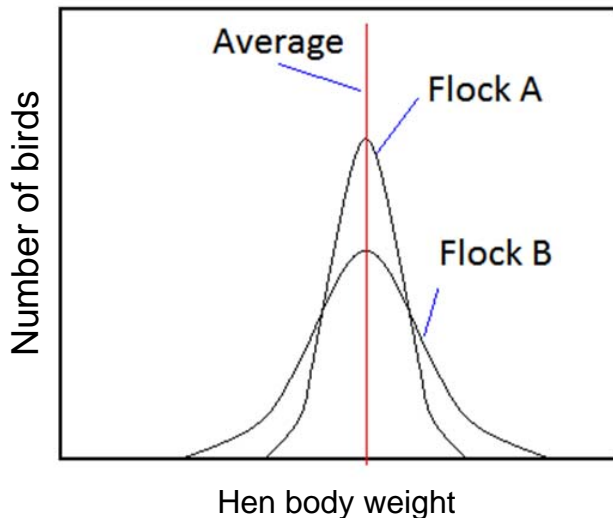# WE ARE ONE: FLOCK UNIFORMITY AND HOW TO CALCULATE IT

Figure 1. Distribution of hen body weights

Keeping a flock in the ideal condition for egg production can be tricky, and is very difficult without good data. Many farmers use average body weights compared to the breeder recommendations as a guide to flock status, however, knowing if you have good body weight uniformity is another valuable management tool.

In any flock some birds are lighter or heavier than the average body weight. Figure 1 shows the distribution of body weights from two different flocks. Both flocks have the same average weight, however, Flock A has more birds with body weights closer to the average than Flock B. The higher body weight variability in Flock B will make management decisions more difficult. When Farmer A makes a decision about lighting, feed amounts or diet phase, it will be the correct decision for most of the birds. The higher variability in flock B means that fewer birds will be getting what they need for ideal egg production.

Uniformity can be calculated by individually weighing at least 100 birds. Individual bird weights are necessary to measure how much each bird's body weight differs from the flock average weight. This calculation is called the deviation. A good quality sample is a selection of birds which represents the entire population. Here some rules for getting a good sample:

1. Weigh at least 100 birds. This is a large enough number that you will see the diversity within your barn, but not so many that it will take too long to collect the information. Anything less than 100 will likely not be representative of the flock, weighing more than 100 birds will not increase the quality of your data.
2. Record the individual weight of each bird. Group weights are of no value when calculating flock uniformity.
3. Sample birds from all over your barn. Weigh all of the birds in a cage and select cages throughout the entire barn. Every barn has warm and cool spots so try to weigh birds from the different micro-environments. Some common areas that often have distinct temperatures are: close to the ventilation intakes and exits, close to the door, against an outside wall, in the middle of the barn, etc. Sample some birds near the start and end of the feed line. If you have multiple tiers of cages, be sure to weigh some birds on the top levels, some on the bottom and some in the middle cages.
4. Weigh rapidly growing pullets at least every two weeks, and mature birds every month to ensure that you have current and accurate weights. If you are making adjustments to the body weight curve, you will want to measure more frequently to verify your management decisions.

Once the data is collected, what do you do with it?

Some scales will display averages and uniformity right on the screen, while others do not; in any case we recommend entering all of your data into a computer. You may be able to download the weights directly from the scale or will need to manually enter the weights you've recorded into the computer. It is important to graph your information to look at the body weight trends which will guide your management decisions. You may also want to keep track of which cages you weighed, because the data can sometimes identify problem areas that have heavy or light hens. For instance, we have found that birds closer to radiant heating sources tend to be heavier than birds further from the heat source. These body weight trends may be related to other management issues (temperature fluctuations, feed distribution, water flow). There are many computer software programs that will allow you to store data. We recommend Microsoft Excel, as this program will do many of your calculations for you.

The easiest way to calculate how close the bird weights are to the average flock body weight is to calculate the Coefficient of Variation (C.V.) using Excel. This is a calculation of how different the individual body weights are from the average. Smaller C.V.'s (less than 10) mean there are more birds with body weights closer to the average. C.V. is calculated by dividing the Standard Deviation of the sample body weights by the average of the flock weight and multiplying by 100.

$$Coefficient\ of\ Variation(C.V.) = \frac{Standard\ Deviation}{Average\ Flock\ Body\ Weight} * 100$$

Fortunately, Excel can do the calculations for you. The Average flock body weight is calculated by typing "=AVERAGE(" into an empty square and then selecting your weights. In the example the average is 1616.2
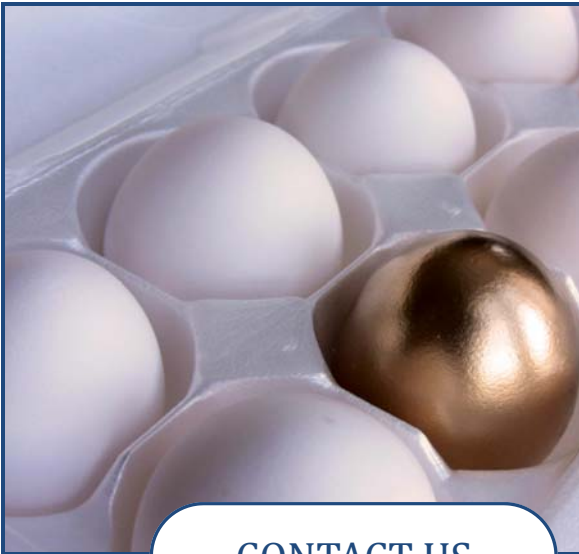
	A	B	C	D
1	Bird #	Weight		
2	1	1745		Average
3	2	1657		=AVERAGE(B2:B11)
4	3	1444		
5	4	1796		
6	5	1680		
7	6	1687		
8	7	1489		
9	8	1380		
10	9	1575		
11	10	1709		

$$Standard\ Deviation = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

The standard deviation formula may look a little scary, but once you break down each of the parts, it is fairly simple to calculate. The $\bar{X}$ represents the average body weight. The x represents each individual body weight. You will need to subtract the individual weight of each bird from the average weight. For bird #1 in the Excel examples, the calculation would go like this: (1745-1616.2) = 128.8. Some will give you a negative number. That's ok, because now you will square (multiply it by itself) that number. For bird #1 in the Excel examples, the square is 16589.44. Repeat this step for every bird that you weighed. The ∑ symbol tells you to add up all of the squared numbers (171597.6 using our excel example). The n (excel example is 10) is simply the number of birds you weighed. Next divide the sum of the squared numbers (171597.6) by the number of birds, less one. Our example will give a result of 19066.4. Take the square root of that number and you will have calculated the standard deviation (138.08).

	A	B	C	D
1	Bird #	Weight		
2	1	1745		Average
3	2	1657		1616.2
4	3	1444		
5	4	1796		Standard Deviation
6	5	1680		=STDEV(B2:B11)
7	6	1687		
8	7	1489		
9	8	1380		
10	9	1575		
11	10	1709		

Or perhaps you're not really a fan of math problems? No worries. Standard Deviation can be calculated by Excel very easily. To calculate Standard Deviation, type "=STDEV(" into an empty square and then select your weights. Once you have the standard deviation and the average, the C.V. value can be calculated.

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	A	B	C	D	E	F
1	Bird #	Weight				
2	1	1745		Average		
3	2	1657		1616.2		
4	3	1444				
5	4	1796		Standard Deviation		
6	5	1680		138.0811356		
7	6	1687				
8	7	1489		Coefficient of Variation		
9	8	1380		=Standard Deviation/Average x100		
10	9	1575		=D6/D3*100		
11	10	1709				

$$C.V. = \left(\frac{138.08}{1616.2}\right) * 100$$

In this example the C.V. value is 8.5%. This means that the weights of these birds vary from the average weight by 8.5%, and the flock is quite uniform. Ideally, the body weight C.V. should be below 10%, increasing the likelihood that your management decision will be appropriate for most of the flock.

Weighing birds, calculating the variation and graphing the data are valuable management tools. These tools allow you to more clearly understand the growth trends and avoid over-reacting to a single data point.

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