Technical innovations in incubation

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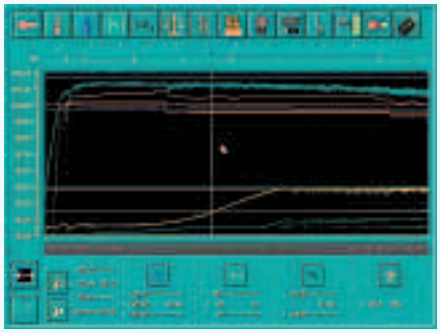
Until recent years, with the industry standard being multi-stage incubation, temperature, rate of fluid loss, and gaseous exchange, were restricted to linear profiles.

With the poultry sector now moving to the more flexible and biosecure and less labour intensive single stage method of incubation the optimum environment required by the embryo can be targeted and with the technology available today the ability to achieve the optimum is present.

However, the poultry world, through its own logistical constraints, dictates limitations to the commercial incubator manufacturer; by definition the commercial incubator should be a maximum volume, minimum cost unit, eggs/m^2 and capital cost per egg will always be a significant factor.

The challenge to the commercial incubator manufacturer is to balance the constraints of the producer whilst implementing the strides made through research and development.



Petersime Focus with hand-held remote controls and large colour display for perfect, language independent graphics.

In the commercial incubator environment the objective is to give the embryo the optimum conditions to develop and grow to its maximum genetic potential.

Fluid and gaseous control

In order to replicate the optimum environment required by the embryo in the commercial incubator the rate of fluid loss and gaseous exchange is controlled by dictating the partial pressures experienced by the egg.

Relatively high levels of humidity and

The latest AirStreamer setters.

CO_2 are generated during the initial endothermic stage of incubation in order to create the partial pressures required to simulate the actions of the mother bird.

Similarly during the exothermic stage levels of humidity and CO_2 are significantly lower, continuing the replication of the mother bird's actions.

The profiles generated are such that all parameters become non-linear and the method is often referred to as the 'non-linear weight loss' method of incubation. Although gains are made throughout the incubation process the area where the greatest gains are made is in late embryonic mortality.

The industry has yet to adopt a recognised universal standard for measuring chick quality but it has been accepted by all users that improvements can be seen in chick quality, uniformity and post hatch performance.

Petersime OvoScan egg shell scanner for bio-response controlled temperature. The Focus controller automatically adjusts the air temperature inside the incubator to achieve a preset level during all phases of incubation.

How the gains are achieved

The fluid and gaseous control has been shown to affect several areas of the incubation process, particularly during the initial embryo development stage.

The initial period of incubation requires the incubator to operate with no air exchange, reducing the introduction of contaminates and improving the temperature stability and overall differential.

The restricted loss of fluid and CO_2 improves the egg's efficiency in maintaining its embryonic fluid's pH balance.

Early indications are that specific levels of CO_2 at critical periods during the embryo's development can result in improvements in heart size, volume and in the efficiency of the oxygenation of the blood circularity system.

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AirStreamer setters and hatchers in a turkey hatchery in Germany.

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Opinion differs amongst academic facilities and individuals as to the degree of relevance each individual component has although it is accepted that the benefits are achieved.

Eggshell temperature control

Ongoing research will ultimately identify the critical elements and their optimum parameters, whilst the commercial incubator manufacturers continue to develop the technology required to bring the ongoing benefits to the industry.

During the endothermic stage of incubation the energy source required to commence full embryonic development is heat.

To achieve a subsequent optimum embryo development the rate of heat exchange has to be controlled.

During the exothermic stage of incubation the optimum rate of embryo growth directly correlates, within the genetic limitations, to the rate of heat exchange.

Air temperature, as a general guide, is a valid indicator as to the thermal conditions experienced by the embryo.

The embryonic heat generated within the confines of an incubator will be the dominant influence, but the reading shown by the temperature sensor will be a combination of both embryonic heat and the following:

- Other heat sources, motors, etc.
- Ambient conditions (air intake temperature).
- The activity of the cooling system utilised.
- The activity of the humidification system utilised.

As research continues into optimising both hatchability and post hatch performance a method was required to negate the variable effects of these influences, and to identify the specific variant of embryonic heat.

Although the movement of cooler air will affect egg surface temperature in a certain way, this effect is air speed and air temperature dependent.

Therefore, shell temperature sensing offers an accurate, non-invasive indication of embryo temperature. This Ovo-Scan system allows for active control of the embryo's temperature throughout the incubation process.

Applicable species

Extensive trials have been carried out both under laboratory conditions and in controlled commercial environments and significant improvements have been recorded when using the non-linear weight loss approach in the poultry, duck and turkey sectors.

The future

The commercial incubator manufacturing industry has broadened its concentration away from looking towards simple hatchability and is now targeting an overall optimum performance.

With the 'tools' now available and the research work being undertaken the optimum performance is achievable, taking the industry into a new era. ■

AirStreamer setters in South Africa incorporating the Dynamic Weight Loss equipment.