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SINGLE STAGE AND MULTI STAGE INCUBATION SYSTEMS

ENG

One of the most significant hatchery changes around the world during the last years is the migration from multi-stage to single-stage systems. **Although the majority of birds still hatch on multi-stage systems.**

 Since a few years most of the new projects are being built with the new single stage concepts, **indicating the poultry world is now undergoing this technological shift.**

Once thought to be only advantageous because of the higher level of biosecurity, single stage systems are now recognized as more efficient in meeting embryos requirements as well.



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INCUBATION

What are the main differences between these two different systems?

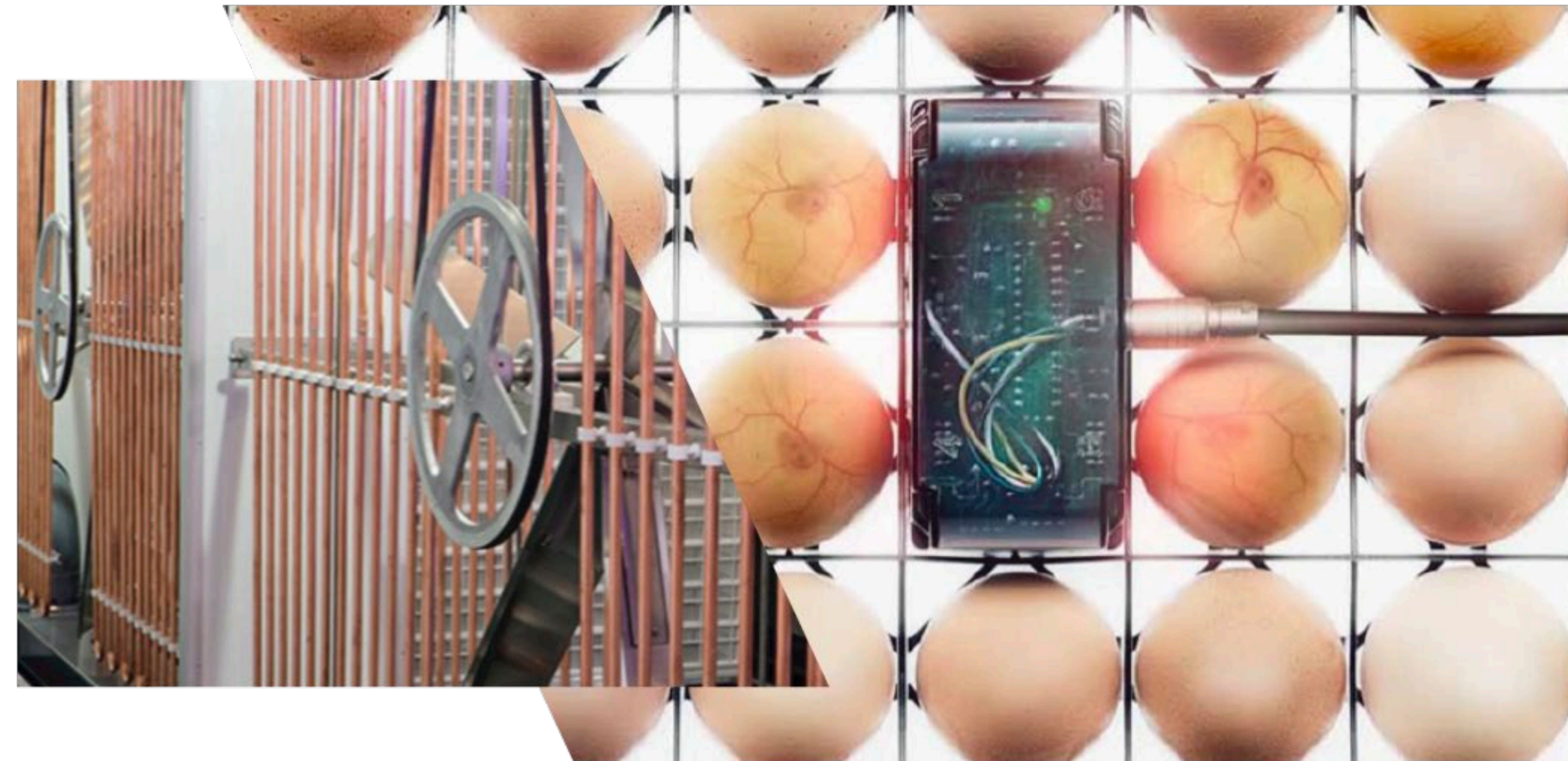
Before explaining their differences, one must be aware of the concept of each system.

Single stage incubation

All the eggs in a specific setter hold embryos of the same chronological age (hence the name “single”).

Multi-stage machines

Whereas multi-stage machines usually hold up to 3 or 6 different embryo ages at the same time, hence the name “multi”.



Although simple to understand, this difference brings up the need of completely different incubation management, ventilation system and eventually construction requirements.









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Regarding management, the multi-stage system often works with fixed parameters such as temperature, relative humidity, and CO₂ levels.

Hatchery managers fine tune what gives the best hatchability of saleable chicks and stick to it regardless of:

-  **The flock origin**
-  **Breed**
-  **Age**
-  **Egg age**

When managed in a good way, some machines can be dedicated to specific batches of eggs and have their specific parameters fixed for the entire duration of the incubation period.

Good managers achieve outstanding performance with LOHMANN birds using multi-stage machines around the world.



In this eventuality dedicate some specific machine in consideration of age, with specific setting, for Young/Prime/Old can done advantage in the best control of the egg weight loss.



The hygiene aspects of multi-stage systems are still one of the strongest handicaps, since the machines are almost impossible to be cleaned and disinfected regularly as on a usual fully utilized hatchery as these machines are never empty or even turned off.

The other hindrance is the impossibility to work with dynamic control of incubation parameters such as temperature, humidity and CO₂.

There is where single-stage machines can outperform the old multi-stage concept.





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What are the main differences between these two systems?

Single stage machines can be emptied, cleaned, and disinfected after every cycle of 18-19 days.

They can even be turned off for around 2 days, promoting some energy savings as well. However, this is not the only benefit of using this system.

Current research and development carried out by universities, incubator and breeding companies have demonstrated that embryo requirements change during incubation, according to the stage of development.

It means that temperature, humidity and CO₂, for example, have variable optimum levels during the entire life of the embryo.

Meeting these requirements can be done only by using single stage machines.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
12.0	12.0	9.0	41.0	24.0	48.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	48.0	0.0
67.0	77.0	100.3	100.3	100.2	100.1	100.0	100.0	100.0	99.9	99.7	99.5	99.4	99.3	99.2	99.1	99.0	98.9	98.8	98.6	0.0
75.0	77.6	101.0	100.9	100.9	100.8	100.7	100.7	100.6	100.6	100.4	100.2	100.1	100.0	99.9	99.8	99.7	99.6	99.5	99.4	0.0
60.0	65.0	75.0	99.5	99.4	99.3	99.2	99.2	99.1	98.9	98.7	98.6	98.5	98.4	98.3	98.2	98.1	98.0	97.8	0.0	
50.0	50.0	75.0	75.0	75.0	75.0	75.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	30.0	30.0	30.0	0.0	
100.0	100.0	100.0	100.0	100.0	100.0	95.0	80.0	75.0	70.0	65.0	60.0	55.0	50.0	50.0	50.0	50.0	50.0	50.0	0.0	
30.0	30.0	50.0	50.0	50.0	50.0	50.0	40.0	40.0	35.0	30.0	30.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	
CO ₂	0.02	0.20	0.80	0.80	0.80	0.80	1.00	0.60	0.50	0.30	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.50	0.00	
CO ₂ ↑	2.00	1.00	1.00	1.00	1.00	1.20	1.20	0.80	0.60	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.70	0.00
CO ₂ ↓	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	5	0	0	0	0	0	10	20	25	30	40	50	60	70	100	100	100	100	0	0
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45	45	45	45	45	45	45	60	60	60	60	60	60	60	60	60	60	60	60	0	0
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55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	0
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0

Table. Program single-stage








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The result of a tailor-made incubation profile can be translated into:

-  **Better saleable chick hatchability.**
-  **Narrow hatch window (time from first to last chicks to hatch in a machine).**
-  **Consequently better first week performance in terms of body weight gain, uniformity and livability.**

Main reasons for these outcomes rely on a uniform and steady start of development process, as well as homogeneity of physical parameters controlled throughout the process.



Several companies can supply both incubation systems, but it is well agreed that investments are predominantly aimed to single stage, as a reflex of the best results achieved.



Incubator manufacturers work hard in making a more stable environment inside the cabinets and on predicting what the embryo needs are now and will be in near future.

Investments are also **focused on energy consumption and less environmental impact** by use of:

More durable parts.

More efficient motors.

New technologies that allow recovery of the heat produced by the embryos to be used for instance on ventilation system, dropping energy consumption by the entire building.

Nowadays it is no longer unusual to have single stage hatcheries with less energy consumption than those having multistage machines.



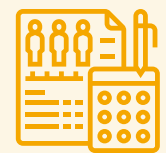


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Embryo physiological behavior

New machines can react to the embryo physiological behavior by **cooling or heating to keep eggshell on proper temperature, opening/closing air valves** in order to allow more oxygen in and expel CO₂ and water produced by embryo metabolism on the right amount at the right time.



Not only these systems are capable of doing such controls, but they are more accurate in the readings of every parameter involved on the incubation process, providing hatchery managers with more dependable process and equipment.



We at LOHMANN have extensive experience in managing either system.

Our team of specialists can assist you at any time when deciding which system to buy or even when you need advices for your running hatchery.

Count on us!

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