Bio-response incubation to maximise hatchability and chick performance

by Paul Degraeve, managing director, Petersime NV, Centrum 125, Zulte, B-9870, Belgium.

During the last decade, a lot of effort has been invested in optimising single-stage incubation of modern high yield breeds, targeting to improve hatchability, chick quality and uniformity and consequently post-hatch performance (growth and feed conversion).

As a result of this, Petersime initiated the idea of so called 'bio-response incubation'. Bio-response incubation consists of a method of incubating each flock to its full genetic potential by measuring the embryo's physiologic parameters and reacting accordingly.

In other words, by measuring closer to the embryo and reacting appropriately, the embryo's needs can be fulfilled in a much better way.

To date, four bio-response incubation parameters have been developed:

- OvoScan.
- Dynamic Weight Loss System.
- Co$_2$ntrol.
- Synchro-Hatch.

OvoScan

As the heat transfer between the avian embryo and its environment varies with flock age, eggshell conductance and ambient humidity, there is no such thing as a 'one fits all' incubator temperature.

As embryo temperature is the parameter we aim to control inside an incubator and measuring the embryo itself is impossible without destroying the eggshell, we decided to measure as closely as possible to the embryo in a non-destructive way.

Petersime's OvoScan.

The Ovoscan device performs a non-contact (infrared) on-line measurement of the eggshell temperature on a number of eggs inside the incubator and averages the measurements. OvoScan compares these averages to the requested preset and automatically adjusts the incubator temperature accordingly.

Therefore, independently of the actual egg load inside the incubator, the requested embryo temperature is met. The embryo itself decides what the incubator temperature should be.

Synchro-Hatch.

Dynamic Weight Loss System

The aim of having a certain level of humidity inside an incubator is to reach a certain amount of egg water loss during the incubation process.

Too low total weight loss will lead to small air cell size by the time of internal pipping, preventing the chick from switching from vascular to lung respiration. Too high total weight loss causes dehydration of the embryo.

The Dynamic Weight Loss System device measures the to-date achieved egg weight loss on-line. Based on this measurement the incubator control system decides what the incubator humidity should be. In other words, the right amount of egg water loss is achieved, regardless of the actual egg load inside the incubator: the embryo itself decides what the humidity level should be.

Co$_2$ntrol

In order to drive the embryo's metabolism to developing a healthy chick, oxygen has to be supplied and carbon dioxide has to leave the egg as a waste product.

By actually on-line measuring and controlling carbon dioxide levels and regulating incubator ventilation rates accordingly, the embryo itself decides upon the required level of oxygen to be supplied.

Synchro-Hatch

It is widely recognised by broiler integrations, that optimal day-old-chick uniformity results in better growth, better feed conversion and enhanced liveability.

Chick uniformity strongly correlates with the hatch window or, in other words, the total time elapsing between first and last chicks hatching.

Consequently, the longer the hatch window, the higher the variability in day-old chick size will be, causing less uniform growth and leading to problems during further processing.

The hatching process is a sequence of distinct phases or physiological events. By applying ambient triggers, the transition from one phase to the other can be delayed or accelerated.

Synchro-Hatch measures hatch progression related signals on-line, and uses this information to shorten the hatch window and enhance chick quality and uniformity.

The timing of applying aforementioned triggers depends entirely upon the actual egg load in the machine. In other words, the embryo itself decides how and when to shorten the hatch window.

Conclusion

Introducing new sensor technology in modern incubators facilitates the hatchery manager to better match incubator environment to the embryo's needs at any stage of the incubation process. Upscaling production and hatchery output to meet growing consumer demands implies adopting fully automated incubation control.

Hatch, as well as post-hatch, performance related to this bio-response system have proven time and again that this is the route to follow. Petersime holds a worldwide patent on the principle of applying bio-responses in commercial incubators.

n

Petersime's Dynamic Weight Loss System.