

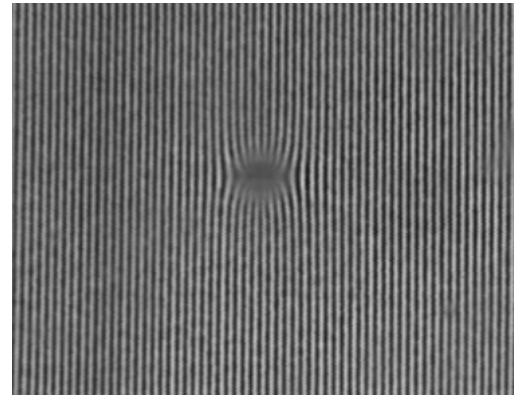
**APPLICATION NOTE: 202**

**A**pplication: Defect Detection in Glass

**P**roblems: 1) Small Opaque Pits, Knots and Clusters  
2) Small Transparent Bubbles and Stones



Stone with Simple Backlight



Stone with *Zebra Backlight*

**S**olution:

The continuous web inspection of glass plate presents special problems due to its transparent nature, diversity of defects and the small size of many defects. Small opaque defects may be found using conventional backlighting techniques. There are also several classes of transparent bubble defects that can be detected using this technique, since the light is refracted at the bubble/glass interface leaving a dark edge which can usually be detected.

The most difficult defect to be detected is the closed bubble or stone. This defect causes a small section of glass to be thicker (or thinner) than the surrounding glass plate. As can be seen in the first image, this defect is impossible to detect using a standard backlight approach. To solve this application problem, a *Zebra Backlight* is employed. The *Zebra Backlight* is a backlight with fine, evenly spaced rulings running in the direction of the moving plate. This technique uses the refractive properties of the glass to create a measurable variation in the pattern. As shown in the second image, the lined pattern is modified by the otherwise invisible defect. Different algorithms can be used to determine a change in the pattern. The simplest conceptual algorithm is image subtraction from a previous image of good product. The resultant image consists of defect areas only, including transparent and opaque defects.

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