

"We have the future of hatchery

After three years of intensive research, Dutch incubator manufacturer Pas Reform is taking the next step into the future of hatchery technology. President Bart Aangenendt expects to meet the demands of modern hatcheries with the introduction of a new line of incubators.

By Wiebe van der Sluis

There are few better examples of fusion between scientific advancement and the requirements of modern customers than the contemporary hatchery. Today's hatchery is a super-clean, efficient, technologically driven environment, designed to recreate the optimum scenario for sound embryonic development and large numbers of healthy, day-old chicks.

Yet with the rapid pace of change and ever-increasing economic demands that are being placed upon them, even these modern hatcheries face, according to Bart Aangenendt, three serious challenges to their continued growth and profitability in the future:

Genetic progress – causes increasing pressure to deliver optimum environmental management, not only to meet the needs of today's modern breeds, but also to keep abreast of genetic advancement for the next twenty years and beyond.

Uniformity – is the golden egg of poultry production. Achieving ever-higher levels of day old chick uniformity in terms of physical appearance is already a significant prerequisite to hatchery performance.

Post hatch performance – is the natural result of high uniformity. The achievement of outstanding post hatch technical results relies on the ability to deliver optimum results on feed conversion, livability, yield and egg production.

Defining the hatchery of the future is a multi-faceted task, says Aangenendt. "We at Pas Reform have invested in the co-operation of embryologists, poultry integration experts, hatchery management specialists, electro-mechanical engineers and industrial designers, to focus solely on these three, key challenges."



The Smart incubation system enables you to actively manage the developing embryo while it is still in the egg.

"The new incubation system enables hatcheries to fully realise the benefits of genetic advancement, now and over the next twenty years,"

President Bart Aangenendt.



The impact of genetic progress

Genetic selection and highly evolved management practices have, according to Pas Reform's director of research and development Dr. Marleen Boerjan, dramatically improved poultry meat and egg production. According to Boerjan, in modern broilers the growing chick spends half the time on the farm than it did a little over 25 years ago. The rearing period has decreased since the late eighties, from 84 days to just 42 today. Similarly, whereas in the past chicks spent just 20% of their total lifespan from egg to slaughterhouse, in incubation, today's modern broiler breeds now

spend 33% of their lives in the incubator. Reduced rearing time has decreased the overall cost of inputs for the growing broiler.

Quality and performance in the incubation of the embryo also has a fundamental, dramatic impact on the growth performance and feed conversion ratios of modern birds. "For that reason," Boerjan says, "incubation plays a vital role in determining commercial breed performance. And it is not just the proportion of lifetime spent in the incubator that has changed. Research has proven that each modern breed generates its own unique metabolic heat signature in the egg."

technology at our fingertips"

Table 1 - Field data post hatch performance (2004)

	Multi stage incubation	Pas Reform Single stage incubation	Difference
Bodyweight 5 wks (g)	1702	1742	+/- 40 g
Feed conversion (1700 g)	1.71	1.64	-/- 0.07
Mortality (%)	5,75	5,14	-/- 0,61

Note: Homogeneous incubation conditions result in the shortest spread of hatch to give high levels of uniformity and the fullest expression of genetic potential. Accurate and sensitive management of embryonic temperature is only achievable in a modular single-stage incubation environment, providing homogeneous temperature distribution.

Source: Pas Reform data

This is very significant in achieving healthy embryonic development – and a factor that fully advocates the adoption of single-stage incubation in order to cater to the different needs of emerging modern breeds in the future.

With her background as embryologist Marleen Boerjan has experienced that genetic selection for high postnatal growth has fundamentally changed the pattern of embryonic development and rates of biosynthesis (growth). This results in ever-higher levels of metabolic heat production, that must be carefully managed in the incubator to achieve optimum hatchability and uniformity. For example, metabolic heat production in Ross 308 birds has been shown to have increased by 26% over recent decades, when compared to the traditional breed 'North Holland Blue'. This is a feature that will become more pre-eminent in the future, and one that can only be fully optimised by a system that provides breed and age specific incubation environments. Such accurate and sensitive management of embryonic temperature can only be achieved in a modular single stage incubation environment that provides homogeneous temperature distribution.

Achieving high uniformity

"High uniformity in day old chicks is one of the greatest challenges facing commercial hatcheries. Yet synchronising the hatch as closely as genetically possible is feasible with the knowledge we have at our disposal today", says Boerjan. Uniformity is a feature of synchronisation: starting the incubation process in a batch simultaneously, with a rapid and uniform increase in eggshell temperature towards set point, will achieve a uniform start to embryonic development.

Failure to optimise homogeneous temperature distribution to the specific requirements of each egg will cause the embryos to grow at different rates, resulting in large variations in the devel-

opment or maturation of day old chicks at the point of hatching and a large spread of hatch. Failure to manage eggshell temperature homogeneously and accurately for each egg is proven to have highly detrimental effects on uniformity - and further, to significantly undermine subsequent post hatch performance.

Hatchery managers are beginning to understand that it is possible to actively manage the embryo while in ovo. Modular single-stage incubation fully maximises hatchability and chick quality – because temperature, humidity and ventilation can be finely adjusted to the needs of each breed, embryonic age and batch. In this way, flock uniformity is steered by the shortest possible spread of hatch.

It is now, according to Aangenendt, widely accepted that homogenous conditions result in the shortest spread of hatch to give high levels of uniformity and the fullest expression of genetic potential. Good uniformity of day old chicks is highly prized because it dramatically improves technical results at farm level, including the lowest feed conversion and mortality rates, the fastest growth rates and excellent processing yield and egg production (see Table 1)

Defining the future of hatchery technology

Pas Reform has a long-term track record for innovation in the development of hatchery technologies, says Bart Aangenendt. "Over the past three years the company has dedicated substantial resources to working closely with a range of specialists in a major R&D project to design an incubation system that successfully and reliably meets the three key challenges facing hatcheries in the future."

"The result of these investigations is the design and development of Smart™, the next generation incubation system that not only meets these

The Smart program contains

A new setter

As we all know, homogenous temperature distribution is the single most important parameter for successfully incubating today's modern breeds, each of which has a unique temperature 'signature' for embryonic development. With SmartSet™ the average difference in eggshell temperature is less than 0.5 °F. Its modular design meets this specific requirement by enabling set points to be defined separately for each section of 19,200 hen eggs – and this allows for both single-stage (All in/All out) and multi-stage incubation.

With capacities of up to 115,200 hen eggs, the new setter is the largest closed-door, single-stage incubator available on the market today. Once the trolleys are in, total system control is possible from outside the setter, eliminating any need to move trolleys during the setting period and fully preserving the integrity of heat management and distribution.

Features include:

- **Reduced heat-up time:** to improve day old chick uniformity, it is vital that the hatching eggs, once in the setter, are rapidly and evenly brought on temperature to start the incubation process. The new heating device has a substantially larger heating surface area and therefore reduces the time to reach machine set point by 50%. This significantly improves uniformity and subsequent post hatch performance
- **Increased cooling capacity:** modern breeds generate more metabolic heat now than in the past - and detailed work to forecast future developments has enabled Pas Reform to calculate cooling capacities not only for today's breeds, but also for their offspring in twenty years from now. In the new setter the cooling capacity has been increased by 40%.
- **Integrated heating & cooling system:** to achieve homogeneous temperature distribution throughout the machine, it has a combined heating & cooling device with 34 vertical, parallel coils per section, supplied with hot or cold water for optimum energy transmission to and from the incubating eggs.

Hatcher

To deliver a fully automated hatching system that delivers accurately regulated temperature, humidity and ventilation – Pas Reform has developed SmartHatch™, an exemplary hatcher that delivers high day old chick uniformity with no need for human intervention.

Features include:

- **Optimised cooling system:** Thanks to a detailed understanding of the impact of metabolic heat production on the growing embryo, the cooling capacity for the new hatcher has been calculated not only for today's breeds, but also for projected breed requirements twenty years from now. The hatcher incorporates 12 parallel cooling circuits that surround the incubating eggs (SurroundCooling™), to deliver an added 20% cooling capacity. The circuits are fully integrated into the aluminium cabinet panels to massively increase the cooling surface area for even temperature distribution.
- **Automated hatching system:** fully automated processes deliver greater accuracy, and it monitors and adjusts the hatching process automatically from the day of transfer through to the last chicks hatching, eliminating any need for human intervention. Field trials have proven that the systematic measurement and control of temperature, humidity and CO₂ production, combined with the use of current and historical data to adjust the hatcher environment automatically consistently produce high levels of uniformity per batch.

challenges in today's terms, but also forecasts the emergence of new parameters and trends to future-proof the system". "Smart enables the hatchery to fully realise the benefits of genetic advancement, with the capacity to cater to the incubation requirements of specific and individual breeds for at least the next twenty years.

High chick uniformity is reliable and consistent, due to modular design and unique control systems – and as a natural result of genetic optimisation, every key performance indicator, from uniformity to processing yields is significantly improved."

Thinking ahead

"Pas Reform has been at the forefront of single-stage incubation technology for the past thirty-five years," Aangenendt continues. "Building on the tried and trusted success of its existing systems, our new Smart incubation system takes established principles a stage further, to fully maximise the benefits of homogeneous temperature control as the single most important criteria for success in rearing modern breeds and their future offspring.

At its core, the new concept embraces the ability to actively manage the developing embryo while it is still in the egg.



SmartCenter communicates with every control unit to continuously monitor each incubator and fine-tune settings.

Modular design and total control over every operating parameter means that a diverse range of incubation environments can be created and managed at any one time, to meet the breed-specific needs of the growing embryo.

The new incubation system comprises a new setter (SmartSet™) and hatcher (SmartHatch™), combined with an advanced incubator control system (SmartDrive™), to allow for the careful management of individual conditions per egg type. A powerful hatchery management information system (SmartCenter™) completes the new range".

Conclusion

"From inception, the new incubation system has been designed to overcome all three key challenges in hatchery opera-

- **Hygiene:** The new hatcher is constructed of high quality, smooth-walled 'food-safe' anodised aluminium, stainless steel and polystyrene. Its robust cabinets are resistant to strong disinfectants and corrosion and extremely durable. The absence of closed air ducts improves hygiene and sanitation, while the incorporation of the cooling circuits into the walls greatly reduces cleaning time.

Control system

The SmartDrive™ control system delivers total control over every function and setting within each, individual incubator, from humidity and CO2 levels and the position of air inlet valves, to the individual operating parameters – temperature, heating, cooling, ventilation and turning – required per batch/egg type.

The ergonomic design and the use of clear, full colour TFT displays and icons, allow its SmartDrive to be configured quickly and simply to programme incubation conditions to meet breed-specific requirements.

Features include:

- **Pre-heat function:** To improve day old chick uniformity requires a synchronised start to incubation. It is critical that the hatching eggs are heated quickly and uniformly once placed in the setter - and SmartDrive's pre-heat function takes this one step further. Full programming for pre-heating time, temperature and ventilation allows the time needed to reach a specific set point from start up to be reduced even further.
- **New PID control combined with set points per section:** SmartDrive incorporates the latest version of PID - Proportional Integral Derivative - control, enabling the hatchery to simulate optimum (near-natural) incubation set points to minimise overshoots. The new PID control is adjustable with separate set points for each section of 19,200 eggs.
- **Turning programmes:** As our knowledge of embryology continues to grow, we are prompted to investigate different incubation programmes and modes. Studies have also revealed the benefits of different turning principles during incu-

bation - and SmartDrive now offers the ultimate in flexibility, for adjusting turning programmes as and when required (frequency of turning, 2 or 3 auto-turning positions, start / stop timing).

Management information centre

Pas Reform's new incubation system employs an intelligent, responsive, 24-hour 'brain': a powerful, simple-to-use total management information system (SmartCenter™) that communicates with every control unit to continuously monitor each incubator and fine-tune settings to ensure that optimum conditions are maintained at all times.

Features include:

- **Knowledge based information system:** An on-screen, customised layout of the hatchery serves as the main control panel, from which every function and parameter for each individual incubator throughout the hatchery may be accessed and controlled. The system comprises an entire database with log files on climate and alarm history, to allow for trouble shooting diagnostics as well as building a knowledge base for future incubation programme development.
- **Unlimited number of incubation programmes:** The central system communicates with the control unit, linked to each incubator via internet browser software, to give a fast, convenient, and efficient access to any one incubator at any time. It incorporates a powerful new programming module, with the options to use an unlimited number of incubation models (breed, age specific).
- **Remote diagnostics:** Through the use of a LAN network the communication speed between the central computer and the control units is dramatically improves and it makes SmartCenter™ accessible from every workstation in the network. Should technical support for the operation, maintenance or trouble-shooting of one of the hatchery control systems be needed, the internet-based system makes it possible for either the own specialists or the Pas Reform Academy support team to assist online within minutes from anywhere in the world.

The Pas Reform Academy

Through the Pas Reform Academy, Pas Reform shares expertise with its partners worldwide through the combined efforts of the Training Centre, Project Management and Research & Development facilities. The Holland based academy regularly organises various training programmes.

The project management team closely works with clients worldwide to develop hatchery-specific strategies that optimise the most efficient, performance-enhancing combination of incubators, hatchery climate control and automation systems.

The Research and Development team is focused on poultry embryology to drive new product development. Through the academy, clients are invited to share the most up-to-date concepts and expertise, from basic research to field studies.

tions", says Bart Aangenendt. "Again it enables the hatchery to fully realise the benefits of genetic advancement, with the capacity to cater to the incubation requirements of specific and individual breeds, now and over the next twenty years. We believe that it is reliable and consistently

delivers high chick uniformity, due to its modular design and its unique control systems and programming parameters. And most of all, it dramatically improves post hatch performance in terms of liveability, feed conversion, growth rate, processing yield and egg production." ■