

White Paper: Glass in Your Pocket?

Background

Today's consumer is demanding more from their hand held electronic device than ever before and this trend shows no sign of slowing. Since the display is the primary point of focus for the consumer in a mobile phone, many devices are now utilizing glass lenses to improve the user experience compared to that which traditional polycarbonate lenses offer. Benefits include improved optics, decoration possibilities, and smaller thickness.

Problem

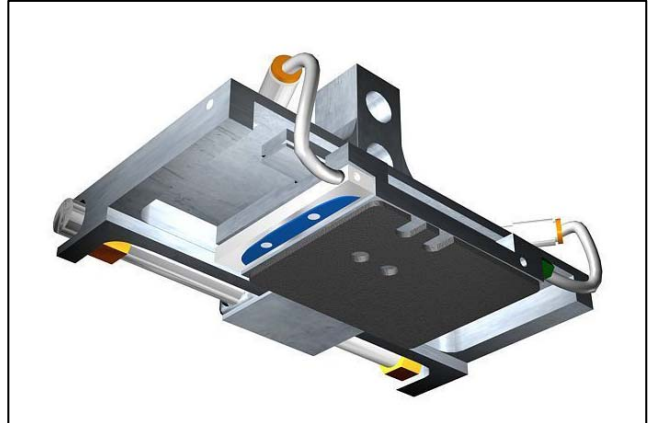
While glass offers many benefits to the user, design engineer and mobile device manufacturer, it presents a unique challenge. It can shatter and expose the user to dangerous glass fragments. One methodology for meeting this challenge has been the development of anti-splinter films (ASF) to cover the glass and protect users. This component consists of optically clear adhesive and a transparent film. The test for machine builders was to develop processes that place the film so it is unnoticeable to the consumer. This requires extremely accurate placement, contaminant free assembly, and elimination of all entrapped air.

Solution

To meet this unique combination of requirements AccuPlace turned to its APAC platform. The APAC is an innovative, fast pick-and-place cell that blends a high performance robot with adhesive component feeders. Required assembly tolerances of +/- 0.025 mm mandate the use of the APAC's standard vision option for positional recognition of the anti-splinter film and lens prior to placement. Contaminants also present an obstacle as any particulate between the film and the lens would result in quality rejection at the inspection station. The APAC employed clean room class 10 RM2065 units for feeding the anti-splinter films. These feeders employ AccuPlace's patented peeling technology along with numerous other features to ensure clean room compatibility. To further ensure the cleanliness of the process, all assembly takes place in an isolated "clean" environment inside the assembly cell. All air exhaust ports are plumbed together for transmission to an outside vacuum system.

While placement accuracy and contaminant elimination each presented their own challenges, the greatest engineering attention was required to eliminate air entrapment after placement of the film. The lenses themselves are loaded into the cell on plastic trays. The lens is processed by removing one from the tray, loading it into an ultrasonic fixture, assembling the ASF, and subsequently returning it to the tray.

The task of bubble-free placement is a multi-step process utilizing AccuPlace Ultrasonic Squeegee Evolution technology (patent applied for). The procedure evolves from the Maxi, to the Micro and subsequently the Nano squeegee to remove even the most microscopic bubbles. The Maxi squeegee is embedded in the servo end effector of the APAC machine. The Maxi effectively picks up the anti-splinter film from the RM2065 as it is peeled. The end effector transports the film to lens where it is assembled by touching the film to one edge of the glass and subsequently wiping across the lens. It is imperative that the film be wiped in controlled and consistent methods otherwise large bubbles can become entrapped which are very difficult to remove later. As well many lenses have printing causing uneven surfaces whose profiles must be mimicked exactly by the APAC end effector. Air coupled tooling to change between the three squeegee types and optional vision inspection for bubbles are other features that allow the APAC to complete this task with ease. After initial placement most lenses require secondary squeegee operations to remove even the smallest of bubbles. The machine next uses the micro and then the nano to drastically increase the effective squeegee force while the ultrasonic nest is activated enhancing entrapped air removal. While sounding rather complex, the process is actually very simple and results in an optically clear assembly.



AccuPlace provides standardized solutions for automated assembly of film adhesive components. These solutions are employed by the market leaders in the computer and peripheral, mobile communication, medical, and automotive market segments. For more information contact:

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