Agenda

- Introduction
- Dispensing method and technologies for mobile electronics
- Dispensing applications for mobile and wearable electronics
  - Yield management and throughput considerations
  - Key technical challenges and trends
- Environmental impact and consideration
Introduction

- Dispensing includes application of all fluid material for the construction of the electronic device
  - Solder paste
  - Silver epoxy
  - Non conductive epoxy
  - Polymer or synthetic rubber based
- This presentation focuses on dispensing application on the rigid and flex board
- This presentation does not cover applications of fluids using screen/stencil printing.
Introduction

- The manufacturing of typical handheld mobile device utilizes various forms of dispensing application covering dozens of fluid types in several hundred locations.

- The following industry trend is increasing number of fluid dispensing applications:
  - Smaller form factors
  - Higher component density
  - Thermal management
  - Curved shapes
  - Water resistance
Smart Phones & Tablets

1. Micro coatings for moisture protection
2. Hot Melt for display assembly
3. CSP & PoP Underfill
4. Solder paste for RF shield, module attach & SIM card solder joints
5. Lens bonding & underfill for camera modules
6. Solder Paste & Silicone Encapsulation for MEMS microphones
7. Epoxy Flux, Liquid RF shielding
Dispense Valve Types

- **Needle Valve**: Time/pressure Operation
- **Auger Valve**: Auger Screw Feed
- **Piston Valve**: Positive Displacement
- **Jet Valve**: Pulse Dot Ejection
Jet Valve
Jet vs Needle in droplet location

- Jet can dispense dot close to die, and high above the die
- Needle must come down to touch substrate next to die, with clearance
- Droplet location from die edge: Jet 150um vs Needle 380um
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Mobile Assembly, Smart Phone & Tablet

- Key Assemblies
  1. Case / Enclosure
  2. Battery
  3. Main (rigid) Board
  4. LCD/Sreen Bezel
  5. Flex boards
  6. Modules

Apple iPhone 5C
Source: ifixit.com
Mobile Assembly

Samsung Galaxy S4

Source: ifixit.com

Apple iPad mini
Rigid Board Underfill/Encapsulation

- **Application**: Board level underfill and encapsulation
- **Key Challenges**:
  - Keep out zones for encapsulation
  - UPH, Dual valve for UPH
  - Board flatness
  - Irregular shares/ molded parts

- CSP underfilled; adjacent passives covered during sloppy process
Typical Flex Boards in High End Smart Phone
Tight Line Width, Thin/Selective Coating, Small KOZ

Illumination LED
Phosphor coating: 25um thickness

MEMS Microphone
250um solder paste sealing line width

Mobile Phone Module
Selective precise coating for individual components

Mobile CSP on Flex
2nd level underfill
KOZ
Small Dot, Tight KOZ, Narrow Dispense Gaps

Dispensing Between Die

RF Module
Dispense small underfill dots for less KOZ

RF shields are soldered to the edges (I) of the main PCB

Nordson
ASYMTEK
Application 2: 250um lines/rings/dots => 12k dispense/hour

(b) Dispensed results

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Common Trends, Challenges and Expectations

- Reduced chip geometries
- Reduced spacing between components
- Tall components with limited reach points
- Increased challenges to improve KOZ, avoid epoxy on die
  Improve UPH even with, small dot/line and dispense accuracy.
- Fine line and low shot weight dispense capability
- Better placement capability
- Improved automation, monitoring and self diagnostics
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Environmental Impact & Consideration

- Utilization of fluids without solvent provides a significant environmental benefit
  - 100% Solids
  - Synthetic Rubber Based Coating
  - Hot-Melt and moisture cure adhesive
Environmental Impact & Consideration

- Current manufacturing techniques results in a high percentages of fluid waist
  - Syringe, fluid tubes, valves have several CC of fluids that is disposed during cleaning
  - Only a portion of the fluid dispensed is really needed for the intended purpose
- Current designs not optimized for minimal usage of fluids
Thank You!