Research article

The truth about turning angle and turning frequency

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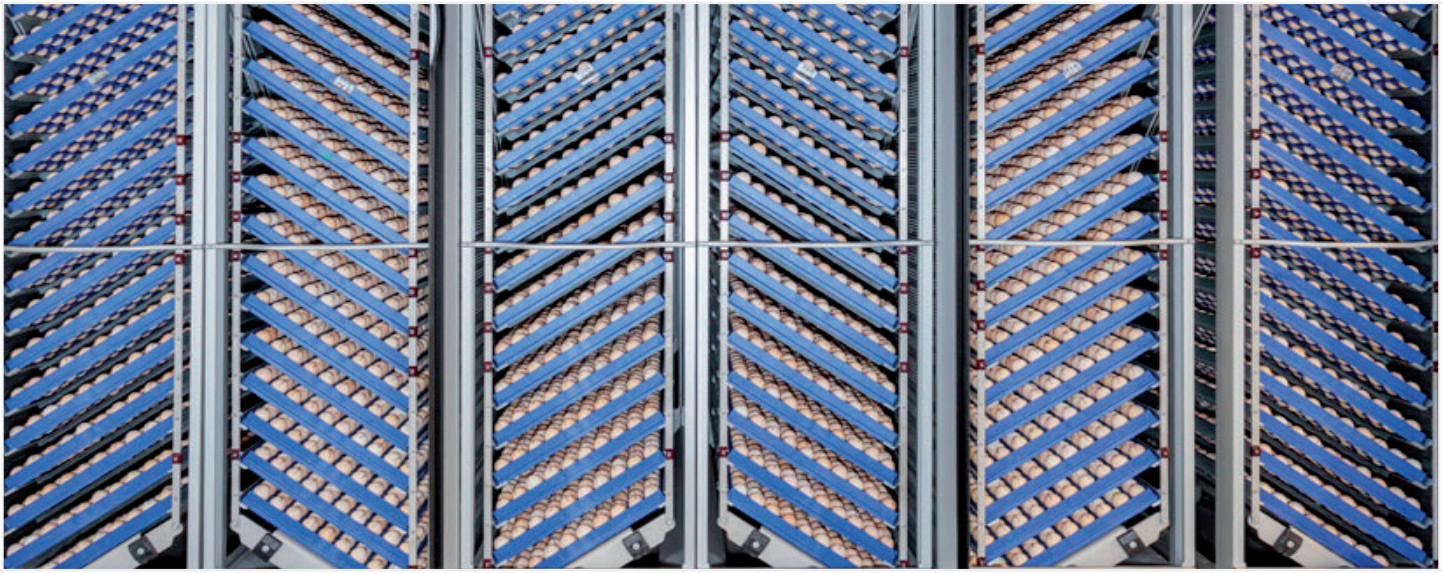


Increasing production efficiency

Hatcheries constantly strive for high hatchability and excellent chick quality in an efficient production process. As the world population increases and demand for poultry products grows along with it, the importance of efficient production is greater than ever. One way to improve production efficiency within the hatchery is by increasing the number of great quality chicks that hatch from existing equipment. This may be done by increasing the egg holding capacity of the setter trolley which results in a larger number of eggs that can be placed in the same incubator. This could mean that hatchery capacity can be improved significantly without requiring extra floor space or incubators.

Egg turning

A consequence of increasing egg holding capacity in a setter trolley is that the egg trays are spaced more closely together than in a standard setter trolley. As a result, the turning angle of the egg trays will have to be reduced to compensate for the loss of space between egg trays. Egg turning is necessary for normal embryo development. In unturned eggs, it is often seen that embryos stick to the eggshell membranes and an increase in malpositioning is common. Turning is furthermore thought to enhance a free flow of nutrients within the egg, which may result in better nutrient uptake by the embryo. Failure to turn hatching eggs may therefore result in decreased hatchability and chick quality at hatching. However, it is not completely clear which minimum turning angle is required to see the benefits of egg turning. Various studies have looked at the effect of turning angle during incubation on hatchability, but many compared quite extreme turning angles such as 30° versus 45° and a lot of literature is not very recent. HatchTech's research team therefore performed two experiments focusing on turning angle to determine how far turning angle can be decreased without negative effects on embryonic mortality, hatchability, and chick quality at hatching.

Turning angle experiments

In two experiments, Ross 308 eggs from one prime parent flock were used. To eliminate confounding effects of temperature, all eggs were incubated at low density with 2,400 eggs per setter trolley and per treatment. Eggshell temperature (EST) sensors were attached to 4 eggs per treatment and machine temperature was automatically adjusted to maintain a constant EST of 100°F throughout incubation.

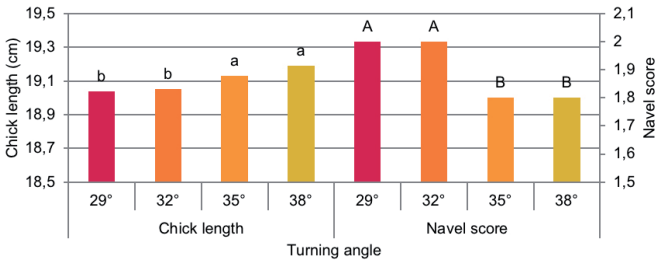
In the first experiment, effects on hatchability and chick quality of 4 turning angles were investigated: 38° (which is the current standard turning angle in HatchTech's setter trolleys), 35°, 32°, and 29°. Unhatched eggs were opened to determine fertility and embryonic mortality. Embryonic mortality did not differ between treatments, but hatch of first grade chicks from set eggs was higher for 38° and 35° than for 32°. It was

furthermore higher for 38° than for 29°. Percentage of second grades, on the other hand, was higher for 29° and 32° than for 38°, with 35° intermediate.

	1st grade hatchability (% of set eggs)	2nd grade hatchability (% of set eggs)
29°	90.5bc	2.0a
32°	90.3c	1.9a
35°	92.2ab	1.3ab
38°	93.1a	1.1b

To look at chick quality in more detail, chick length and navel score were determined within 6 hours after the moment of emergence from the eggshell. Chick length is a measure of frame development and chick quality, and it correlates positively with yolk free body mass. It was found that chicks from eggs that had been turned at an angle of 35° or 38° were longer than chicks that had hatched from eggs turned at 29° or 32°. This indicates that chicks from eggs that had been turned at an angle of at least 35° were more developed.

Navel score was scored from 1 to 4, with 1 being a perfectly closed navel and 4 being an unclosed navel that qualifies a chick as second grade. Navel score tended to be lower (better) for chicks from 35° and 38° eggs than for 32° and 29° eggs, indicating higher chick quality at larger turning angles. A better navel score indicates improved navel closure, which means that chicks are better developed and run a lower risk of yolk sac infections.



The first experiment showed that hatchability and chick quality in eggs turned at 35° did not differ from that of eggs turned at 38°. However, hatchability and chick quality and development were found to decrease for turning angles of 32° and lower, incidating that there is a lower limit to what turning angle can be used in hatching eggs.

In a second experiment, the two most extreme turning angles (29° and 38°) were again tested. This time, both turning angles were either turned hourly or 4 times per hour to see if increasing the turning frequency could lessen the negative effect of lower turning angles on chick quality and hatchability. This resulted in 4 treatments: 29° turned hourly, 29° turned 4x hourly, 38° turned hourly, and 38° turned 4x hourly. Again, eggs were incubated at a constant EST of 100°F.

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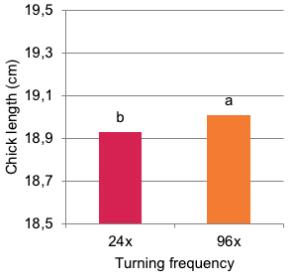

Conclusions

Reducing the turning angle of setter trays from 38° (HatchTech's current standard) to 35° did not affect embryonic mortality, hatchability, or chick quality. However, reducing the turning angle to 32° or less may result in decreased hatchability and chick quality. Care must therefore be taken to ensure that the turning angle of setter trays does not drop below 35°. Increasing the turning frequency from hourly to 4x per hour resulted in longer, more developed chicks, possibly as a result of improved nutrient flow through the egg. This result was independent of turning angle and may therefore prove to be a simple way to further improve chick quality at hatching.

Turning angle: a turning angle of 38° and 35° result in equal hatchability and chick quality, but a turning angle below 35° can have a negative effect on hatchability and chick quality.

Turning Frequency: turning eggs 4x per hour instead of 1x per hour improves chick quality.