Litho Lamination

Adhesive Solution Advisor

FIGHTING WARP

Keys to Preventing and Solving Common Warping Problems on Laminating Jobs

Warping in final laminated sheets and other problems associated with excessive moisture in paper and double wall corrugated are significant problems which can occur in your jobs, causing downtime and unnecessary material waste.

In your own litho lamination operation, you likely deal with many different combinations of printed topsheets and corrugated material. These two substrates are often produced by different vendors under different operating conditions. Therefore, incoming checks on the paper are critical for success in litho lamination.

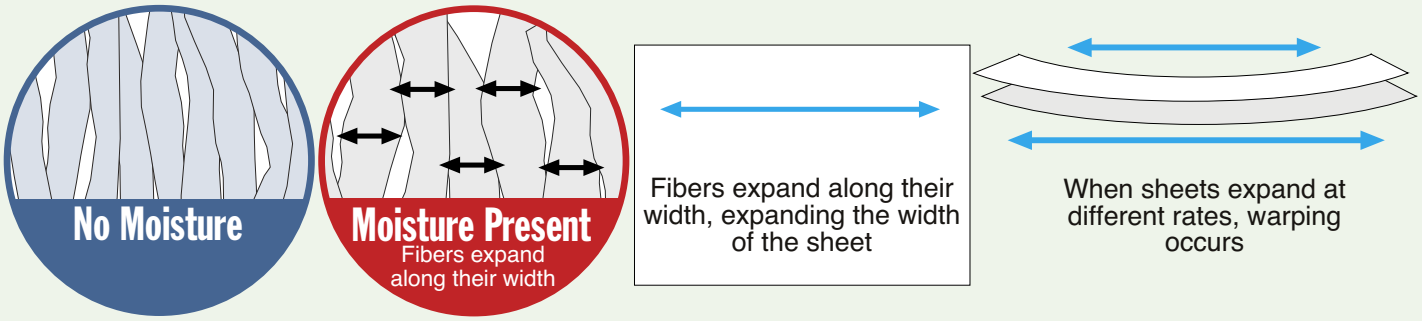
The moisture content of the litho sheet is affected by the relative humidity of the facility where it is stored. It has been suggested that 4-6% moisture content of the litho stock will yield optimal results.[1]

Causes of Moisture Problems in Paper Stock

There have been several articles in our field giving reasons why paper moisture content varies from standard. Many of these articles focus on maintaining a controlled environment to help keep problems to a minimum throughout the job. This includes all phases of production, from when the substrates are laminated to when they are die-cut. For example, large differences in moisture content between the printed litho stock and corrugated substrate can lead to warp in the finished product. To compound this, variations in moisture along with misapplication of adhesive or an incorrect adhesive, can also create bubbles, “tunnelling,” and score crack between the litho stock and corrugated substrate.

How Moisture Creates Warpage

Fibers in litho stock and double wall corrugated absorb moisture at different rates, from the air, and from inks, coatings, and adhesives. Fibers in each of these sheets expand along their widths, expanding each sheet along its width. Once laminated, when one sheet expands more than another, warpage of the entire finished sheet occurs.



Paper grain plays an important role in strength and warp. Fibers in the cross direction react differently than those running with the grain. It is for this reason that litho sheets may react differently to conditions of added moisture or humidity, from job to job.

When exposed to moisture, paper fibers swell and grow. The most growth will be seen in the cross direction of the paper.[2] Even when the paper is dried it will never return to its original size, but will remain slightly larger than before.[1] The paper fibers in printed litho stock may expand at a different rate than those in the corrugated board to which they are laminated. As the fibers swell, this difference in expansion should occur along the width of the sheet if the printer has correctly run the litho stock.

However, it is also these different rates of expansion between the litho stock and substrate that can cause warp in the finished sheet. The operator's goal has to be to introduce as little moisture into the system as possible. Keeping the adhesive spread low and applying to the litho stock is generally considered best practice in litho lamination jobs. Too much adhesive, or not checking moisture content prior to starting a job will many times create unnecessary waste and complicate final die-cutting and finishing operations.

Differences in expansion rates between litho stock and double wall corrugated can cause warping in finished laminated pieces

Solving Moisture-Related Lamination Problems: Key Steps Before Running the Job

The first step in solving moisture problems in lamination is to examine the moisture content of stock before running the job. A Cobb test is a simple way to measure the moisture content of the paper prior to running.

All paper will try to find a natural equilibrium with the surrounding environment. Paper may change in moisture content if your facility does not have ways to maintain a controlled environment. Therefore it is important that

in these cases all materials be shrink wrapped until ready for use.

Litho stock and corrugated material received from other locations should always be checked for both high and low moisture levels; if high or low moisture is detected, this material should either be rejected or be given sufficient time to reach the appropriate humidity level (4-6%) on your shop floor before processing (generally 48 hours minimum).[2]

When the Job is Completed

Operators can also sometimes mitigate warp problems by reverse-stacking finished sheets. This activity can help equalize the direction of warp between one stack of sheets and another. However, this approach can't always be relied on to eliminate warp in the final product, (especially true with fast setting adhesives), so it's better to head these potential moisture problems off before the job is run.

Another key factor in preventing warp is the choice of adhesive you use in your lamination projects. Selecting the wrong adhesive for a project, or applying the right adhesive incorrectly, not only introduces unwanted moisture into a job, but also adds its own complications to the moisture problems that cause stock warp. Because of this, there's a need for a better understanding of the role adhesives play in causing these problems—and in solving them.

Look to your adhesive choices to prevent these cost-killing problems in your litho lamination production:

- **Warp**
- **Bubbling**
- **Score Cracking**
- **Neoprene band replacement**

The Downside of Resin-Based Adhesive: Higher Speeds Increase Warpage Potential

To increase production speeds, litho lamination operators have switched from traditional corn dextrin-based adhesives to synthetic resin emulsions.

While resin emulsions have shown promise by having higher tack rates and shorter drying times, they are not typically formulated to allow the litho stock and the corrugated to find an equilibrium before the lamination has cured. When dextrin-based adhesives are used, moisture levels in the litho stock and corrugated have longer to come back to equilibrium before the lamination has cured. This has generally been referred to as the **lay-flat characteristic** for a particular formulation.

Dextrin vs. Resin? With Hybrid Adhesives, Now There's Another Choice

Hybrid adhesives, such as Evans ResDex™, which contain a mix of both dextrin and resin emulsion, combine the

flexibility of resin based adhesives with the lay-flat attributes of dextrin-based adhesives. These formulations have been problem solvers in many litho lamination jobs.

- Hybrid adhesives can be applied at a lower thickness (as low as 6 lbs. per M.S.F compared to 8-9 lbs. per M.S.F for dextrin based adhesive), which lowers your cost of materials for each job;[3]
- In addition to savings from lower material usage, hybrid adhesives are approximately 10-20% less expensive than resin-based adhesives;
- Unlike resin-based adhesives, hybrid adhesives are pH neutral and do not cause early deterioration of neoprene bands in your Automatän machine; this saves repair cost and downtime in your production flow;
- Hybrid adhesives are compatible with both dextrin and resin emulsion systems;
- Hybrid adhesives are as easy to clean as standard dextrin adhesives

If you've experienced the higher costs of wasted materials and production delays caused by warp and other related problems, being aware of these key guidelines can help you stop moisture-induced warp problems before they become a problem in your production operation. Also, give careful consideration to the role played by your choice of adhesive used in each job.

With hybrid adhesives, you have the advantages of both for your litho lamination projects.

Benefits of Hybrid Adhesives:

- **Fast production speeds**
- **Thinner application rates vs. dextrin**
- **Less expensive than resin-based adhesive**
- **pH Neutral**

1. Rawson, Doug. "Successful Litho-Lamination." Corrugated Today (Nov/Dec 2012): 55-59. Web.

2. Peterson, Jeff. "Challenges with Mounting/Laminating." Foil and Specialty Effects Association, 1 Nov. 2000. Web. 13 Mar. 2014.

3. Rawson, Doug. "Cracking a Sticky Problem: How to Prevent Cracked Scores & Bubbling on Corrugated Board during Litho Lamination." AICC Boxscore 13.4 (2009): 25. Web. 13 Mar. 2014 (http://www.aiccbox.org/boxscore/09_July_Aug.pdf).

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