

WHY MEASURE EGG WATER LOSS?

- The porous eggshell acts as a semipermeable barrier, permitting oxygen to enter while allowing water and carbon dioxide to exit. This process of water loss causes the egg to lose weight and the air cell to enlarge during incubation.
- The size of this air cell at internal pipping is crucial, as it supplies the air that inflates the chick's lungs prior to pipping the shell.
- To manage this process, water loss is best assessed by weighing the eggs before setting and again at transfer, then calculating the weight loss. Routine monitoring of egg water (weight) loss is therefore the most effective way to ensure incubator humidity is correct, using the egg itself to guide adjustments.

OPTIMUM EGG WATER LOSS

When incubated correctly, eggs typically lose 10.5–12.5% of their weight between lay and transfer in the hatchery at 18 days.



Water Loss Too Low

Air cell is too small, preventing the embryo from inflating its lungs sufficiently.

Action: Decrease humidity in the incubator.



Water Loss Correct

Action: No action required.



Water Loss Too High

Air cell is too large, causing the embryo to become dehydrated.

Action: Increase humidity in the incubator.

Note - A small amount of water (typically 0.5% per week of storage) is lost from the egg during storage. This water loss should be subtracted from the target weight loss during incubation (e.g., if eggs are stored for one week, the target weight loss between set and transfer at 18 days should be adjusted from 10.5–12.5% to 10–12%).

THE PROCEDURE FOR MEASURING EGG WATER LOSS

To measure egg water loss accurately:

- Monitor egg water loss using three incubator trays from each flock.
- Use a scale capable of weighing an entire setter tray of eggs with an accuracy of at least 5 g (0.2 oz).

Step 1 Label the empty trays for easy identification at future stages of incubation. Weigh each tray individually and record the weights.

Step 2 Fill the labeled trays with fresh eggs. Inspect for cracked or poor shell quality eggs and replace any defective eggs.

Step 3 Weigh the filled setter trays, recording both the total weight and the number of eggs in each tray.

Step 4 Place the trays into the setter, ensuring one is near the top, one near the middle, and one near the bottom of the incubator rack for balanced sampling.

Step 5 If eggs are candled before transfer, record the number of clear eggs in each tray, but do not remove clear or non-viable eggs from the sample trays.

Step 6 At 18-day transfer, re-weigh the trays of eggs and record their weights. Remove cracked or rotten eggs before weighing, record the count, and adjust calculations for average egg weight accordingly.

Note - The weights of setter trays within a hatchery can vary, especially if trays have been added or replaced since the original purchase. To account for these variations, it is essential to weigh each tray when empty, every time. This process can be more convenient if the empty trays are weighed after transfer, as they are already being emptied as part of the transfer process.



CALCULATING EGG WATER LOSS

$$\% \text{ Water Loss} = \frac{\text{Average fresh egg weight} - \text{Average egg weight at transfer}}{\text{Average fresh egg weight}} \times 100$$

For Example: Weight of empty tray = 1,205 g;
 Weight of full tray at set = 10,109 g; Weight of tray at transfer = 9,019 g;
 Number of eggs at set= 168; Eggs removed at transfer= 1 (rotten).

$$\text{Average Fresh Egg Weight} = \frac{\text{Weight of full tray at set} - \text{Weight of empty tray}}{\text{Number of eggs at set}} = \frac{10,109 - 1,205}{168} = 53.0 \text{ (g)}$$

$$\text{Average Transfer Egg Weight} = \frac{\text{Weight of full tray at transfer} - \text{Weight of empty tray}}{\text{Number of eggs at transfer}} = \frac{9,019 - 1,205}{168 - 1} = 46.79 \text{ (g)}$$

$$\begin{aligned} \% \text{ Water Loss} &= \frac{53.0 - 46.79}{53.0} \times 100 \\ &= 11.7\% \end{aligned}$$

Note: This calculation works with imperial measurements as well, provided the recommended precision level (± 0.2 oz) is maintained.

If eggs are not transferred and weighed at exactly 18 days, the calculated water loss should be corrected to 18 days to ensure accurate and reliable quality control. Use the following formula to calculate water loss corrected to 18 days:

$$\text{18-day Water Loss} = \frac{\text{Actual calculated water loss \%}}{\text{Actual number of days at transfer}} \times 18$$

For Example: If eggs are transferred at 19 days and the water loss is 11.7%, the correction would be:

$$\frac{11.7\%}{19} \times 18 = 11.1\%.$$

The example form below includes fields for recording chick yield data, as the two quality processes can be conveniently combined—refer to **“How To ... Measure Chick Yield”** for details.

Set Date	06/02/2025			06/02/2025			06/03/2025		
Transfer Date	06/20/2025			06/20/2025			06/21/2025		
Hatch Date	06/23/2025			06/23/2025			06/24/2025		
Farm	A			B			C		
Flock No.	1954			1942			1934		
Flock Age (Week)	26			38			46		
Egg Age (Week)	6			4			7		
Setter	1			2			3		
Tray	2 (Top)	8 (Middle)	15 (Bottom)	2 (Top)	8 (Middle)	15 (Bottom)	2 (Top)	8 (Middle)	15 (Bottom)
# of Eggs	168	168	168	168	168	168	168	168	168
Wt. of Empty Tray (g)	1000.2	1005.3	1000.1	995.3	1010.7	1000.7	1005.4	1000.4	990.8
Wt. of Full Tray (g)	9883.1	10113.2	9609.4	10808.6	10477.9	11310.1	11826.7	11475.6	11972.2
Mean Set Egg Wt. (g)	52.87	54.21	51.25	58.41	56.35	61.37	64.41	62.35	65.37
# of Eggs Transferred	166	168	167	168	168	167	168	168	166
Transfer Egg Wt. (g)	8752.3	9014.1	8541.5	9852.7	9496.3	10165.1	10201.5	9978.8	10159.1
# of Chicks Hatched	142	145	140	143	137	141	140	144	146
Total Net Chick Wt. (g)	5110.6	5318.6	4818.8	5800.1	5381.4	5982.6	5950.0	5860.8	6275.1
Mean Transfer Egg Wt. (g)	46.7	47.7	45.2	52.7	50.5	54.9	54.7	53.4	55.2
Mean Chick Wt. (g)	36.0	36.7	34.4	40.6	39.3	42.4	42.5	40.7	43.0
Moisture Loss (0–18 days)	11.7	12.1	11.9	9.7	10.4	10.6	15.0	14.3	15.5
Chick Yield (0–21 days)	68.1	67.7	67.2	69.4	69.7	69.1	66.0	65.3	65.8

INTERPRETING RESULTS

The graph below shows the water loss results from 3 different incubators:



Incubator 1 has water losses within the ideal range.

No action required.

Incubator 2 has lower water loss but within the acceptable range.

Action: Check the water loss from this incubator again, make sure humidifiers are working correctly, and if it is still low, decrease incubator humidity.

Incubator 3 has very high water loss.

Action: Make sure there were no cracked eggs on the trays (these will lead to an artificially high estimate of water loss), make sure humidifiers are working correctly, and increase incubator humidity.

Note - If cracked eggs are found to be present, the data for that tray should be ignored and a repeat measurement taken.

If the 18-day weight loss consistently falls outside the target of 10.5–12.5%, then humidity in the setter will need to be adjusted.

- **For multi-stage setters:** A 5% change in humidity (equivalent to 1°C/2°F wet bulb) can alter weight loss by approximately 1%.
- **For single-stage machines:** Opening the vents one day earlier or one day later can either increase or decrease weight loss by around 0.5%.

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