Electronics Industry Design Trends and Drivers

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Outline

• General design trends for electronics
• Drivers
• The design cycle for electronics
• Material selection trends
General Design Trends for Electronic Products

• Move to more mobile devices

• Power and versatility
  o No longer single function devices

• Aesthetically pleasing

• Environmentally friendly and sustainable
  o Materials and energy efficiency are being maximized

Photo source: https://funalive.com/articles/the-evolution-of-cell-phones_W3M.html
Computing Continues to Shift Between Formfactors

Household Ownership Computing Devices

Source: CTA 20th Annual Ownership & Market Potential Study
Material Impacts

Sales (Units)  Weight (metric tons)

Annual Product Inflows in units for all U.S. Households

Annual Product Inflows by Mass (metric tons) for all U.S. Households

Blu-ray  DVD  VCR  MP3 player  Digital camcorder  Digital camera  Gaming console  LED TV  LCD TV  Plasma TV  CRT TV  LED Monitor  LCD monitor  CRT monitor  Printer  Laptop  Desktop  E-reader  Tablet  Smart phone  Basic phone

Consumer Technology Association

CES

CTA.tech
Drivers for Design Trends

• Customer demand

• Standards

• Innovation

• Laws and regulations

• Trade-offs
The Design Cycle

- Design cycle is 18 – 36 months for most IT devices; longer for large devices

- Considerations
  - Drivers (as before -- what does the customer want)
  - Lifecycle of the product
  - Risk/hazard/liability
  - Costs to the customer
  - Value recovery – Circular economy

- Compliance and documentation
Considerations in Material Selection

- **Manufacturability**
  - Part geometry & quantity vs. cost equation
  - Thickness

- **Durability**
  - Impact
  - Load?
  - Chemical resistance
  - Wear resistance?

- **Appearance**
  - Specific integrated color
  - Texture
  - Gloss
  - Translucent...tints?

- **Temperature**
  - Low (with mechanical stress?)
  - High (with mech. stress?)
  - Broad range?

- **Specialty**
  - Combination: Electrical insulation & thermally conductive?
  - EMI/RFI

- Flame Retardants, if used, are part of a comprehensive engineered solution
  - No “one size fits all” chemical, physical or design solution for flame protection
Material Selection – Standards

**End Products**
- End product standards (PCs, copiers, phones, dishwashers, etc.)
- UL746C (electrical enclosures, barriers, etc.)
- Material Pre-selection Guidance

**Polymeric Materials**
- UL 94 (flammability)
- UL 746A (short-term properties)
- UL746B (long-term properties)
- UL746C (Use of polymer mats in electrical equipment)
- UL746D (finished parts)
Polymer Chemistry 101

Styrene

Polystyrene
Polymer Chemistry 101

• Additive
  - Materials that are dispersed but do not alter the underlying structure of the polymer

• Reactive
  - Materials that change the polymer structure
Material Selection

• Continual evaluation of potentially hazardous materials
  o Industry continuously reviews materials added to a device
    • Hazard screening
    • Risk assessments
  o Many regulatory restrictions are preceded by industry materials trends
    • Example: RoHS lead restrictions

• The electronics industry works with governments, NGOs and industry to evaluate materials in products
  o IT Industry (among others) worked with Clean Production Action to develop the GreenScreen tool
  o Working on Green Procurement Standards (IEEE, NSF, UL) to establish guidelines
  o Worked with State of California to develop Green Chemistry Alternatives Assessment process
Summary

• Many drivers on electronics design
  o Customer experience is always first driver
    • Wants/needs
    • Safety
  o Regulatory drivers
  o Innovation
    • Electronics industry is always looking for next technological advance
Thank You

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