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Hatchery TIPS 20

BALANCING A SET IN SINGLE STAGE SETTERS

Although the optimal eggshell temperature for maximum hatch and chick quality is in the range 37.8-38.3°C (or 100-101°F), it is not always easy to keep within this range in a commercial setter. One of the most common causes of uneven temperatures is when the eggs are loaded into the setter without allowing for differences in their potential heat output or when gaps in the set allow air to short circuit the optimal path.

Nowadays, more and more hatcheries install enormous setters, to save space and cost. Depending on the make, there will be one air temperature sensor in each setter or in each sub-section of it. In principle, the sensor controls heating and cooling to keep the air temperature within the machine set-points and keep eggshell temperature within the optimal range. For this to work properly embryo heat production needs to be spread evenly throughout the setter and all the eggs affected by a temperature sensor should be of similar size and fertility. Unfortunately in the real world parent flock sizes are often variable and never match the setter capacities available. A large setter will have to be filled using eggs from more than one parent flock, or sometimes run partially full. If not managed carefully, it is very easy to create an unbalanced loading pattern.

The heat output of a batch of eggs will depend on several factors. It is important to take these into account when deciding where to put each batch of eggs in a large setter.

- Egg size. Large eggs produce large embryos, which produce more total heat per egg.
- Flock age. Eggs from flocks under 30 weeks tend to produce less heat per egg than would be expected for their size.
- Fertility. There are more eggs with live embryos when fertility is higher. If a flock is more fertile, heat production per 1,000 eggs will be higher.

Unbalanced egg loading in the setter may exaggerate variability in eggshell temperature (especially after 12 days of incubation) and consequently widen the hatch window and cause poor chick quality. Embryo (eggshell) temperature will be cooler where eggs have a lower heat production and these chicks will hatch later and some of them may be culled because they are still wet and lethargic at take-off. Embryo temperature will be hotter where eggs have a higher heat production causing chicks to hatch earlier, with some of them getting dehydrated before pulling. If eggshell temperature goes to a very high level, 103˚F or above, hatchability and chick quality will be depressed.

Here are some tips to balance egg loading in the setter:

- As a good start, follow the recommendations from the incubator manufacturers.
- When you have to mix egg sources in a setter, always choose the ones from similar flock ages and with similar fertility.
- Put eggs closest to average next to the temperature sensors.
- When you can not completely fill a setter, always set the eggs in a pattern which will not change the normal air flow or cause short-cuts of air flow in the setter. Fill any gaps with empty trays or trollies.
- Always check eggshell temperature and its evenness if you try a new egg loading pattern.

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Hatchery TIPS 21

CHECK HATCHING EGG QUALITY WITH UV LIGHT

Hatching egg quality has a significant impact on hatchability and chick quality. Not every problem with the egg shell can be seen with the naked eye, but a device in your pocket can help you go beyond that biological limit. A UV flash light can be an invaluable tool to help identify egg shell hygiene issues.

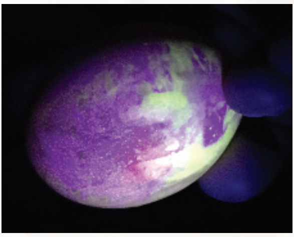
Many hatcheries receive only a limited history of the eggs delivered from the farms. However, wiped, washed, scraped or otherwise cleaned eggs can cause serious contamination issues in a hatchery. Even when eggs are put through selection and grading on arrival, some problematic eggs can still go undetected on a simple visual assessment. If we can find these eggs, segregating and setting them in a separate incubator or at least setting them in the bottom trays, can help a lot to avoid contamination.

A UV flashlight can be used to identify:

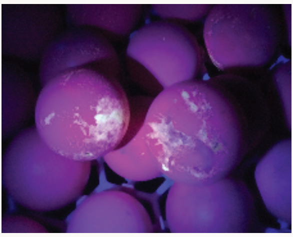
- Washed eggs
- Sprayed eggs
- Wiped eggs
- Scraped/physically cleaned eggs
- Dirty/floor eggs

Using a UV light is very easy. A pocket size UV torch with 395nm wavelength is sufficient to identify the main issues. You do need a dark environment when doing an investigation. Direct the UV light source on the eggs and try to find shiny and different looking eggs. Some examples of problem eggs are shown below, with the cause identified:

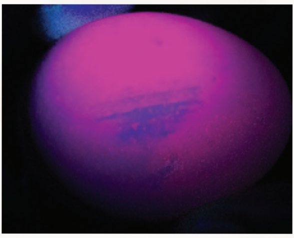
Floor egg



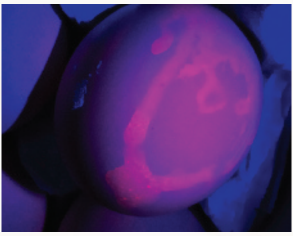
Dirty egg



Scraping



Poor spray sanitation



Avoid looking into the UV light directly; this can cause serious eye damage. Just like any other type of UV lights, LED UV light sources have a finite life span. Change the torch when it becomes difficult to see the colour differences.

If a monitoring system is set up to do regular random checks for all flocks, the information generated can provide a timely feedback or warning to increase the focus on egg selection on farm.

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Hatchery TIPS 22

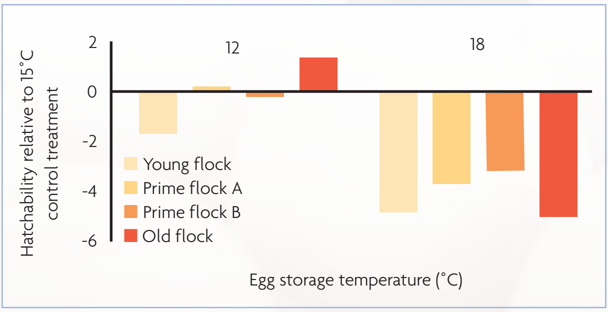
THE BEST TEMPERATURE FOR STORING EGGS

Most hatchery planners aim to keep egg age under seven days at set. However, even in broiler hatcheries this is not always easy, or even possible. You may need to build up numbers so that a single broiler unit can be filled using eggs from only one breeder flock, order sizes may not be exactly even day to day or there may be a general slowdown in the market for seasonal or other reasons. Most advice on egg storage conditions suggests that the temperature should be adjusted dynamically depending on the average egg age.

However, in practice the advice is seen as too complicated and is rarely followed. Consequently, in many operations egg storage temperature stays firmly at 17-18°C, no matter what the egg age. In fact, the best advice is that egg store temperature should always be adjusted downwards to be optimal for the oldest eggs. Fresh eggs hatch just as well stored at colder temperatures, but older eggs suffer badly if the egg store is held too warm. The only thing you need to watch out for is the possibility of condensation when moving eggs from the cold egg store into the setter rooms. Keeping eggs which need to be stored for longer at a lower temperature slows down the physical deterioration to the albumen and yolk membranes which are needed to support the best hatchability. The embryo will also be affected by both storage time and storage temperature, and colder storage slows down the rate of deterioration in the embryo as well.

A recent collaborative study between Aviagen and Ankara University investigated the effect of storage temperature on hatchability in eggs stored for 14 days, as part of a larger investigation into how SPIDES treatments interacted with storage temperatures. In the study, covering young, prime and old grandparent flocks, hatchability was much better when 14-day-old eggs were stored at 15°C rather than 18°C. More unexpectedly, eggs stored at 12°C hatched no better than those stored at 15°C. The hatchery where the trials were done is unusual in having three separately controlled egg stores, so it was possible to run comparisons of the three storage temperatures simultaneously which gave a very robust comparison. The trial was repeated over four batches of eggs, from young, prime and old flocks.

Fig. 1. shows how eggs stored at 18°C hatched worse than those stored at 15°C by an average of 4.4% over four comparisons covering young, prime and older flock ages. In contrast, when hatch of eggs stored at 12°C was compared with hatch of eggs stored at 15°C, there was no overall improvement. Our conclusion from these trials was that unless eggs are only being set when very fresh (no more than four days old) it is probably better to run egg stores at 15°C rather than 18°C.



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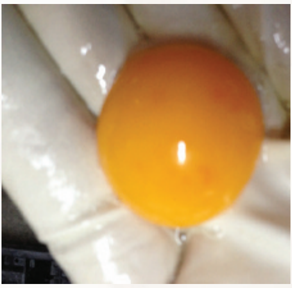
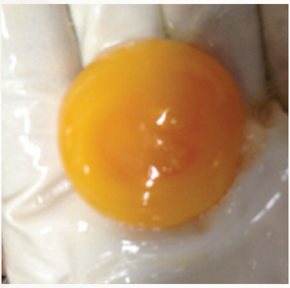
EGG YOLK MOTTLING

Levels of mottling in egg yolks seem to be quite high at the moment. Mottling is something that is often identified when there are reports of high levels of very early dead embryos, or particularly poor hatch after egg storage longer than 4-5 days. Opening candled clear eggs shows that there is very little embryo development. But unlike infertile eggs, often the yolk membrane has broken and the yolk is mingled with the albumen.

Examining fresh eggs usually shows that fertility is normal for the flock age, but that the yolk surface looks different – there are areas of the yolk that look translucent in mild cases (below left) but a tan colour in more severe ones (below right). This is due to changes in the membrane around the yolk which allow water to collect between the layers. This makes the yolk more fragile, and less able to support normal embryo development.





It is normal to see some mottling, which will get worse as eggs age. It will not necessarily be easy to see in fresh eggs on the breeder farm. However, if the incidence of candled clear eggs is higher than expected and fertility is normal, it is worth checking eggs carefully for mottling.

Mottling can be caused by a variety of factors affecting the breeder hens. One of the best known is contamination of the feed with Nicarbazine (or an anticoccidial containing Nicarbazine). Wormers such as Piperazine can cause mottling, as can gossypol from cottonseed meal (above 0.005%) or tannins from sorghum (above 1%).

Yolk mottling also tends to be high in years where fungal diseases in wheat and maize cause a high or erratic mycotoxin burden in finished feed. Management factors which put the birds under stress can also cause them to lay eggs with mottled yolks.

Over mating is a surprisingly common cause – which tends to escalate if the candled clears are perceived to be due to poor fertility, triggering early or over generous spiking. The bird handling necessary for taking blood or swab samples can also cause a rise in mottling.

Sometimes the cause of mottling is not immediately obvious. In this case, a review of the feed formulation and raw materials in the feed mill will be helpful, along with a review of the birds' behaviour. This should include periods of observation in the house, watching the birds feeding, selecting nests to lay in and during peak mating times.

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Hatchery TIPS 24

MAINTAINING FANS IN SETTERS AND HATCHERS

Incubators sold by the various manufacturers have a range of fan designs. However, the fans all have the same function, which is to move fresh air into the cabinet, and to provide an airflow pattern within the filled cabinet which is balanced and of sufficient airspeed over all of the eggs or chicks to keep them at their optimal temperature. Regular and effective maintenance is crucial if the fans are to deliver the right amount of air in the right places and at the right speed. There are several aspects of fan set up, wear and (lack of) maintenance which will cause the fans to need attention.

Fan blade damage – if the fans are bent or dented, they will not deliver optimal airflow. Damaged blades should be replaced as soon as possible.

Fan positioning is important, and problems can be seen after a fan has been replaced if it is not positioned correctly. This is especially important when the fan needs to be mounted in a fan housing. The fan must be mounted at the correct height within the housing, so that the air can only move in the desired direction. If the fan is mounted slightly above the housing, air will tend to escape to the sides. The fan must always be mounted centrally within the housing – if it is offset a 'blow-by' effect can be caused, where some air is sucked back away from the desired airflow. Make sure that the fan is pushing the air in the correct direction.

Fan speeds need to be checked regularly using a suitable tachometer. Regular maintenance should be set up to check:

- Belt tension – too loose and the rubber belt will slip on the metal pulley – listen for a squeal on start up. This can cause the fan to slow down. If the belt is too tight it will grind into the pulley and wear out more quickly.
- Pulley size, condition and alignment – a worn pulley should be replaced using one of the same size. Once in place, the fan belt should sit in the pulley groove, with its top surface level with the edge. If the belt sits proud or inset, either it is worn, or the wrong belt is being used. Make sure that the pulleys are in a straight line.
- Belt worn out – fan belts tend to become brittle, glazed or cracked. Belts are relatively cheap, so replace them regularly as part of a preventative maintenance programme.
- The rating of the fan motor – when replacing a failed or failing motor, make sure that it has the correct specification to be an exact replacement. Check that the voltage supplied to the new fan is correct.

Fan cleanliness – especially in multistage machines and hatchers dust, dirt and chick fluff can settle on and stick to the fan blade edges, making them less efficient. This should be cleaned off regularly. If the water used for humidification has a high mineral content, a hard residue can form on the fan blades, again making them less efficient. The residue should be removed carefully, making sure that the blade is not deformed in the process.

Clean fan blades.

Dirty fan blades.

A worn fan belt.

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CHANGING TO DIFFERENT FANS

One fundamental requirement for hatching good quality chicks is providing the correct eggshell temperature (EST) throughout incubation. The incubator is set up to control air temperature, which is not the same as EST. Two factors make the two temperatures diverge – the heat production of the embryos as they grow and develop and the ability of the air moving through the machine to take up and remove surplus heat. Embryo heat production increases rapidly after 10 days of incubation and then plateaus briefly at 17-18 days of incubation at around 138mW/egg. Air movement within the setter plays an important role in removing surplus heat from around the eggs, its effectiveness driven mostly by air speed between the setter trays.

In reality, air speed varies within the setter. Eggs located in a position with low air speed, will have higher eggshell temperature in the last week of incubation than eggs located where air speed is higher. It can be a big challenge to achieve even air speed (and hence eggshell temperature) in the setters in many hatcheries.

One way to get a more uniform air speed is to replace or speed up the fans. In a European hatchery with fixed-rack multi-stage incubators it was felt that the original propeller fans were not strong enough to deliver the air all the way down to the floor. In trial machines, the fans were replaced with stronger axial fans, but this did not improve chick quality or hatchability. In fact, it made things worse: the machine became too cold at floor level and too hot higher up. During the experiment, air was measured with a hot-wire anemometer and eggshell temperature was measured with Tiny Tag temperature loggers. The new fans increased air speed by an average of 0.5m/s. However, the average EST increased, with the hottest area moving from the bottom of the machine to the top.

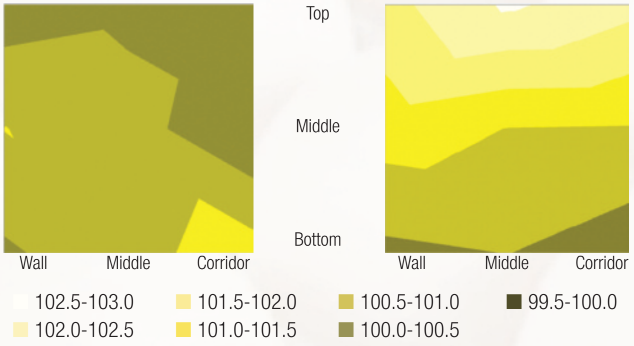
In a setter, air does not always take the route we expect. Setting pattern, egg size and even turning angle can affect airflow – air always goes by the easiest route where there are fewer or no obstacles, although resistance can increase with air speed.

So, the air flow pattern in the setter can be very tricky. When we try to change ventilation inside of the setter, we should always evaluate the change by checking how actual eggshell temperature changes.

The EST area plots show that despite the higher air speed, the average EST was higher, with more eggs falling into the band above 102°F, which is where problems of quality may be expected to start.

Day-17 EST distribution in the setter with the original fans.

Day-17 EST distribution in the setter with new fans.



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Hatchery TIPS 26

MEASURING ROOM STATIC PRESSURE

What is room static pressure?

• ‘Room pressure’ is the difference in pressure between the room itself and the reference it is being compared to.
• The most common units used to measure room pressures are Pascals (Pa) or Inches of Water Column ("WC). There are 2.5Pa per 0.01"WC.
• If the room pressure is measured at +5Pascals (Pa) / 0.02 Inches of Water Column ("WC), and the reference is to the outside, this means that the air pressure in the room is 5Pa / 0.02”WC higher than atmospheric pressure.
• A room will show a positive pressure if it is well sealed, and the volume of air being supplied into the room is greater than the volume of air being extracted from the room through the incubators and other exhaust systems.

Why is room air pressure important?

• Incubators are designed to operate with a certain pressure differential between the intake and the exhaust.
• Too high or too low pressure differentials across the incubator can impair the flow of air through the incubator. This will affect the performance of the incubator and may compromise embryo development.
• Most hatcheries operate on a slight pressure gradient between rooms to keep air from the dirtiest parts of the hatchery (chick and wash rooms) from getting into the cleaner areas (egg store and setters).

Pressure meters

• Pressure meters come in a variety of types and are known as manometers.
• A simple, portable and accurate meter is the floating ball meter. This can measure both positive and negative pressure.
• Dial type meters, calibrated to measure both positive and negative pressure are also useful.
• Digital meters are also suitable.
• Before buying a manometer, confirm the required pressure range of your specific incubator type.
• For example, do not buy a manometer with a range of 0-60Pa (0-0.24"WC) if your rooms are only going to operate at +5Pa (+0.02"WC).

Outside air pressure

• Room pressure should always be measured relative to the outside atmospheric pressure.
• However, a room in the middle of a hatchery will often have several other rooms between it and the outside, all of them operating at slightly different pressures and none of them open to the outside. Here, measure room pressure relative to the roof or a passage, having first confirmed that the reference space is at ambient pressure.

Note: It may be impossible to have a reference room at equilibrium to the outside air. If so, find the reference room pressure relative to the outside air and then add this second measurement to the difference between the room of interest and the reference room. However, this method will increase the likely error in the measurement, so it is worth making every effort to create a proper reference room.

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MEASURING ROOM STATIC PRESSURE – PART 2

When measuring room static pressure it is very important to create a reference point

1. Measure relative to the roof space

- It is often easiest to use the roof space as a reference point.
- Make sure the roof space is neutral by checking the pressure relative to the outside through a door or roof hatch.
- If the pressure reading is 0, then the roof space is at atmospheric pressure.
- If it is positive or negative relative to the outside, open doors in the roof space until the pressure is neutral.
- Once the roof space is neutral, measure the pressure of the room of interest through a small hole in the ceiling of the room.

2. Measure relative to a passage

- First, check if the passage is at atmospheric pressure.
  – This can be done by opening all internal doors along the passage from the room to a point where the passage can open to the outside such as a window or door.
  – Measure the passage pressure at this point.
- If the pressure reading is 0, then the passage is at atmospheric pressure.
- If the pressure reading is positive or negative, open an external door or window in the passage to equalise the pressure to the outside and then measure again.
- Once the passage is neutral, go back to the room of interest (keeping all the inter leading doors along the passage open) and measure the room pressure through the door seal.

3. Measure directly to the outside

- If the room has an outside wall, then a small hole can be made in the wall directly to the outside.
- The outlet will need to be protected from the wind such that it is surrounded by still air.
- Measure the room pressure directly relative to the outside through the hole.

How to use the pressure meter

- Read the operating instructions, which will give directions on how to hold the meter while measuring, and how to calibrate it.
- The meter will have both a positive and a negative port, and either one or both of these will have a plastic tube attached.
- Start by assuming that the rooms will be operating close to their design specification, and will be running at positive or negative pressure relative to atmosphere accordingly.
- If measuring from within a positive room to the outside/roof, then attach one end of the tube to the negative port and put the other end through the hole/door so that it is outside the room.
- If standing outside a positive room (in the passage or roof) you want to measure, place one end of the plastic tube on the positive port and put the other end of the tube through the door/hole into the room.
- In both cases above if the meter shows a positive reading or the dial moves to the right, the room is positive.
- Connect the tubes opposite to the above if measuring a negative pressure room.

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