Ningbo Yanxin Industrial Technology Co., Ltd.

[Bottle Defect Test Report]

R&D Department

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1. Customer needs

Inspect the bottle for surface defects.

2. Experimental Objectives

- scratches
- black spots
- Foreign object at the bottom of the bottle
- Bottle neck broken

3. Experimental results and explanations

1. The first type of feature is scratches. Figures 1 and 2 show scratched products with obvious characteristics, and can detect scratches longer than 1cm. Figures 3 and 4 show products with interfering heat seal lines. If the heat seal lines are similar to the scratch features, they will cause false rejection.

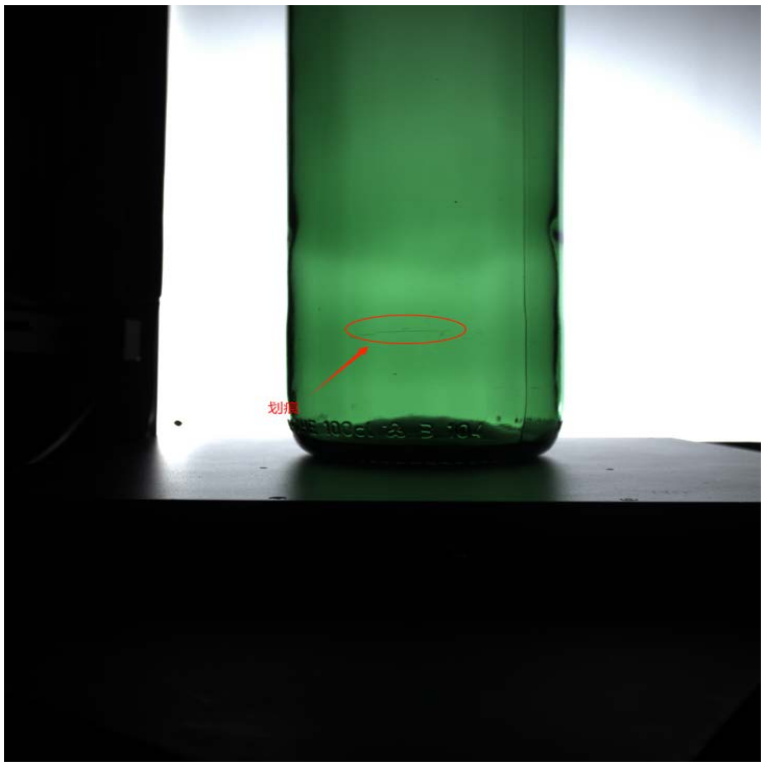


Figure 1 - Scratched Products



Figure 2 - Scratched Products



Figure 3—Heat-sealed wire interference products



Figure 4—Heat-sealed wire interference products

2. The second category is special black spots. Figure 5 shows a product with black spots; the characteristics are obvious, and products with black spots larger than 2mm x 2mm can be detected. Figure 6 shows black shadows caused by unevenness inside the product, which can lead to false rejection. Figures 7 and 8 show interference images of bottom text and patterns, similar to the characteristics, and cannot detect bottom text and pattern areas. Figure 9 shows interference images of the transparent bottle's own manufacturing process, similar to the characteristics; small black spots on transparent bottles cannot be detected, only large black spots larger than 3mm x 3mm can be detected.



Figure 5 - Products with black spots



Figure 6—Shadows caused by unevenness within the product.



Figure 7 - Products with black spots

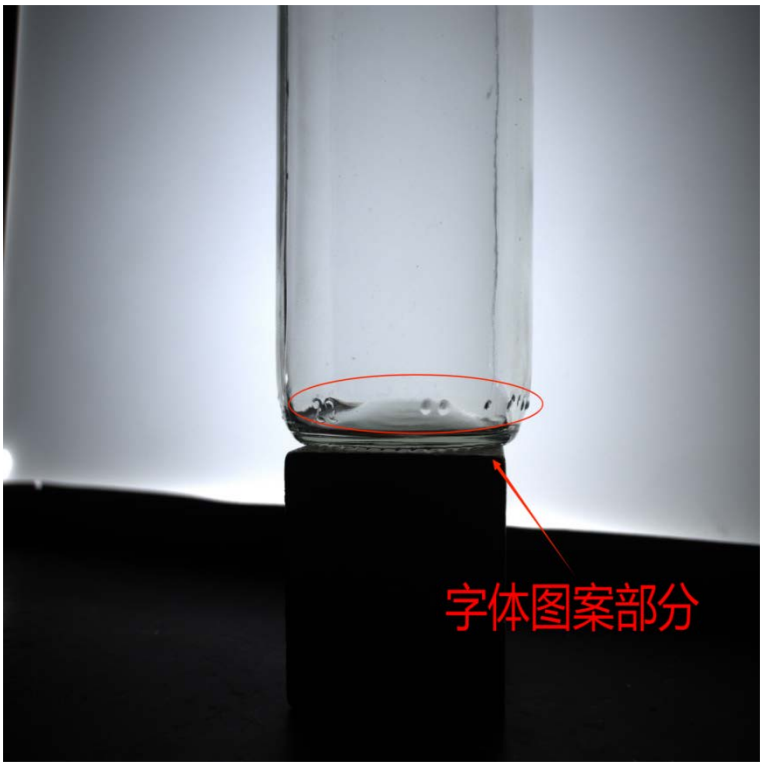


Figure 8 - Products with black spots



Figure 9 - Products with black spots

3. The third category of foreign objects at the bottom of the bottle, as shown in Figures 10, 11, and 12, are products with foreign objects at the bottom. These features are clearly visible, and foreign objects larger than 5mm * 5mm at the bottom of the bottle that have a clear color contrast with the bottle bottom can be detected. The outer shaded and patterned areas cannot be detected.

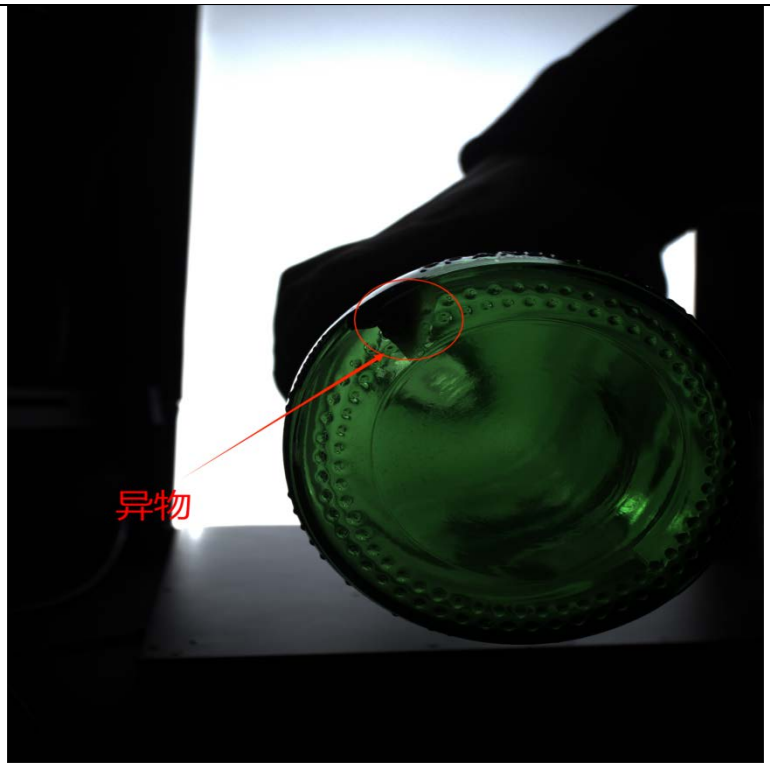


Figure 10—Product with foreign objects at the bottom

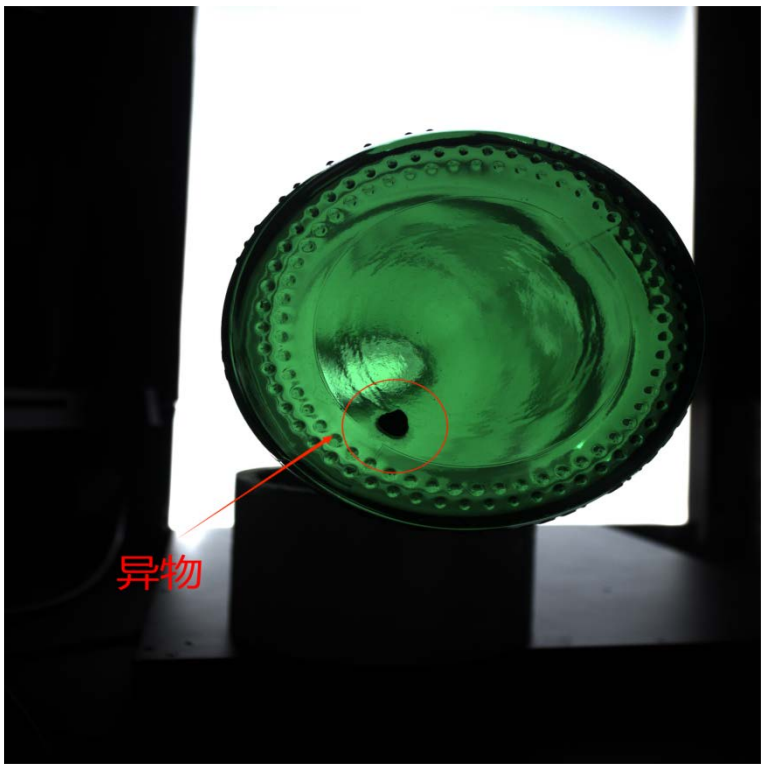


Figure 11 - Products with foreign objects at the bottom

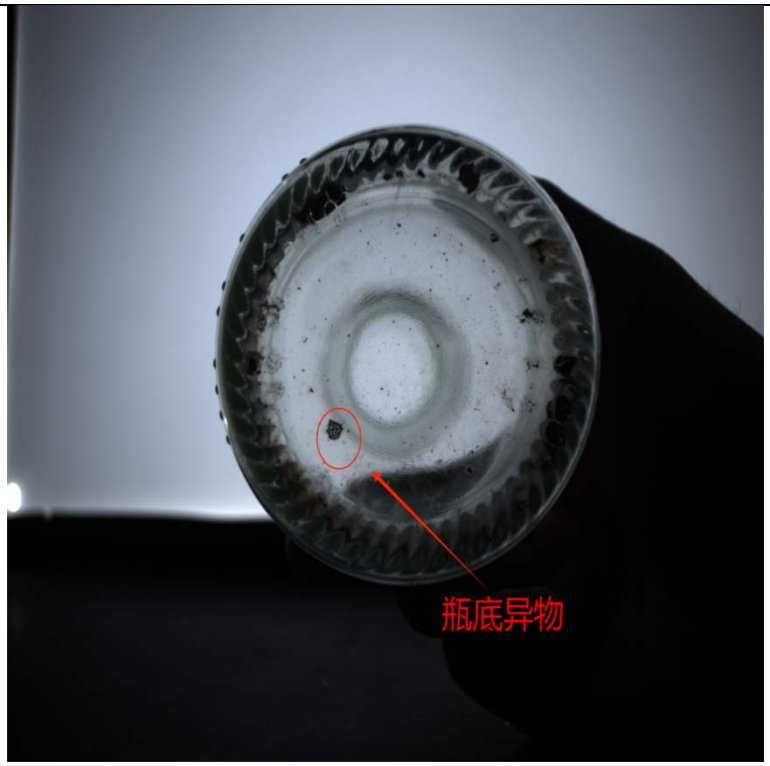


Figure 12—Product with foreign objects at the bottom

4. The fourth type of feature is bottle mouth damage. Figures 13 and 14 show products with bottle mouth damage. The feature is obvious and can be detected by showing bottle mouth damage of more than 2mm x 2mm with obvious color contrast in the image.

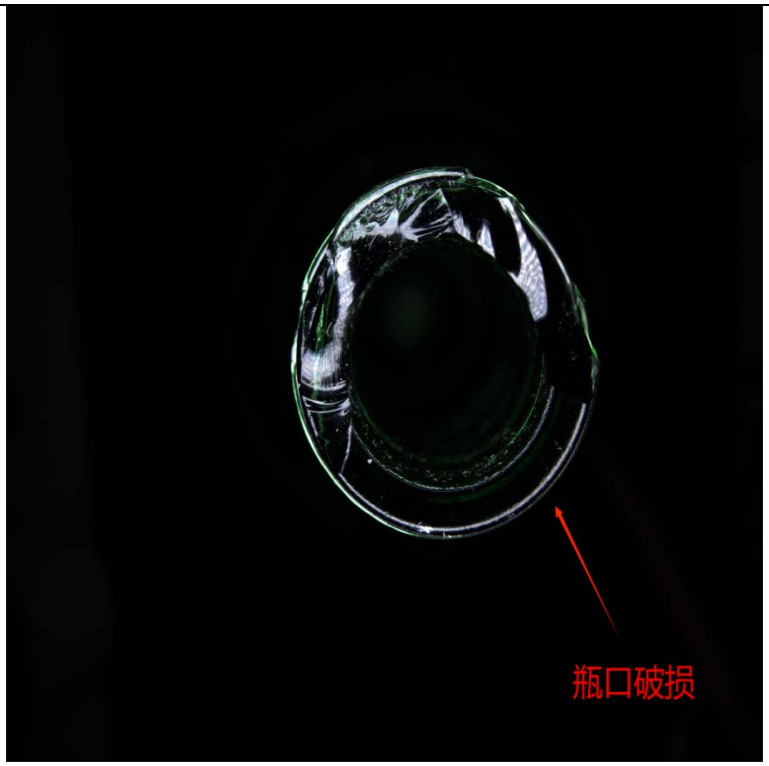


Figure 13 - Products with damaged bottle openings



Figure 14—Products with damaged bottle openings

4. Detection prerequisites

All detectable features of the product must meet the following conditions

（1）The supply of raw materials for our products is stable.

（2）There are gaps between the products.

（3）Product features are visible on the surface.

（4）The text area at the bottom of the product cannot be detected.

5. Test Result Analysis

type	sample	Expected detection (subject to actual results)	Minimum detectable accuracy
scratches	Provided	99.8 %	Length greater than 1cm
black spots	Provided	99.9 %	The black spot on the green bottle is larger than 2mm*2mm, and the black spot on the transparent bottle is larger than 3mm*3mm.
Foreign object at the bottom of the bottle	Provided	99.7 %	There is a clear color contrast between the image and the bottom of the bottle, and the area is larger than 5mm * 5mm.
Bottle neck broken	Provided	99.7 %	Area greater than 2mm*2mm

*The above data was analyzed by optical engineers based on experience under the premise of testing and minimum detectable accuracy. Everything is subject to the actual production status.

6. in conclusion

This type of product can be tested

1. scratches
2. black spots
3. Foreign object at the bottom of the bottle
4. Bottle neck broken

Risk points:

1. Bottle firing issues can result in shadows, and such bottles will be rejected.
2. Firing issues can cause the seam line to appear shadowed on the front; such instances will result in the item being rejected.
3. The text area at the bottom is subject to interference and cannot be detected.
4. The shaded and patterned areas on the outer edge of the bottle bottom cannot be detected.

Testing revealed that the two products of different quality levels are incompatible, and only one bottle type can be produced per production line. This conclusion is based on the current samples and the size of their defects. Further analysis is required if significant differences are observed. These experimental results are based on the premise that the tested products were uncontaminated.