In-House Seminars

Tech Sheet

Rev. 11/19

DuraTech seminars can be tailored for each customer and generally run from one to two hours, depending on content and questions. The seminar is presented by one of our Sales Engineering staff and can include representatives from our suppliers. Please call your direct Sales Representative or customer service representative for further information.

In-House Seminar Sample Agenda:

Adhesives

- Choosing the correct adhesive
- Fundamentals of adhesion performance
- Adhesive call-outs on blueprints
- Life expectancy of acrylic pressure sensitive adhesives

Materials

- Polycarbonate
- Polyester
- Coblends
- Pressure Sensitive Films
- Cost comparisons

Designing Parts Cost Effectively

- Blueprint call-outs
- Design issues
- Prototyping options
- Other process capabilities

1. **Adhesives**

A. Choosing the correct adhesive

1. Adhesion vs. Cohesion
    a. Adhesion—external bond strength—tested by "peel" strength
    b. Cohesion—internal bond strength—resists slippage and edge lifting—tested by "shear" strength
2. Initial bond vs. Ultimate bond
    a. Initial—tested after 20 minutes at room temperate—assembly line
    b. Ultimate—tested after 72 hours at 158 degrees F
3. Environmental properties
    a. Temperature resistance
    b. UV resistance
    c. Chemical resistance
    d. Humidity resistance
4. Surface energy—the strength of attraction is determined by the surface applied to
    a. Metals
    b. High Surface Energy (HSE) - the adhesive can flow (or "wet-out")
    c. Low Surface Energy (LSE) - liquid (or adhesive) does not readily flow out
5. Surface texture—a rough texture needs additional adhesive—a thinner adhesive may only make contact with the peaks
6. Rubber-based adhesives—poor environmental properties—best for short-term, indoor application

B. Fundamentals of adhesion performance

1. Surface contact must be dry and free of contaminants
2. Firm pressure must be applied to increase the flow and contact of the adhesive with the substrate
3. Time and temperature will increase the surface contact and adhesion values

C. Adhesive callouts on blueprints

1. General vs. Specific
2. Include surface applied to and any extreme exposures
3. Permanent vs. Removable

D. Life expectancy of acrylic pressure sensitive adhesives

II. Materials

A. Polycarbonate

1. Flexibility
   a. Wide thickness range—.005” to .030” - thicker gauges make for easier handling
   b. Variety of finishes—clear, matte, textured (most popular), brushed
   c. Different grades available—UV resistant, FDA, flame retardant
   d. Hard-coated films—provide added mar and solvent resistance
2. Properties
   a. Excellent clarity
   b. Thermal—relative stability to 300 degrees F—can yellow after long-term exposure above 185 degrees F—ductile down to at least 150 degrees F
   c. Chemical resistance—limited—recommend hard-coating
   d. Weatherability—limited, intermittent use—HPW for long term exposure
   e. Flammability—UL 94 V2 (.010” and above) - UL 94 V0 flame retardant grades
3. Processing (ease of fabrication)
   a. Printing—easily printed without topcoats
   b. Die cutting—relatively “soft” material allows for ease in cutting
   c. Embossing—easily embossed, but greatly reduces life of the film

B. Polyester

1. Properties
   a. Chemical resistance—excellent, resistance to virtually all common chemicals
   b. Electrical—excellent insulator
   c. Mechanical—extremely strong and better flex life—excellent choice for embossed overlays and circuit flex tails

d. Thermal—above 158-176 degrees F the film can shrink slightly—long-term exposure to temperatures up to 248 degrees F

e. Optical—clear to .010” only, above this and film turns hazy

f. Outdoor durability—not recommended, becomes brittle

g. Texturing—cannot be done during casting—can be done as a coating process

2. Processing (difficulties in fabrication)

a. Printing—topcoats required for printing due to the inherent barrier properties

b. Die cutting—“strength” of material may require special techniques to prevent edge “splitting”

c. Embossing—excellent flex life makes it ideal choice, however it requires different tooling and processes than polycarbonate—excellent memory requires higher emboss to reach same levels

3. Coblends

a. Polycarbonate/Polyester coblend provides “toughness” of polyester with the processing ease of polycarbonate

b. Polycarbonate/PVF “laminate” provides an outdoor durable product

4. Polyester cost comparisons to Polycarbonate

a. Uncoated—polyester films are more expensive

b. Hard-coated—polyester films are more expensive

c. Pre-textured—polyester films substantially higher

B. Pressure sensitive films—Vinyls vs. Polyester

1. Vinyl advantages and disadvantages

a. Flexibility allows application to curved or irregular surfaces

b. Very good to excellent outdoor durability

c. Low temperature resistance—176 to 225 degrees F

d. Can shrink as much as .015” over time, more at elevated temperatures

2. Polyester advantages and disadvantages

a. Excellent chemical resistance—used as an over-laminating film

b. Excellent dimensional stability

c. Available in metallized versions to simulate nameplates

d. Excellent temperature resistance to 302 degrees F

e. Good outdoor durability to 2 years

f. Inherent strength causes “orange peel” look on textured or irregular surfaces

3. Cost comparisons
    a. Intermediate (2 year) vinyls are a little less than polyester
    b. Premium vinyls are quite a bit more than polyesters
4. Tamper-indicating
    a. Tamper indicating (polyesters) - "Void" message
    b. Self-destructible (vinyls) - fracture easily

III Tolerances

A. Die cutting

1. Hard tooling (+/-.005")
    a. Long life—"permanent tooling"
    b. Male/female design—reduced crimping, clean cut
    c. High cost
    d. Long lead time
2. Steel rule dies (Laser burned +/- .010", or Jig Cut +/- .015")
    a. Relatively low cost
    b. Short lead time
    c. Limited life—"temporary tooling"
    d. Designed for thinner plastic materials, generally .030" or less
    e. Configuration limitations can lead to crimping, rough edges
3. I-Cutting—Electronically controlled plotter (+/-.005" on materials <10 mil. thick)
    a. No tooling costs
    b. No tooling lead time
    c. Designed for thinner plastics, generally .030" or less
    d. Ideal for short runs

B. Graphics to die cutting

1. +/- .010" Tight tolerance, one color registration only
2. +/- .015" Industry standard
3. +/- .020" Less critical applications, multi-color registration, large parts

C. Art/Printed Graphics

1. +/- .005” All original artwork when specified, otherwise +/- .010”
2. +/-.010” Printed graphics to graphics when registration is created by one color
3. +/-.020” Printed graphics to graphics when registration is created by more than one color

IV Designing parts more cost effectively

A. Blueprints

1. Avoid over-spec’ing
2. Indicate when an equivalent can be used. Temperature requirements
3. Whenever possible, please include environment and end-use on print
   a. Chemical exposure
   b. Temperature requirements
   c. Surface applied to
   d. Indoor/outdoor

B. Design issues

1. Get vendor involved as early as possible on “new” projects
2. Material and adhesive choice—correct type and thickness
3. Number of colors—can any be eliminated
4. Discourage custom textures and finishes
5. Design “bleeds” as large as possible
6. Opacity—backgrounds, keys, borders—choose the best color
7. Sets and kits

V Other Process Capabilities

A. Digital Printing
B. Polyurethane doming
C. Flexographic Printing
D. In-Mold Electronics (IME)
E. In-Mold Decorating (IMD)
F. Forming