

# 1. Hatching egg breakage: reducing losses along the production chain



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When hatchability decreases and contamination increases, hairline cracks should be investigated. To understand the impact of cracked eggs on hatchability, Cobb-Vantress conducted a trial comparing cracked eggs with non-cracked eggs.

As shown in Table 1 below, cracked eggs decreased hatchability and increased second-grade chicks, cull chicks, embryonic mortality and contamination. The data clearly indicate that cracks cause great losses to the production process.

Therefore, it is extremely important to manage all processes, from the farm to the hatchery, in order to identify where cracks are occurring. Given this data, identifying and correcting the sources of cracked eggs can improve hatchability and improve chick quality.

There are six main areas on the farm that need to be investigated:

1. Hens
2. Team member handling issues
3. Equipment maintenance
4. Feed and nutrition
5. Environmental issues including ventilation
6. Disease challenges

## 1. Hens

Hens not fully conditioned before light stimulation may show abnormal nesting behaviours. This can include hens dropping eggs from a standing or even walking position, which can cause cracked, slat and floor eggs. Hens may also cause cracks by pecking at eggs. Pecking at eggs occurs primarily with floor and slat eggs. There are multiple reasons for egg pecking including the house configuration, slat type and design, nest quality, and management-related issues.

## 2. Team member handling issues

The care taken in egg collection can have a big impact on the quality of eggs. Whether in manual or mechanical nests, the collection is a critical control point for cracked eggs. It is important to observe the frequency, duration, and time interval between collections. If eggs are accumulating in the nests, on the collection belt or on the collection tables, the number of cracked eggs will almost always increase.

Most of the eggs are produced 4-6 hours after the lights come on. Therefore, increase egg gathering during this time frame.

In manual nests, it is ideal to collect eggs at least five times per day, with three collections in the morning, where most of the daily production is concentrated, and two collections in the afternoon. No more than three hatching eggs should be permitted to accumulate. In mechanical nests, where eggs are collected by a belt and sent to an egg collection table, the number of collections depends on environmental house temperature and the collection belt capacity. Normally, a minimum of three collections should be done per day. Activating the conveyor system only once per day is not recommended, as 7-8 hours of production will accumulate on the belt system and increase the risk of cracked eggs.

In the event of egg accumulations on the collection tables, the speed of the egg transport belt should be reduced to prevent accumulations. It is important to have belts that are wide enough (25cm for each nest side is ideal) so that eggs can collect on the belts without microfractures. With manual collections, extreme care should be taken when transporting eggs from different nest rows or houses to a central on-farm location. It is very important that eggs are protected from sun and rain on their journey to this location. Like collection, the packing process requires care and it is important to prevent the accumulation of eggs, excessive egg rolling, and rough handling.

**Table 1. Difference in hatching results between good and hairline crack eggs (Cobb-Vantress. Unpublished data).**

	Total hatch	Second grade	Cull chicks	Infertile	Early	Middle	Late	Cont.
Good eggs	89.6	0.9	0.7	4	2.9	0.2	3.1	0.2
Hairline cracks	66.4	5.1	4.4	3.8	12.5	0.3	13.7	3.3
Diff.	23.2	4.2	3.7	0.2	9.6	0.1	10.6	3.1

## 3. Equipment maintenance

As automation increases, equipment maintenance is critical, as it can have a big impact on the number of cracked eggs. An electronic egg can be used to measure the G-forces applied to the eggshells along the transport system including the egg packer. Areas in the transport system where eggs are more likely to crack can then be

identified and addressed. For nests, check the nest pads and replace them before they become excessively worn. Also ensure that the nest pads are installed correctly. In community nests, if the plastic belts between the nest pads and the egg belt are damaged and curling, hens may peck at eggs when the conveyor belt is visible. Egg yolk present on the belt can be an indication of broken and shell-less eggs. If eggs are breaking, it is also likely that eggs are incurring cracks.

Conveyor belts moving eggs to a packing unit or a central collection table must be wide enough to support a large quantity of eggs. Systems that have only one conveyor belt in the centre shared by nests on both sides, are more prone to egg damage. In poorly adjusted systems, eggs can roll to the centre of the belt, hitting each other.

Check that the mechanical community nests are level, collection belts are not warped, and clamps are holding the belt in place. Adjust the tension on the belt so that the eggs are evenly distributed on the belt. The belt should not sag causing eggs to bunch together, nor should it be too tight causing eggs to bounce. These items should be part of a regularly scheduled maintenance programme, which includes replacing parts before they fail. When designing a new system, factors to consider include the number of birds per nest, the system being used (manual or mechanical), and flock density.

#### Suggested dimensions:

- Manual nests: maximum five birds/nest entrance.
- Mechanical community nests: between 45-50 birds/nest entrance.
- Individual mechanical nests: 5.5 birds/nest entrance.

## 4. Feed and nutrition

It is difficult to correct eggshell quality once it deteriorates significantly. Evaluate eggshell quality regularly and if issues occur, check calcium availability and particle sizes, as well as phosphorous and vitamin D3 levels in the diet:

**Checking eggs at the hatchery helps determine the source of hairline cracks. Cracks can be visualised by candling.**



**A single belt measuring 40cm in community nest setup with egg counter at the end of the belt. Poorly adjusted systems can cause additional cracks in eggs.**

- An imbalance of calcium, phosphorous and vitamin D3 can cause weak eggshells.
- If the hens deplete calcium reserves, eggshell quality decreases and more cracked eggs occur. This could be the result of low or fluctuating calcium levels. In this case, check feed formulation as mixing or inaccuracies in formulation may be an issue.
- If limestone particles in the feed are too fine, calcium uptake may be reduced. This issue is more common in pelleted and crumbled feeds.
- Feed contaminants including Nicarbazin (concentrations of > 3-5ppm) and mycotoxins may have a negative effect on eggshell colour, quality, and hatchability.

## 5. Environmental issues including ventilation

Heat stress and ventilation issues that cause the house temperatures to rise above the thermo-neutral zone of the flock can induce heavy respiration. As a result, respiratory alkalosis can occur and may reduce eggshell quality.

## 6. Disease challenges

Disease challenges can have negative effects on the uterus and/or oviduct of the bird, ultimately impacting eggshell quality. Eggs should have a uniform colour and a shiny appearance if the cuticle is properly formed. If the oviduct is impacted by disease, the shell cuticle may be malformed or absent. If eggs are dull or colour is variable, there may be a disease challenge.

## Transportation

Egg transport is also critical and must be consistently monitored. This includes evaluating the condition of roads and transportation vehicles. Other monitoring includes supervising employees and preventing rough handling. Drivers should be made aware of the fragility of the eggs. Communicate with the hatchery regarding

the number of cracked eggs before and after delivery to assess transportation. Compare the number of cracked eggs per team member, as fast-working collectors often have the highest number of cracked eggs in the trays.

## Hatchery

In the hatchery, monitor the egg quality weekly, evaluating a sample of at least 600 eggs per breeder flock, divided among the houses. Evaluate and record the number of cracked, upside down, dirty, and thin-shelled eggs. Sample eggs or trays per house when it is possible to track the house origin of the eggs. Remove the eggs from the tray and evaluate them individually. Cracks that are not visible in fresh eggs can be identified by candling or after a few days in storage when water evaporates through the cracks.

If the eggs are evaluated on the farm and arrive at the hatchery in incubation trays, ready to incubate, cracked eggs can be counted and removed. However, if the eggs are sorted in the hatchery, the evaluation will be more complicated and must consider how to identify cracked eggs and their sources. Note that the automated equipment used for classification must be closely monitored, as it can be an important cause of cracks if machines are not properly adjusted. By evaluating and sorting cracked eggs, the hatchery can communicate with the farm and work together to improve the quality of the eggs.

## Conclusion

A fundamental factor for success is monitoring critical control points in the egg production process. Assessing and auditing the process along the production continuum will provide information about where the operation should focus to reduce cracked eggs losses. Consistent communication between the farm and hatchery is also very valuable to improve the quality and reduce damage to hatching eggs. ■

**A double belt egg collection system, each measuring 25cm with a separation in the middle, reduces hairline cracks and allows more eggs to accumulate on the belt, an important process when working with egg packers.**

