

Speaking from Experience

First-hand Experiences with Single Stage Incubation

By John Metzger

I'd like to share with you my experiences with single stage incubation this year and how it has improved my hatch by 4-18%.

Definition: Single stage incubation means that all the eggs in one incubator are of the same age. Each set of eggs has its own incubator. Most

game bird breeders use multi stage incubation which means you have several different ages in each incubator. Duck and turkey eggs take 28 days

to hatch. All ages given in this article are for ducks and turkeys. You would need to proportionately reduce them for other game birds.

Advantages of Single and Multi Stage Incubators

Single Stage

Incubator environment can be programmed to any points you want and changed at any time during incubation

Incubator can be cleaned and sanitized between sets

Easier to keep track of eggs as each week's eggs are all in one machine

Easier control of carbon dioxide levels

Resulting chicks:

- lower cull rate in hatchery
- better feed conversion
- heavier when they hatch
- lower one week mortality

Shorter time between first and last chick to hatch

Trays are not accidentally left in the incubator and hatch there

Multi Stage

Simpler to monitor as only one temperature and humidity setting

Does not require as much cooling capability in the machine

Loss spread over several weeks if a machine fails and kills all its eggs (though single stage machines are normally newer with fewer problems and better alarm systems)

You can do all your incubation in one machine, single stage requires one machine per set

Background: We have a waterfowl hatchery that hatches ducks year round along with geese, wild turkeys and guineas in the spring. Last year I decided to invest in new single stage incubators. I ultimately chose Jamesway and am very happy with their machines. However, all major incubator manufacturers are now building single stage incubators – including Natureform with whom most of you are familiar.

Results: The only things we changed were our incubators and one hatcher. We did not change any other phase of bird management, sanitation, cooling or holding of the eggs, setting schedule or personnel. As you can see from the table, there was an improvement in hatch of fertile eggs for all birds. In addition, the birds were more uniform in their hatch time (which means the early birds did not have to

sit in the hatcher as long) and the quality of the birds was better. I cannot tell you how much of this improvement was due to single stage incubation and how much was due to Jamesway's superior technology and expertise – but I am very pleased with the results.

One of the effects of single stage incubation is more robust growth of the embryo and less weight loss in the egg during



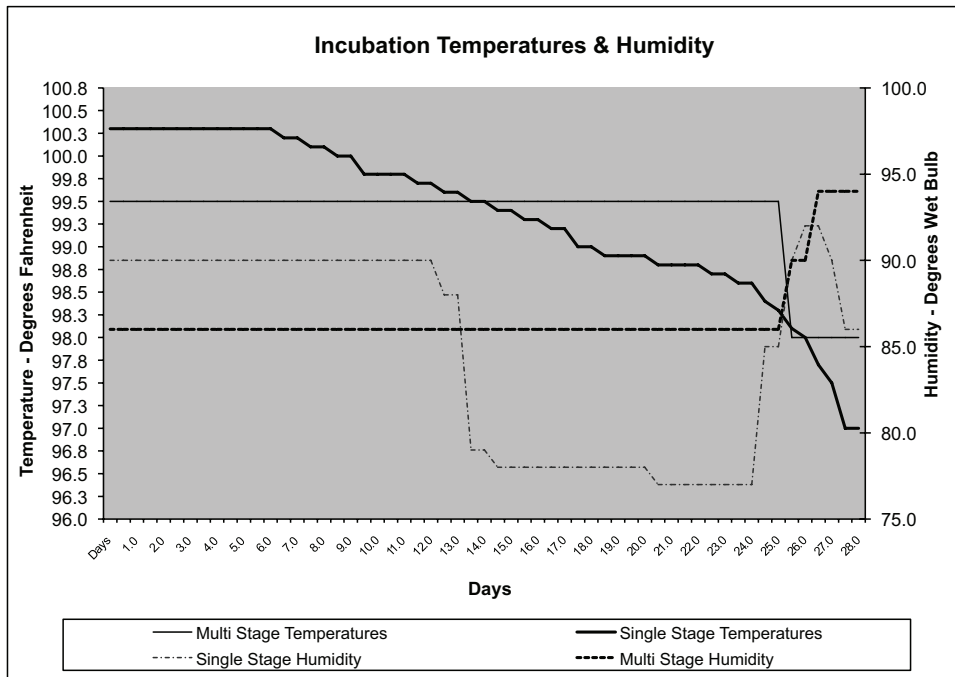
Mallard ducklings ready to be removed from their hatcher trays.

incubation. The normal rule of thumb was that a 15% weight loss was desirable during incubation. With single stage, the weight loss is closer to 9-11%. Therefore the embryo is heavier at hatch which leads to less of a problem with dehydration and a quicker start. Many chicken and turkey companies can justify the conversion to new, single stage incubators merely from the lower mortality the first several days and better feed conversion. Most game bird breeders may not notice the better feed conversion but if birds are converting better, you know they are healthier and more robust.

Profiles: The fascinating part of single stage incubation is that you can control all aspects of incubation during the incubation and hatching cycle. For Jamesway you can program up to twenty of these “profiles” in your machine. Each profile has its own set of temperatures, humidity and carbon dioxide levels during incubation. For example, you can use one profile for early in the season, another for mid season and another for the end of the season. Or you could have one profile for chukar, one for pheasant and one for quail. The following charts show the profile they recommend for waterfowl compared to normal single stage settings.

Improvability in Hatchability of Fertile Eggs

Pekin ducks	7.8%
Mallard ducks	2.0%
All other ducks	7.1 - 15.6%
Geese	10.5 - 18.4%
Wild Turkeys	4.5%
Guineas	6.3%



Temperature: With single stage machines you increase the temperature early in incubation and gradually drop it as the embryo grows. There is a feeling among broiler hatcheries that early deaths are reduced in eggs from older flocks by using these higher early incubation temperatures. As most game bird breeders only have one age of breeder flock, you can change your profiles as the season progresses so your early temperatures are higher later in the season.

Carbon Dioxide: From what I have learned, the control of carbon dioxide may be the greatest benefit of single stage incubation. You will note that the machine is entirely closed for the first eight days - all vents are completely closed. The desire is to have higher than normal carbon dioxide levels. The normal level of carbon dioxide in the air you are breathing now is about 800 ppm. The average level in a multistage incubator is about 3,000 ppm. You will see that the maximum allowed during the first 13 days of incubation is 8,000 ppm, after that it is reduced to 4,000 ppm and eventually 3,000 ppm. Organ and vascular development starts early in incubation and higher carbon dioxide levels promotes this

development. In addition, higher carbon dioxide levels help prevent the thinning of the albumen. Albumen tends to be thinner in eggs from older breeders and in eggs held for longer periods before setting. It also appears carbon dioxide thins the shell (more minerals going to the larger embryo) which allows easier hatching.

Control Priorities: The primary concerns of multistage machines are temperature and humidity. For my single stage machines, the main concerns are temperature and carbon dioxide. The humidity is the third item. If the humidity is too high, nothing is done as opening the vents to lower the humidity would reduce the carbon dioxide levels and a correct carbon dioxide level is considered more important than a correct humidity level. In very humid climates you can purchase dehumidifiers for Jamesway machines, but because of our drier climate that was not necessary for us. Due to the closed machine, humidity levels are higher than normal early in incubation but your profile allows you to drop the humidity later in incubation to make up for this.

Energy Usage: Single stage incubation is supposed to use slightly more energy, though we have not seen that yet.

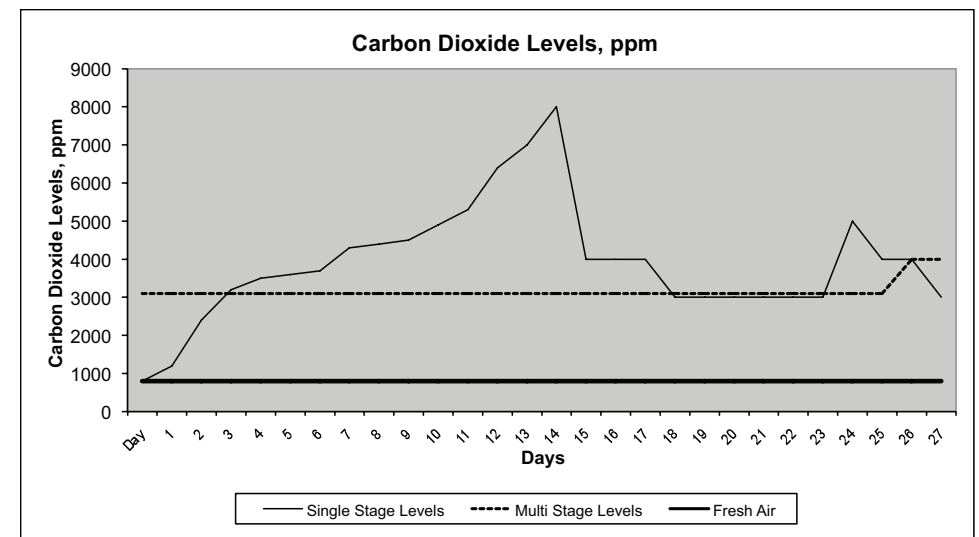
What can you do? If you are hesitant about jumping into single stage incubation with both feet for a complete season, Natureform suggests you try single stage with your first set next year. Simply close the vents for the first nine days of incubation, then go back to your normal multistage incubation procedures. That first set will have had elevated carbon dioxide levels the correct amount of time and the second set (assuming you set every seven days) will have had higher carbon dioxide for at least two days.

If you have sufficient cabinets, you can try single stage with your machines. Get some more thermometers and set up a schedule to change the thermometers as needed. You can begin with higher temperatures for the first week and then start stair stepping your temperatures and humidity levels down. Of course if you do convert to single stage, you should consult with your manufacturer as you may have to add better cooling capacity in your incubators as the

incubator will be filled with full term embryos prior to transfer. And if you are nervous about carbon dioxide levels, buy a simple tester.

Final Thoughts: Though these items have nothing to do with single stage incubation, setting turning frequency and fan speed are options on some new incubators. In the Jamesway machines you can set the turning frequency to every .25 hour, .5 hour, .75 hour, 1 hour, 1.5 hours, 2 hours or no turning. The Jamesway recommendation is to stop turning on day 22 for duck eggs. As turning is most critical the first week, you can increase the turning frequency if you want. You can also set fan speed. During early incubation when the eggs are not generating heat and the incubator is very uniform in its environment due to all vents being closed, you can reduce the speed of the fans to 75% to save electricity.

If you have any questions concerning single stage incubation, contact your manufacturer. Or you can contact me at metzer@metzerfarms.com. I'd be happy to share my experiences and learn from yours! Good luck!



Days 1-8: Damper closed. These are typical levels we reach.

Days 9-13: Maximum level is 8000 but we normally only reach levels shown on the graph.

Days 14-28: Damper is controlled by carbon dioxide levels so level in incubator closely follows maximum allowed.