Cull Eggs:
What To Expect And How To Reduce The Incidence
Introduction

Over the years, several Hybrid customers have inquired about the number of cull eggs to expect from a flock of Hybrid breeder hens, especially new customers that may not have much experience with Hybrid stock and are setting internal company standards or goals for turkey production and personnel performance. With this in mind, the Hybrid Technical Service team solicited data from customers with Converter parent stock (PS) hen flocks that categorized the number and type of cull eggs produced throughout lay. This Info Sheet will summarize these data and try to characterize the incidence and impact of cull eggs within the “Average” Hybrid parent stock hen flock.

The Data

The numbers summarized here represent eggs that were laid over a 3 year period from 2005 through 2007. Ten companies participated in this data set, all from North America (USA & Canada) representing the Eastern, Central and Western regions of the continent. The number of PS breeder flocks equaled 91 and included flocks that began laying in every calendar month of the year. So, the data set is diverse and literally represents year round egg production for the 3 year period. The average flock size within this summary was over 10 thousand Converter breeder hens for a total that exceeded 900 thousand PS hens over the data collection period. The total number of hatching eggs produced by these hens exceeds 88 million eggs.

Egg Production

The onset of egg production in the turkey breeder hen requires that 3 basic criteria be met. The hen must have achieved an AGE sufficient for sexual maturity, she must have attained a critical BODY WEIGHT or body mass, and she must be exposed to a sufficiently long DAYLENGTH (photoperiod) to trigger photoreceptors in the brain that release endocrine cues which create a cascade of events within the hen’s body that cause the initiation of egg production. Just as there is individual variation between hens of a given breeder flock, each and every breeder flock will also perform differently since our ability to coordinate the achievement of all 3 criteria at the same time and with the same intensity will vary by flock and by season.

Once egg production is initiated, it is also important to remember that all hens do not respond with the same urgency or with the same intensity. Our ability to maintain uniformity within a flock for these criteria (age, weight, & sensitivity to light) dictates to a great extent our success in achieving satisfactory egg production for the entire flock of hens. In production, our ability to monitor the egg laying patterns of each hen within a flock is normally limited. Therefore we tend to report egg production data temporally (by collection time, by day, by week, etc.) and for the entire flock of hens as a collective unit. Thrown together, the subsequent egg production of a given flock of PS hens can be characterized graphically as in Figure 1 below.

Figure 1. Converter Hen Egg Production

Depending upon the season and individual performance, flocks may be kept in production from 26 to 32 weeks of lay. The level of production, cost of and demand for eggs, along with fertility and hatchability of eggs laid all play a role in deciding how long hens will continue to lay eggs during a production cycle.
Cull Eggs

While egg production in most flocks is described by the number of hatching eggs or settable eggs, all hens will produce a total number of eggs to include a small percentage of Cull Eggs (eggs not suitable for sale or incubation). By the third week of egg production the number of cull eggs for a flock of hens should be around 5% of total eggs decreasing over the next couple of weeks to between 4.0 and 4.5% (Figure 2).

The eggs comprising this percentage of culls can be loosely categorized into 5 different groups: small, double yolk, cracked, poor quality and floor eggs. A description and characterization for each of the 5 groups is included below.

Small Eggs

Every company makes a decision regarding size constraints for egg weight. Most integrated organizations will establish 70 grams as a minimum acceptable egg weight while other hatcheries might “raise the bar” to 72 or even 74 grams in an effort to improve poult uniformity and increase hatchling weight. Regardless of the threshold, conventional wisdom supports an increase in egg size early in the first clutch of turkey hens. This increase in egg weight is demonstrated again here as the number of small eggs during the first week of lay averages over 12% of the very first eggs produced, then plummet to below 1% of all eggs laid by the 3rd week of lay.

Although the embryo viability within these first eggs is very good, the smaller egg and thicker shell make it difficult to incubate these eggs uniformly when comingled with larger eggs from older hens. In single stage incubators it is possible to establish unique temperature and humidity profiles that produce optimum quality poults from the smaller eggs.

Lighting hens at younger ages or at smaller weights relative to published Breed Goals can often lead to an increased percentage of small eggs as hens come into production. By 6 weeks of egg production most flocks should produce less than 0.5% small eggs and this percentage continues to decline as hens get older and their average egg size increases.
Double Yolk Eggs

Like small eggs, the incidence of double yolk eggs ( Doubles) often starts high and decreases as lay progresses. When 2 follicles (yolks) are ovulated simultaneously, both will be incorporated into a single egg, usually resulting in a very large egg. Both follicles are often fertile but rarely go to term (hatch) and very rarely produce a viable poult. Therefore, these eggs are traditionally excluded from settable hatching eggs and are listed as culls.

The initial likelihood of producing Doubles is greatest if hens are overweight when egg production commences or if hens are “Super” stimulated by increases in day length and/or light intensity. It is not uncommon to see initial Doubles around 1.5%, reaching a maximum incidence around the time of peak egg production then trailing off toward 0.5% by the end of first cycle egg production (Figure 3).

Cracked Eggs

The causes for cracked eggs are usually mechanical. Nesting equipment, bird handling practices, nest density, and egg collection/transport/sanitation are most often involved (Photo 1a). For this reason the incidence of cracked eggs is fairly stable, but probably offers the greatest opportunity for improvement among the 5 classifications of cull eggs. This data set shows that the highest percentage of cracked eggs occurs during the first week of lay when hens are learning the nests and establishing behavioral patterns (Figure 3). Thereafter, the percentage of cracked eggs drops to around 1.5% until late in lay when eggs get bigger and shells become thinner.

There has been much discussion about the influence of mechanical versus wooden nests on cracked eggs with plenty of data supporting each system. Monitoring the incidence and rewarding improvement almost always pays dividends in this category.

Figure 3. Double & Cracked Eggs by Week

![Double & Cracked Eggs by Week](image)

Photo 1. Cracked & misshapen eggs

![Photo 1a](image) ![Photo 1b](image)
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Poor Eggs

Eggs reported in this classification seem to be varied in cause and appearance. It becomes almost a miscellaneous grouping for eggs that do not fit other categories. Poor eggs would include flat sided eggs, when 2 separate eggs arrive in the uterus (shell gland) at different times but are being calcified simultaneously (Photo 1b). Held eggs might appear in this group where an egg is fully formed and ready to be laid near the end of day light but held in the oviduct overnight and laid the next morning. This results in extra calcification and appears white and chalky compared to a normal egg.

The incidence of poorly formed eggs is normally low early in the production cycle and approaches 1.0% by 16 weeks of lay (Figure 4). wrinkled, dimpled, and membrane eggs (laid without a shell) normally are grouped into this category of cull eggs but account for only 12 to 25% of all cull eggs. Delaying inseminations until later in the afternoon may reduce the incidence of poorly formed eggs. Also, certain health related issues such as viral infection by adenovirus or paramyxovirus can cause a sudden drop in egg production and also affect egg shell quality with similar symptoms.

Floor Eggs

Eggs reported as floor eggs are the 2nd least likely cause for culling with small eggs having the lowest incidence. Floor eggs account for only about 0.5% of all eggs produced and result when hens lay their eggs outside the nest (Figure 4). These eggs appear dirty from being laid on the floor and often increase when hens are trying to go “Broody” (accumulate eggs and set on them). Training the hens to use the nest properly, early in lay, is the most effective means of preventing floor eggs. Fencing off corners and eliminating dark areas in the barn will also discourage hens from laying eggs on the floor while also reducing broody tendencies.

Photo 2. Dirty & stained eggs

Floor eggs usually appear dirty (Photo 2) and are often contaminated resulting in eggs that “explode” during incubation or produce poultls that may be contaminated with bacteria which subsequently contaminate other poultls that are hatched in the same machine. The number of floor eggs may be higher if the hen per nest ratio is higher than 5.5 hens. Floor eggs should never be saved for incubation and good staffing and pen design will help minimize these eggs.
Combined

Cull eggs represent a financial loss to settable egg production. Most cull eggs contain a viable embryo but are afflicted with size or shell quality problems.

Combined, cull eggs may account for as much as 15 to 18% of all eggs produced during the first week of egg production. Bearing in mind that egg production during the first week is only about 25%, then 15% culls of 25% production may not represent huge numbers of eggs. Thereafter, cull eggs normally stabilize around 4% of all eggs with some flocks demonstrating more or less problems.

Small eggs and double yolks tend to be more of a problem early in lay while poor quality and cracked eggs present more of a risk later in the egg production cycle. Cracked eggs represent 35 to 40% of all cull eggs and probably offer the greatest opportunity for improving overall cull numbers.