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ELECTRONICS SOLUTIONS

Case Study

Leading electronic hearing device manufacturer reduces UV precise coating cycle time by 79% with advanced Nordson automation.

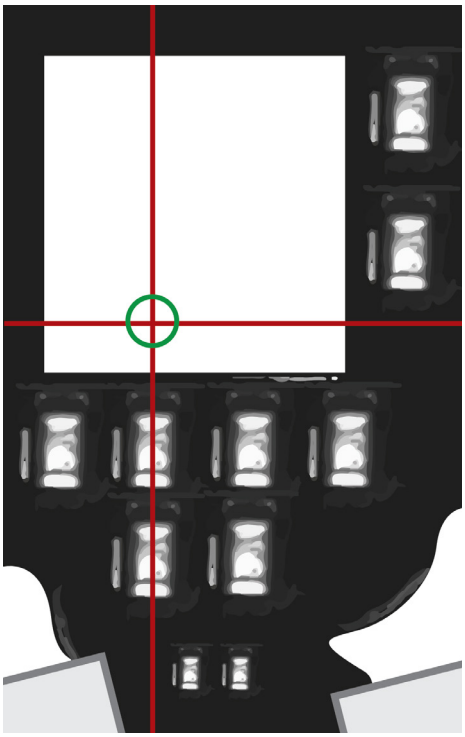
BACKGROUND

In this manual electromechanical assembly (EMA) application, operators hand-brushed protective UV coating material onto hearing device components on a double-sided printed circuit board with five precise coating areas on one side and four on the other. Components in each coating area were fully encapsulated with Dymax Multi-Cure® 9-20557 medium-viscosity coating material, protecting them from moisture, dust, and temperature variation.

When applying the coating, operators worked around densely packed components of various heights and a sensitive device with mechanical movement that the coating material could not obstruct.

The entire manual application process took 4.4 minutes to coat both sides of a board, and quality outcomes were inconsistent, with variation from operator to operator. This affected product quality and resulted in additional costs.

The manufacturer approached Nordson requesting an automated solution to increase production volumes, improve quality, and reduce costs for this complex application.



All illustrations represent actual results, are used for illustrative purposes only, and are not an exact representation of the customer part.

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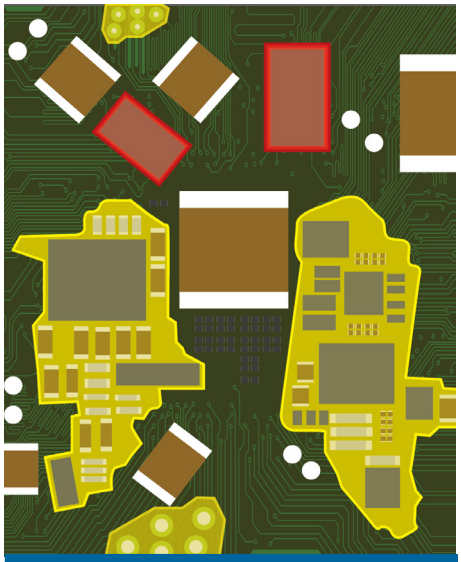
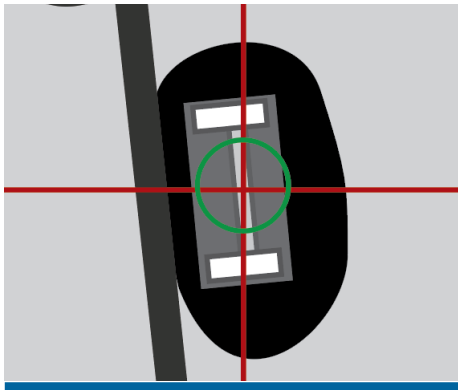
APPLICATION DETAILS AND SPECIFICATIONS

- Board dimensions: 40.80 mm x 25.95 mm
- The smallest coating area: 0.2 mm
- Significant part height differences across the coating areas required varied dispense heights.
- The largest coating volume for a single part: 14,200 µg
- Specified dot weight range: 5.85-5.97 µg
- Total fluid weight side one: 11.17 mg
- Total fluid weight side two: 28.75 mg
- Required coating thickness: 15 µm
- All identified components required complete coverage.



Coated regions are shown in yellow, and non-coated are shown in red.



The smallest coating area at 0.2 mm.

CHALLENGE

The main challenges in automating this application centered around controlling fluid volume and placement around densely packed components of varied heights and a component with moving parts inside minuscule coating areas. Given these constraints, the following outcomes were critical:

- Prevent fluid from flowing into and negatively affecting the performance of moving parts by optimizing the fluid placement.
- Avoid contamination of the dispense nozzle, allowing for the complete coverage and protection of each identified component while working around varied component heights.

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SOLUTION

Nordson application engineers began their detailed analysis with equipment selection and evaluation of three critical areas: dispense locations, dispense weight per part, and height sensing locations.

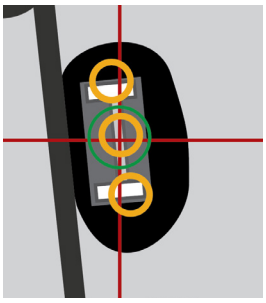
The team selected the ASYMTEK Forte® Series equipped with the high-frequency ASYMTEK IntelliJet® Jetting System and RT-15 ReadiSet® Jet Cartridge to support the application.

Optimizing Fluid Placement

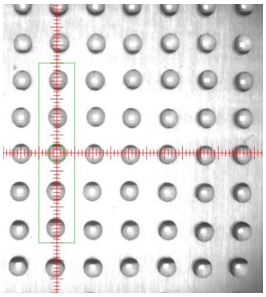
The first step involved determining the most suitable method for fluid placement. The Nordson applications team considered the locations and number of dots per component needed to achieve the ideal fluid placement and part coverage.

The team found that dispensing the entire volume required to cover a part in a single location made it challenging to keep the coating material from flowing into neighboring components. To address that limitation, they tested dispensing the total volume across multiple locations to achieve the desired coverage and prevent material from flowing outside the dispensing area.

In addition, they applied the ASYMTEK Calibrated Process Jetting (CPJ) feature to further assist with meeting the application requirements, which proved beneficial, attaining consistent results throughout the process. CPJ maintains volumetric repeatability for closed-loop process control, automatically compensating for changes in fluid viscosity. The mass per dot is automatically measured and compared to user-specified min/max values to maintain constant dispensed weight per part. Finally, the Nordson team employed weight-controlled line and dot features to coat all components evenly, ensuring precise and repeatable results.



Three dispense locations in the smallest coating area at 0.2 mm.



CPJ Setting example at 0.00597 mg/dot

Valve Settings

- Frequency: 600 Hz
- Valve on-time: 1 ms
- Valve stroke: 120 µm
- Opening rate: 0.150
- Closing rate: 1.2
- Valve temperature: 25°C

Recipe Parameters

- Applicator valve air: 20 psi
- Applicator cooling air: 10 psi
- Fluid air: 15 psi

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SOLUTION CONTINUED

Working Around Varied Component Height

Identifying the correct dispense height is crucial for applications with varied component heights. It must be accurate to avoid potential crashes that could lead to nozzle contamination and incomplete part coverage.

Through the application development process, the team identified and applied the optimal height sensing locations to accommodate the varied component-to-component heights, significantly eliminating quality concerns and costly defects related to insufficient coverage.

Discover how Nordson can optimize your process. For more information, visit our website to find your local regional office or representative.

We have several global locations to serve you.

Acknowledgments

We thank our colleagues Ehan Umapathy, Application and Service Technician, and Wanlop Srisuk, Technical Services Engineer, for their insight and technical expertise, which greatly assisted in creating this case study.

Process Automation Results & Benefits

- The Forte® Series with IntelliJet® Jetting System successfully automated this complex application, increasing throughput and quality outcomes and reducing set-up time.
- Through automation, the manufacturer reduced the total cycle time to coat both sides of the board by 79%, from 4.4 minutes to 55 seconds.
- ±40 µm placement accuracy @ 3σ in the X and Y axis.
- Elimination of defects related to coating material flow out and mixed component heights.
- **Additional recommended process enhancement:** Add Forte MAX dual-IntelliJet dispensing to increase UPH further while maintaining accuracy.