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Wall thickness measurement for non-round bottles

Requirements for the production of lightweight bottles are increasing every day because lightweight bottles permit a reduction of melting energy and CO_2 emissions. From the glass production perspective, however, the possibility of breakage increases if proper quality control is not performed. One of the most important inspection functions for lightweight bottles is the on-line measurement of wall thickness. Naohiro Tanaka presents the latest machine innovation from Nihon Yamamura for non-round ware.

There are two types of wall thickness measurement device, a non-contact type employing optics and a contact type using probes. Both methods have their disadvantages. The optical method sometimes fails to guarantee 100% circumference inspection if the inside surface is not very smooth. On the other hand, the contact type employs a probe that is consumable because of constant contacts with the surface of the glass bottle.

When measuring the wall thickness of non-round bottles that are oval, rectangular or square in shape, however, there is no alternative but to select the contact type, although there are still many difficulties to overcome. One of the biggest problems is how to keep the probe in contact with the surface of the glass 100% circumferentially, especially if the revolution of the bottle during inspection is fast.

The Nihon Yamamura probe is attached to a specially shaped 'sponge' that features special elasticity, as well providing a solution to the problem outlined above.

A second challenge encountered is the existence of defects caused by the curvature differences of square ▸

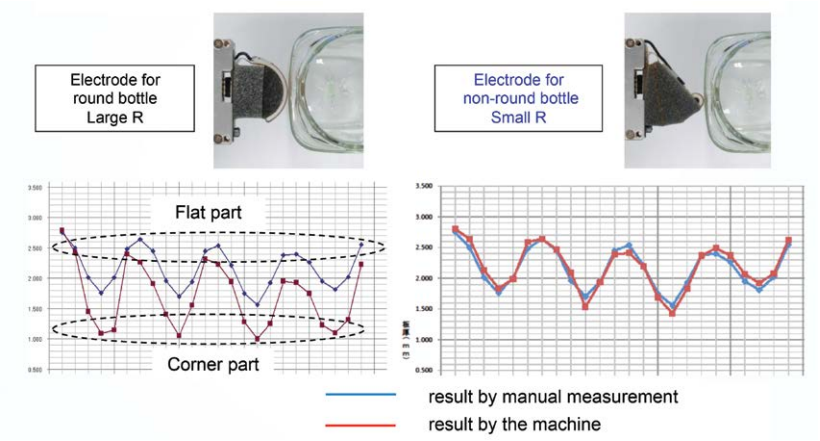

Figure 1: A small probe was adapted to provide a solution.

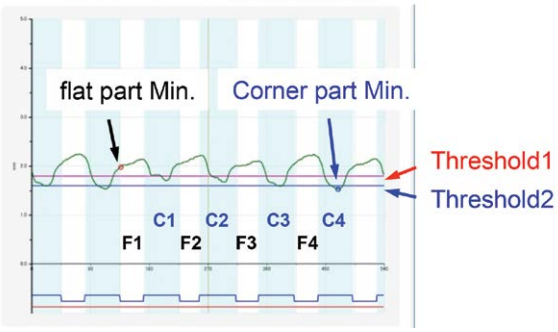

Figure 3: The operator can confirm the part being measured on-screen.

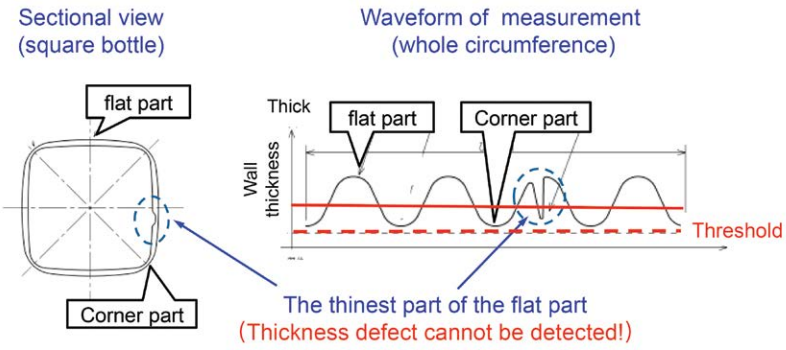

Figure 2: If the bottle has a thin spot on the flat part and the thickness of the thin spot is greater than that of the corner, this defect can remain undetected.

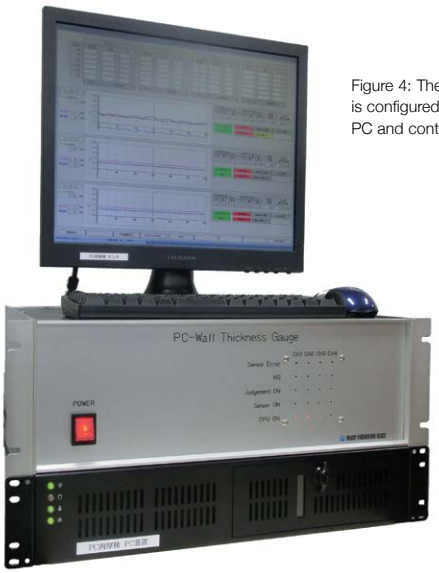

Figure 4: The device is configured with a PC and controller.

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Naohiro Tanaka addresses the 41st ASEAN Glass Conference in Da Nang, Vietnam.

and rectangular bottles along their circumference when capacity is measured. This is because wall thickness is determined by measuring the capacity of the item before calculating its thickness. Even though the thickness is the same, the smaller the curvature, the smaller the capacity. To solve this problem, a very small probe has been adapted. The positive effect of this solution is shown in figure 1.

Another problem to overcome is that the employment of only one threshold to judge whether wall thickness is within specification is insufficient for non-round bottles. Generally, the corner of a square bottle is thinner than the flat part. If the bottle has a thin spot on the flat part and the thickness of the thin spot is greater than that of the corner, this defect can remain undetected (see figure 2). Consequently, the Nihon Yamamura system allows the user to set different thresholds for flat and corner areas. By constantly monitoring the compression of the sponge that holds the probe, the system is able to recognise whether the part being measured is a corner or a flat area. The operator can confirm the part being measured on-screen with the assistance of a different background colour (figure 3).

By solving these three major problems, the company has successfully developed an in-line wall thickness measurement device for non-round ware. The bottle shapes measured include round, oval, square, rectangular and polyhedrons, at inspection speeds up to 300 bottles/min. A measurement accuracy of +/-0.1mm is provided. The device is configured with a PC and controller and a maximum of four probes (see figures 4 and 5). The device is CE marked and has been patented in some countries. ●

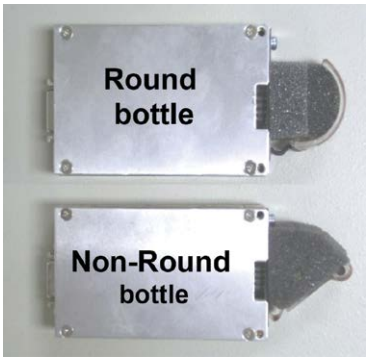

Figure 5: A measurement accuracy of +/-0.1mm is provided.

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