Underfill Dispensing For Advanced Semiconductor Packaging - Maximizing Throughput by 400%

Advanced Semiconductor Packaging Customer: Underfill Dispensing Challenge

A leading electronics manufacturer specializing in advanced semiconductor packaging encountered an issue with excessive dripping in their existing board level underfill process. Their production line utilized a Precision Auger dispensing pump, which, although dependable for certain applications, exhibited limitations when dispensing low-viscosity, particle-filled underfill materials in a heated environment.

Key issues with the underfill dispensing process included:

Dripping and tailing effects at the end of the dispense cycle, leading to uneven coverage and potential contamination. Reduced throughput caused by the need to slow down dispense speeds to maintain accuracy, impacting takt time and overall line efficiency. Need to frequently clean the needle tip to mitigate the fluid dripping

These challenges resulted in increased rework, yield loss, and difficulty scaling production to meet growing demand.

GPD Global's Underfill Dispensing Solution

After a detailed process audit—including material rheology analysis, dispense pattern evaluation, and cycle time benchmarking—our team recommended replacing the auger pump with a Progressive Cavity Displacement (PCD) pump, specifically engineered for low-viscosity and filled fluids.

Technical advantages of the PCD pump included:

Positive displacement mechanism using a rotor-stator configuration, enabling precise, pulse-free fluid delivery regardless of viscosity or filler content.

Linear volumetric flow directly proportional to motor speed, allowing for accurate control over dispense volume and rate. Self-sealing geometry that eliminates dripping and ensures clean cut-off at the end of each

dispense cycle. High-pressure capability to maintain consistent flow through fine dispense needles, critical for tight die spacing and micro-dispense applications.

Underfill Dispensing Implementation and Results

The PCD pump was integrated into the customer's existing GPD Global MAX Series automated dispensing platform. Calibration and tuning were completed using our proprietary software, which allowed for fine control over dispense parameters such as:

- Flow rate (µL/sec)
- Dispense volume per cycle
- Needle approach and retract speeds
- Z-height control for die-level precision

Post-implementation metrics realized:

- Increase in throughput, reducing cycle time by a factor of 4X.
- Elimination of tailing and dripping, improving first-pass yield and reducing post-dispense inspection failures.
- Improved operator efficiency, fewer operator interventions to address dripping or flow rate changes. Higher confidence levels for a consistent process throughout the production shift.

Advanced Semiconductor Packaging Customer Feedback

Switching to the PCD pump was a game-changer. We dramatically increased the throughput and eliminated the variability we had been seeing with the auger system. GPD Global's team made the upgrade seamless by assisting with process parameters and pump maintenance training.

Conclusion: Maximizing Underfill Dispensing for Advanced Semiconductor Packaging

This case study demonstrates the critical role of dispense technology selection in optimizing semiconductor packaging processes. By transitioning from auger-based to progressive cavity pump systems, the customer achieved substantial gains in throughput, accuracy, and reliability. GPD Global's technical expertise in fluid dynamics and precision automation enabled a smooth transition and long-term process stability.

Read more Case Studies about Dispensing

Contact Us about Your Underfill Dispensing Application