Technical Note
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Quality Control with the Use of Checkweighers

The primary purpose of a checkweigher is to measure the weight of products and reject unacceptable under or overweight products. In addition to measuring product weight, checkweighers can be also used for quality control purposes. This paper introduces how to improve the quality of your product using a histogram.

【1】Statics of checkweighers

First, let's take a look at statistical data displayed on a checkweigher's screen. Figure 1-1 shows basic statistics such as average weight (X-bar), standard deviation (s), range (R), maximum weight (Max) and minimum weight (Min). The number of pass and defective products can also be viewed.

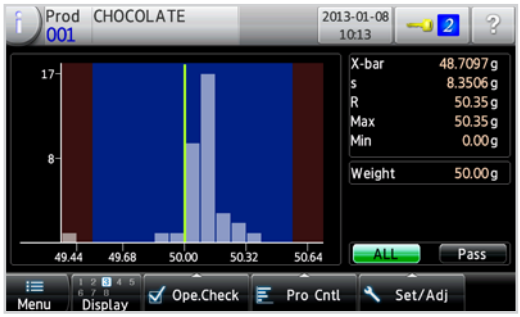

Fig. 1-1: Statistics display

Fig. 1-2: Histogram display

【2】What is a histogram?

A histogram is a graphical representation of data distribution. On a checkweigher display, a histogram is shown as Figure 1-2. A histogram is greatly related to standard deviation. When standard deviation is small (weights do not vary), the shape of the histogram becomes sharp bell-shaped curve. When standard deviation is large (weights vary), the shape of the histogram becomes flatter and less bell-shaped. An ideal shape for a histogram obtained in production sites is sharp bell-shaped curve as in Figure 2-1. For those who find it difficult to understand the concept of standard deviation, a histogram can become a helpful tool in obtaining the visual impression of how data is distributed.

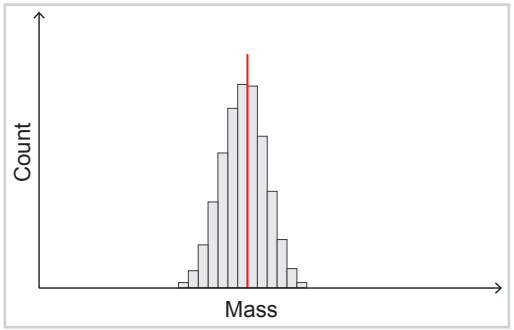

Fig. 2-1: Ideal histogram obtained in production line

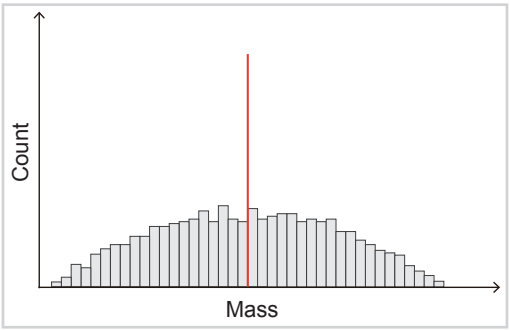

Fig. 2-2: Histogram when variation in data is large

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【3】Quality control with the use of checkweigher

Even though small weight variation may not affect the product quality (texture, taste, and the like), a sign of abnormality should be detected earlier. You can use a histogram for this purpose.

Let's look at an experiment using cheese-topped crackers (A and B) of 100 pieces each with different cooking time. B was baked for 1.5 times longer than A. The statistics of A and B are shown in Table 3-1. The standard deviation were almost the same between A and B, meaning there were no difference in data variation. Looking closely, you may find B having an area that are baked more than A but such difference is barely visible (Fig. 3-2).

	A	B
Average	13.289	12.940
Standard deviation	0.188	0.185
Minimum [g]	12.774	12.463
Maxmum [g]	13.723	13.331

Table 3-1: Results of experiment

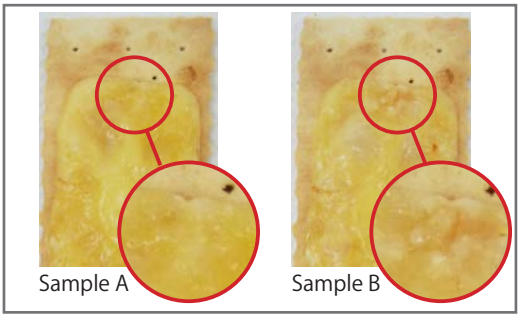

Fig. 3-2: Difference of appearance

Next, let's look at histograms produced from A and B. Both are bell-shaped but the distribution of B is skewed to the left compared to that of A (Fig. 3-3). This means the overall weight of B is lighter than A. In an actual production line, something similar could be observed not only when the oven temperature is higher than predetermined value, but also when the mixing ratio of raw materials is different from the specified one.

By comparing histograms, you would be able to find a sign of a possible problem with the oven or blending machine at an early stage. If you find something abnormal in your production line — for example, products look darker, larger, or swelling more than usual — check the histogram on your checkweigher screen. By checking the histograms, you would be able to deal with the troubles ealier.

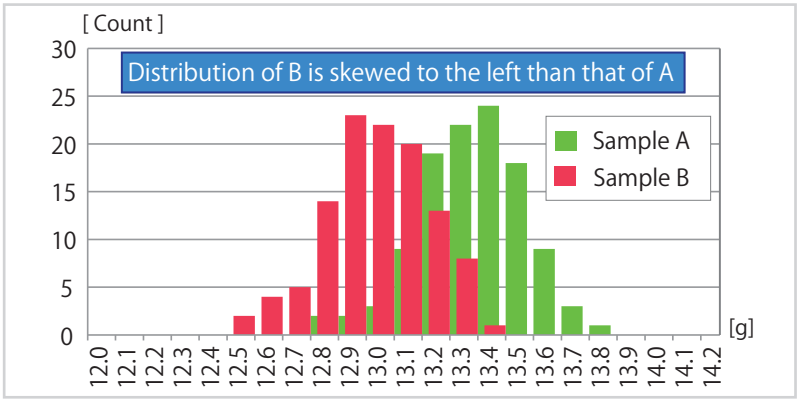

Fig. 3-3: Histogram Note: These graphs are produced with a spreadsheet software.

【4】Remarks

A histogram can be viewed easily on your checkweigher. We hope you will make use of it for improving the quality of your products, in addition to for checking product weight.

Next issue will introduce the factor of and the countermeasure against the double product error of a checkweigher.