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Poultry Housing Tips

Recent Developments in Wind-Chill Charts

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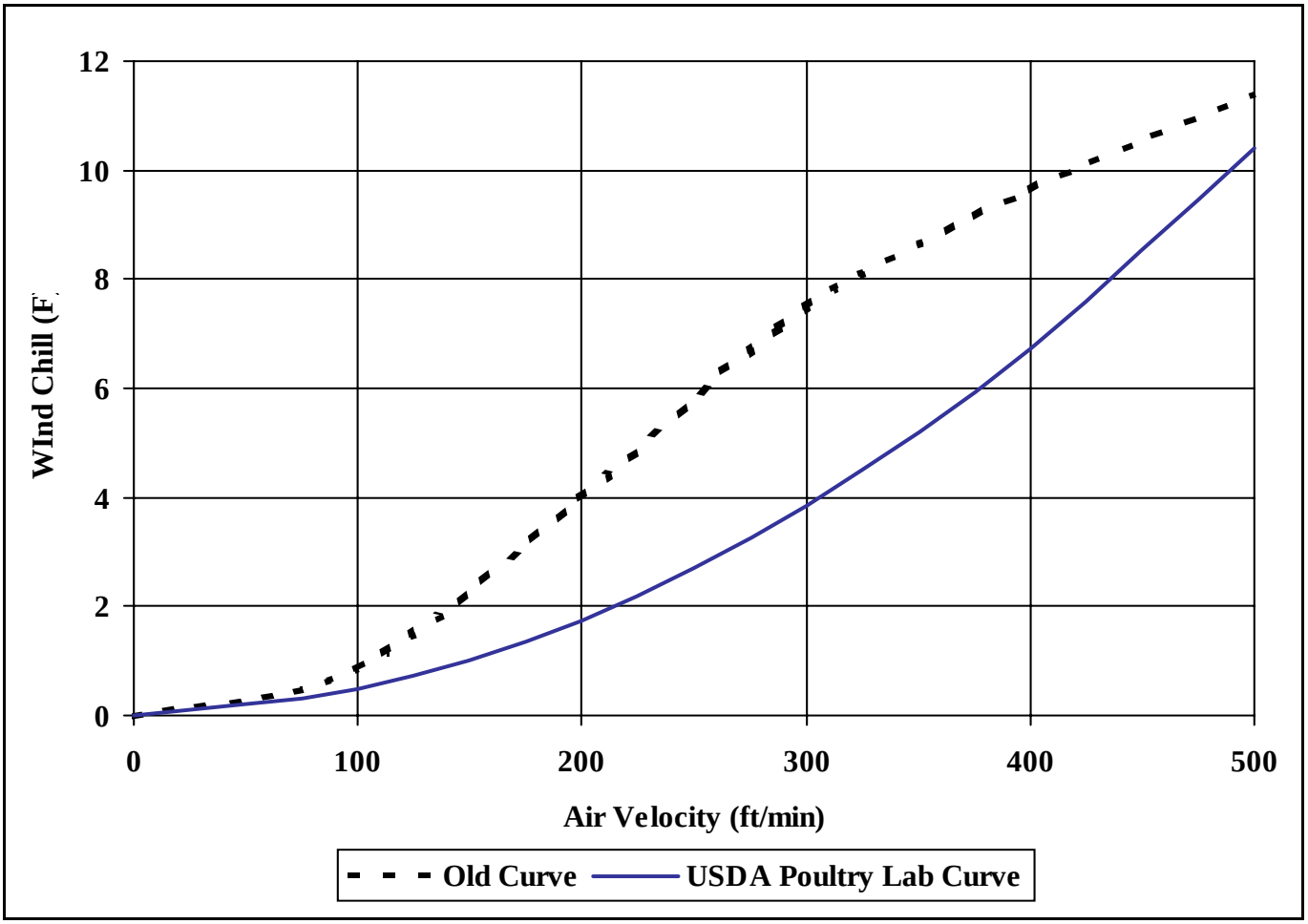

Figure 1. Wind chill Chart for Seven-Week-Old Broilers

Air movement is very effective at cooling birds during hot weather. As air moves over a bird's body, heat is removed from the bird's, making it feel cooler, thereby increasing feed consumption as well as bird weight. The cooling effect produced through air movement is often referred to as the *wind chill effect*. The challenge for producers is trying to

determine how much air movement equals how much cooling so they can determine whether they are keeping the proper house air temperature. For instance, at 80ºF is 400 ft/min air speed six degrees cooling or sixteen degrees cooling? If 400 ft/min air speed produces only six degrees of cooling, the producer may want to turn on additional fans to get more air speed and therefore more cooling. Conversely, if 400 ft/min produces sixteen degrees cooling, the producer may want to turn off a couple of fans to reduce cooling to prevent birds from being chilled and electricity from being wasted.

To aid producers with these management decisions wind chill charts have been developed. The wind chill charts for the most part were developed from information taken from a number of different studies and/or field experiences. In many ways they should be viewed as a best guess based on the information currently available. They were in no way a precise method of determining the amount of cooling produced through air movement and were basically developed to give producers a point from which to start. Adjustments in wind speed, (i.e., number of fans operating) could then be made based on bird behavior.

Studies now being conducted at the USDA Poultry Research Laboratory at Mississippi State University by Dr. Berry Lott and colleagues aim to more precisely determine the wind-chill effect produced at different wind speeds. In these studies birds are grown until three weeks of age at common industry temperatures after which they are split up in to groups that will be grown for the remainder of a seven week grow out in pens with still air or pens with different amounts of wind speed. The birds which are to be grown in still air are separated again into smaller groups which will be grown at different air temperatures. For instance one group of birds will be grown at 65ºF, another 67ºF, another 68ºF, all the way up to 85ºF. The birds in the air movement group are all grown at 85ºF, but will be subdivided into groups that will be provided different air speeds, i.e, 200 ft/min, and 400 ft/min.

Each week weight gains and feed conversions are determined for each group. Then the weight gains and feed conversions for the birds grown at 85ºF and different air speeds are compared to those grown in still air. If the birds grown at 85ºF and 200 ft/min had a weight gain like those which were grown at 80ºF and still air, the wind chill effect produced by the 200 ft/min air speed would be five degrees. The process is continued for different wind speeds and a fairly accurate wind chill curve can then be developed.

Figure 1 is a wind chill curve developed from research conducted with seven-week-old birds at air speeds of 200 and 400 ft/min as well as the wind chill curve used by many producers today. At the higher wind speeds the curve is fairly similar to that used in the past, namely 400 to 500 ft/min is about a 10ºF wind chill effect. The biggest difference between the two curves is the shape. The older curve is more straight, flattening off slightly at the higher air speeds. The curve developed based on the recent work done at the USDA Poultry Research Lab is more exponential in shape. As a result the old curve indicates that there may only be a three degree difference in wind chill effect when air speed is increased from three to four hundred feet per minute. The USDA Poultry Research Lab curve indicates a much larger difference of about six degrees. This tends to back up reports from the field that large broilers in houses with 500 ft/min air speeds perform significantly better than those grown in houses with air speeds of only 300 ft/min.

The new curve puts a new emphasis on keeping fan shutters clean and belts tight. A number of studies have shown that exhaust fans with dirty shutters move 20 to 30% less air than those with clean shutters. As a result, a house may start out with 500 ft/min air speed, but over the course of the growout as dust collects on the shutters the air moving capacity of the fans will gradually decrease. If the grower does not clean the shutters, by the end of the growout the air speed in the house could drop to 350 ft/min or less. This could result in a reduced cooling effect of six degrees or more when cooling is needed the most.

It is important to note that part of the reason the old curve tended to flatten off at higher air speeds was due to the assumption based on earlier work that air speeds of 600 ft/min or better were detrimental. Was this assumption wrong? The USDA Poultry Research Lab Curve tends to indicate that 600 ft/min would be significantly better than

400 ft/min. To answer this question the USDA Poultry Research Lab is currently conducting studies with birds at 400 and 600 ft/min air speed. Preliminary results show that, in fact, cooling increases significantly when the air speed is increased to 600 ft/min, and as a result broiler performance is improved.

Does this mean that tunnel houses should have an air speed of 600 ft/min? It is far too early to say. The fact is that the test results are very preliminary. Yes, it may be possible to get more cooling, but will the cost of purchasing and operating additional fans and evaporative cooling pads provide a reasonable return on your investment? Probably the best thing that can be said about the 600 ft/min research is that the fear that some producers have about too much air speed over older birds during hot weather is probably unfounded.

Which curve is the "right" curve? It is difficult to say, more work still has to be done. Different air temperatures, relative humidities, bird ages, and air velocities will alter these curves. We are still a long way off from saying exactly how much cooling is produced by different amounts of wind speed. For the near future the wind chill curves are intended to give a producer a point to start from. As research continues, we will get a better and better understanding of how air speed affects bird cooling and therefore performance.

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