubated in this period. The ideal incubation environment during this period

has a high relative humidity and a uniform temperature for transferring heat to the embryos. In a gas sealed incubation environment, the moisture that is lost from the eggs is retained inside the incubator. The moisture lost by the eggs creates a relative humidity of 85-90% in the incubator. Because the moisture is naturally derived from the eggs, the heat transfer quality of the air is excellent. This excellent quality air with high heat transfer capacity is the ideal environment for uniform early embryonic growth at the optimum embryo temperature of 37.8°C. There are no cold areas as there is when the relative humidity is created by a spray nozzle humidification system.

To retain the naturally occurring moisture derived from the eggs, the incubator must be designed to truly seal and prevent moisture loss from the incubator. HatchTech was the first to introduce the gas sealed concept to the incubation industry. The combination of laminar airflow, uniform heating capacity, and a 3-day gas sealed environment in the HatchTech incubator, creates the optimum conditions for the early incubation period and minimizes early embryonic mortality.

#### The Last Week of Incubation

The last week of incubation is a very difficult period of incubation. During the last week of incubation, the heat production of the embryo increases exponentially. When embryo temperature rises above the optimum 37.8°C, late embryonic mortality increases. The air temperature must decrease below 37.8°C to maintain the optimal embryo temperature of 37.8°C. In addition, the relative humidity must be low to ensure egg weight loss of at least 10% at day 18 of incubation. The low relative humidity air has a lower heat transfer capacity as well. At this stage, four factors are crucial to adequately cool the yield embryo: a uniform and adequate cooling system, a sufficient temperature sensing system, laminar airflow, and air velocity.

In a HatchTech incubator, the radiators are the heating and cooling system. The unique HatchTech radiator design delivers adequate and uniform heating and cooling for the yield breed embryos of today and tomorrow. The water enters and exits separately from each individual loop in the radiator and flows continuously. Consequently, the water temperature does not change dramatically from the entrance to the exit end. This ensures that the air flowing over the radiator is exposed to a uniform temperature across the radiator. This design is crucial to create a uniform temperature throughout the egg mass.

This radiator design is combined with the unique HatchTech design of the temperature sensing system. In the HatchTech incubator, the temperature of the water circulating in the radiators is determined directly by the amount of heat produced by the eggs in each individual section. There is one temperature sensor for each section located behind the egg mass. This sensor constantly senses the temperature of the air as it exits the egg mass. Based on this information,

the water temperature in the radiator located upstream to the egg mass is continuously modulated to deliver the optimum air temperature to that individual section of eggs. This unique design of the incubator air temperature control means that all eggs in every individual section are automatically incubated at the optimum embryo temperature.

The combination of the radiator and temperature sensing system eliminates the need to change profiles for breeder flock ages. Hatch of fertile loss is often related to breeder flock age. In general, there is more hatch of fertile loss in young and old breeder flocks than in prime breeder flock ages. This is because the embryo temperature in the old and the young breeder flocks is often not the optimum 37.8°C. In a HatchTech incubator, the embryo temperature is 37.8°C in all breeder flock ages due to a sufficient heating and cooling capacity and a high air velocity. Therefore, the hatch of fertile in old and young breeder flocks is the same as in prime flocks. The six individual sections within one incubator also enable that young and old breeder flocks can be incubated in the same incubator with no loss in hatch of fertile.

Besides the uniform and adequate cooling system and the sufficient temperature sensing system, the laminar airflow ensures that the environment created by the radiators is carried to every egg uniformly. The laminar airflow is created by pressure differentials within the environment and the perforated radiators.

A high air velocity minimizes temperature differences between up and downstream eggs because eggs are exposed to a uniform air temperature.

Although the HatchTech incubator is especially designed to optimize embryo temperatures in all breeder flock ages, correct egg weight loss is also necessary to achieve the hatch of fertile and chick quality goals.

### **Egg Weight Loss**

Egg weight loss should at least be about 10% at day 18 of incubation. To increase egg weight loss, the relative humidity of the air surrounding the eggs must be reduced. While it is necessary to lower the relative humidity to facilitate egg weight loss in the eggs, a reduction in the relative humidity decreases the heat transfer capacity of the air. Decreased heat transfer capacity of the air means that it is more difficult to remove heat from the eggs to the environment.

As eggs progress in incubation time, embryo heat production increases and it becomes more difficult to cool them. In the HatchTech Incubation Technology design, the cooling is uniform and the cooling capacity is adequate to meet the needs of high yield genetics. An increase in relative humidity is not needed for a sufficient cooling capacity. This means that the relative humidity can be reduced to meet the egg weight loss needs of today's high yield genetics without overheating the embryos. Because the relative humidity can be reduced later in incubation, it is possible to incubate with a high relative humidity during the first 3 days of incubation without causing egg weight loss problems.

HatchTech Incubation Technology is designed to deliver the optimum hatch of fertile and chick quality on a daily basis in all breeder flock ages. The combination of a uniform environment tailored to the stage of incubation and the breeder flock age optimizes embryonic development throughout incubation. Optimum embryonic development maximizes hatchability and chick quality and, therefore, ensures the return on your investment.

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