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Die Attach Process Advancement for Reduction of Damaged Substrate Strips for Thin Applications

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Keywords— *Substrate; warpage; damaged strips; die attach process; workholder.*

I. OVERVIEW

Today more than ever, cost reductions push the industry towards larger strip formats and thin substrate in manufacturing for efficiencies at high-cost processes. This is also true for maximizing material potentials and labor at the processing steps. These larger strip sizes in Fig. 1 offer high strip density and reduce labor and factory costs.

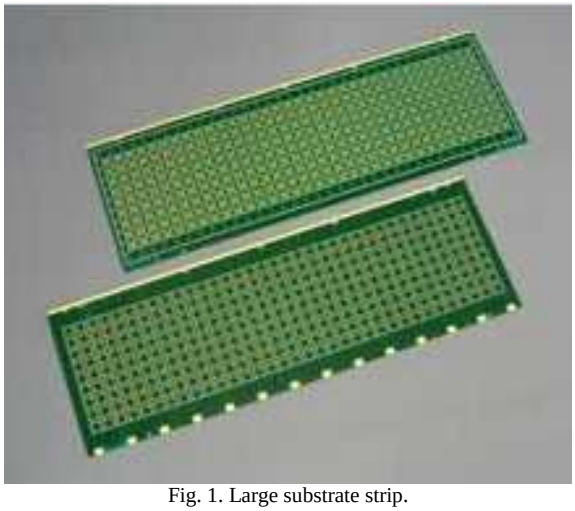

Fig. 1. Large substrate strip.

Going wider and longer with the thinner substrate material makes handling at each processing step a challenge. The thin and large substrate will be subjected to more vulnerable in warpage and flexing during assembly processing than the narrow lead frame types that are traditionally used shown in Fig. 2.

Fig. 2. Strip warpage.

This paper showcased how to handle the challenges large and thin substrate at die attach or die bond process to reduce damaged substrate strips. As highlighted, the focus is the assembly process step at die attach operations. During this process, singulated silicon dies are picked from incoming tested wafers and placed on a substrate carrier or strip with die attach material. This assembly process step adds additional weight of the silicon die and die attach material to the substrate. Current machine control is to install roller on work holder as shown in Fig. 3.

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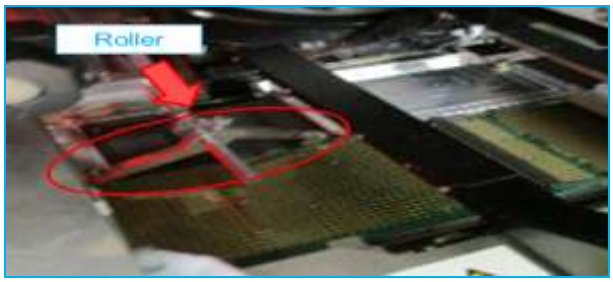

Fig. 3. Die attach process.

II. PROBLEM IDENTIFICATION

Damaged substrate depicted in Fig. 4 is any damage in the substrate induced by machine mechanical during processing at die attach which will affect bonding or visual and dimensional quality. Processing severely warped substrates can cause jamming during indexing.

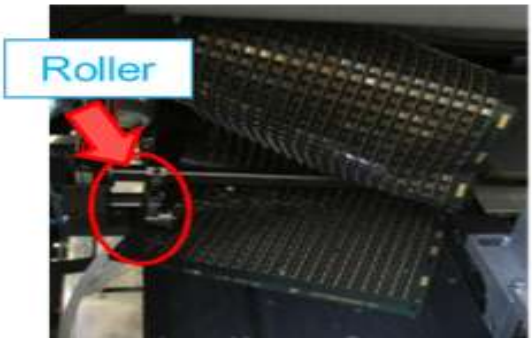

Fig. 4. Damaged substrate strip.

Existing die attach machine workholder setup in Fig. 5 has no mode to control the substrate from flexing and the warpage.

Fig. 5. Current die attach workholder.

III. ASSEMBLY PROCESS IMPROVEMENT

The die attach process is augmented and improved with the installation of the anti-warp kits as shown in Fig. 6. The advanced setup is from the dispense area all the way to output area, which greatly reduced the risk of substrates getting jammed during indexing, even when processing severely warped substrates.

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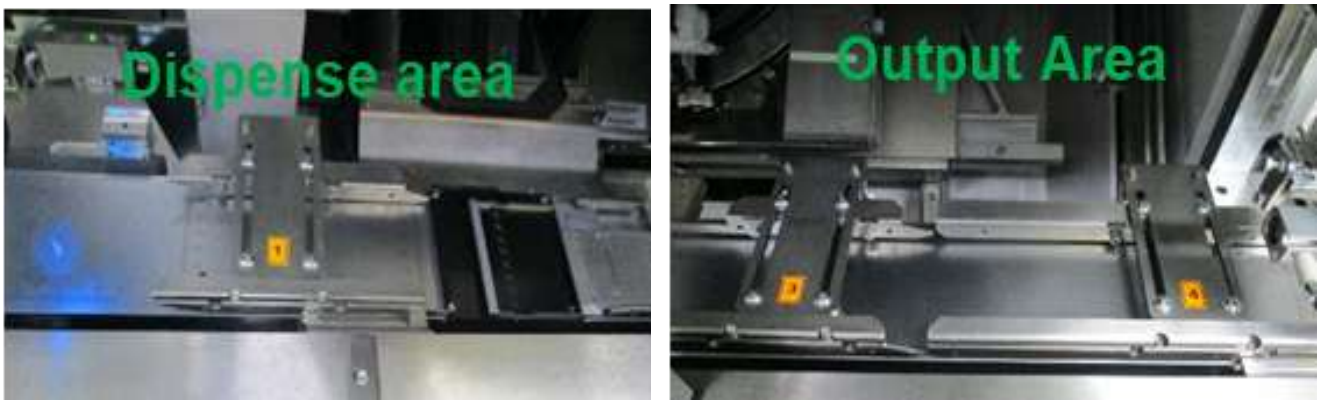

Fig. 6. Anti-warp kits.

Machine design changes on workholder and the substrate support systems in Fig. 7 have been incorporated in the die attach or die bond process to eliminate the problems. Substrate flexing and warpage, as well as rail flatness of workholder during the process, were controlled with machine fixture and rail design changes.

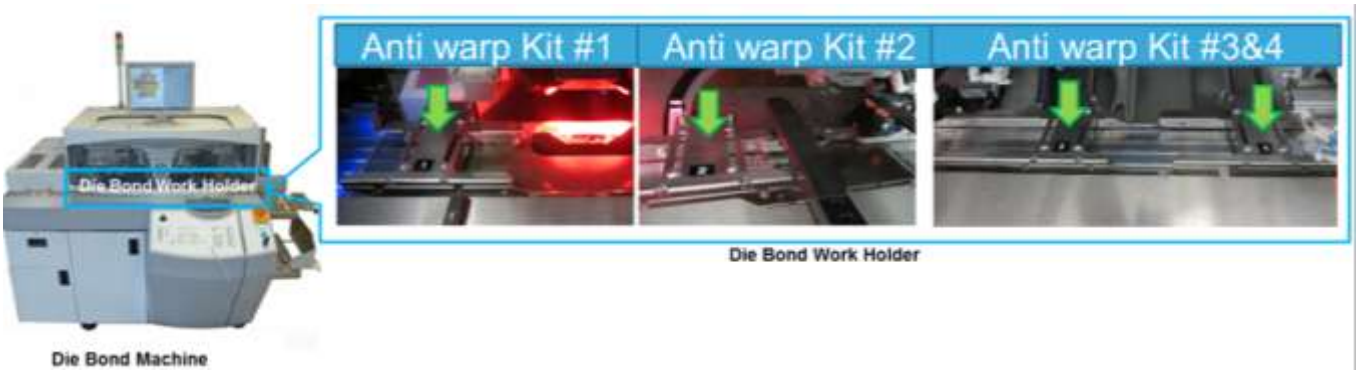

Fig. 7. Die attach workholder with anti-warp kits.

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