Laminating Optically Clear Adhesives


Special Considerations

The quality of adhesive, laminating equipment and process are critical to obtaining an optional laminate result. Therefore, it is important to have a basic understanding of nip roll mechanics and equipment.

Nip Roll Laminating Mechanics

In applications of optically clear laminating adhesive (OCA), the nip process is often used for laminating two webs together, i.e., a film adhesive and film or sheet substrate. As in all laminating, the key objective is to obtain a lamination free of wrinkles, bubbles, contaminants, and curl or bow when the web is cut down to final dimensions. Laminating under clean room conditions will minimize entrapment of potential contaminants.

The OCA laminating station typically consists of two rollers, often different diameters and materials. A commonly used system has an elastomeric material for one roll and steel for the other.

When one roll is an elastomer, it is necessary to take into consideration the dynamics experienced in the roll shapes and the consequent effect on web tensions. The rubber roll will change shape as it experiences pressure from the harder steel roller at the nip point (Figure A).

As a result, the rubber roll surface speed increases at the pressure point (nip), which in turn puts a significant (several percent) increase in tension on the web on which it has a firm grip, especially if the web wrap around the roller is large.

It may be possible to compensate for this induced curl mechanics by adjusting web tensions. These dynamics are very difficult to instrument and measure; therefore, the process is generally controlled by trial and error process. Standards are difficult to establish.

Ideal Configuration

The ideal nip roll laminator for process predictability and control would utilize two rollers of the same diameter. The webs would enter the nip nearly tangent to the nip point (Figure B).

It may prove necessary, however, to use a large wrap around the roll(s) if the web material tends to be wrinkled and requires smoothing with the roller. Tensions should be kept minimal as well as nip pressures. The variables, web tensions and nip pressure, are normally controllable and measurable for the laminating process.
Potential for Moisture Problems

An additional concern when working with optically clear adhesives is the problem of moisture retained within the laminate system.

Some film and sheet materials such as polycarbonate and acrylic contain a significant percentage of moisture. If this moisture is trapped in the polymer when an adhesive is laminated to the polymer surface, the moisture can expand or “outgas” when the product is exposed to elevated use conditions.

This trapped moisture can cause cosmetic and sometimes physical degradation at the bond interface. This may appear as small “bubbles” or “snowflakes” at the interface or within the pressure sensitive adhesive.

Correcting Moisture Problems

A suggestion for decreasing this moisture problem is to preheat the substrate materials 25-50°F higher than expected use temperatures for a period of time. Please check with the suppliers of materials for their specific temperature and dwell recommendations.

Lamination Conditions

Lamination should be done soon after the preheating process and in an area of standard conditions (65-80°F, 50 ± 10% RH). In addition:

- Substrates should be perfectly clean and static must be eliminated from the process.
- All materials should be stored at standard conditions for a minimum of 24 hours for preconditioning prior to lamination.

For Additional Information


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