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Packaging Bonding and Surface Testing

Ensure you have a clean, strong substrate prior to adhesive application. Before bonding, store the substrate at room temperature. Examine the substrate. Determine that it's free of varnish in the gluing area and has adequate scoring of the flap creases.

3 QUICK WAYS TO TEST A SUBSTRATE SURFACE

1

DYNE PEN TEST

Streak the substrate surface with a 38 level dyne pen. If a continuous line is maintained, then the board's surface energy is high enough for proper adhesive application. If the line slowly begins to lose continuity, but not fully, then adhesion issues may occur. If the line fully loses continuity, then adhesion issues should be expected.

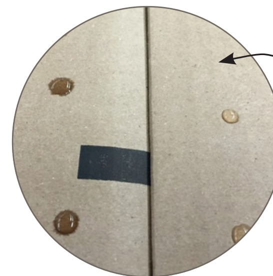
- **REQUIRES:** A 38 LEVEL DYNE PEN, WHICH CAN BE BOUGHT AT ACCUDYNETEST.COM

2

WATER DROPLET TEST

Place substrate to be tested on a clean, flat surface. Apply one droplet of water on each substrate. Time the rate of absorption into the board stock. Measure the spread of the drop onto the board stock. The rate at which the drop disappears into the stock gives an indication of the how well adhesive will wet out onto the substrate.

- **REQUIRES:** A WATER DROPPER (FOOD COLORING OPTIONAL)



The board on the left absorbs water quickly, which indicates the adhesive most likely will have ideal bond strength. The board on the right doesn't absorb water as quickly and therefore the adhesive will have weaker fiber tear.

3

CLAY LIFT TEST

Place two strips of tape 8" long in a "cross" on the substrate. Apply approximately five pounds of pressure to the substrate over the "cross". Then, peel the tape off quickly at 180° to the surface in our all four directions (from tape edge to crossed section). Repeat at 90° to surface. Repeat again at 90° and 180° to surface, pulling slowly. Note the appearance of the board in each pull direction, and examine the tape for ink or clay. If clay and/or ink are removed by the tape, without fiber tear, there may be issues with anchorage into the substrate, and bonding may not yield the needed fiber tear. If there is little to no transfer from the substrate to tape, a more aggressive adhesive may be needed.

- **REQUIRES:** SCOTCH TAPE

The tape on the left has adequate fiber tear. The tape on the right indicates a difficult board, which will require a robust adhesive with superior bond strength.

FACTORS AFFECTING BOND INTEGRITY

Once line operators have validated that the substrate is clean and strong, they must ensure that they have strong adhesive bond performance. To achieve consistent, secure destructive bonds, line operators must ensure the hot melt application temperature, tank pump pressure settings, and nozzle size used are ideal for the board and application. H.B. Fuller engineers can help optimize your adhesive application by suggesting the appropriate machine settings. Here are some general guidelines:

<table>
<tr><th></th><th>HIGH</th><th>LOW</th></tr>
<tr><td rowspan="4">APPLICATION TEMPERATURE</td><td>More hot melt is applied</td><td>Less hot melt is applied</td></tr>
<tr><td>Takes longer for hot melt to set</td><td>Hot melt cools quickly</td></tr>
<tr><td rowspan="2">Bond may pop open out of compression if application temperature is too high</td><td>May not properly penetrate secondary surface if application temperature is too low</td></tr>
<tr><td>Bond may pop open out of compression if application temperature is too low</td></tr>
<tr><td rowspan="3">TANK PUMP PRESSURE</td><td>More hot melt is applied</td><td>Less hot melt is applied can be wavy in appearance</td></tr>
<tr><td>Takes longer for hot melt to set</td><td>Hot melt cools quickly</td></tr>
<tr><td>Bond may pop open out of compression if tank pump pressure is too high</td><td>May not properly penetrate secondary surface if tank pump pressure is too low</td></tr>
<tr><td rowspan="4">NOZZLE SIZE</td><td>More hot melt is applied</td><td>Less hot melt is applied can be wavy in appearance</td></tr>
<tr><td>Takes longer for hot melt to set</td><td>Hot melt cools quickly</td></tr>
<tr><td>Bond may pop open out of compression if nozzle size is too big</td><td>May not properly penetrate secondary surface if nozzle size is too small</td></tr>
<tr><td>Can result in poor cut off if nozzle size is too big</td><td>Can cause adhesive stringing due to premature setting if nozzle size is too small</td></tr>
</table>

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