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Question and Answer

Overcoming Adhesive Challenges in the Folding/Gluing Process by: Staff August-September, 2014

When trying to put the finishing touches on a project, temperature, humidity, coatings and adhesives can conspire to create some unique challenges in terms of folding/gluing. InsideFinishing magazine consulted with industry experts at W.H. Leary, Capital Adhesives and PPC Technologies & Solutions LLC (PPCTS) to discuss solutions to these challenges.

Why does stock run differently during the winter vs. the summer?

Chris Leary, director of sales and service for W.H. Leary, said ambient temperature plays a dominant role in the performance of raw materials. Because board is a naturally fibrous material that is susceptible to temperature changes in its environment, he recommends exposing any newly delivered stock to the ambient temperature for a few hours before running it.

Sam Davis, lab manager at Capital Adhesives, echoed the sentiment that paperboard's moisture content will not remain consistent. In warmer environments or during times of high humidity and heat, more moisture is absorbed, which causes the board to plump up. The opposite effect happens during winter months – lower humidity and temperatures actually draw moisture out of the substrate. "The best solution, whenever possible, is to control the environment – temperature and humidity – in terms of both plant operations and warehousing," Davis explained.

What can a finisher do if sheets come in with a coating that will not accept glue?

Leary said there are two primary solutions for coating challenges. One option is to collaborate with the adhesive supplier to find a more aggressive formula that will work with the carton's existing coatings. Most adhesive suppliers have a range of options for the different types of coated stock in the current market. Another option is to use a plasma treating system to change the surface tension of the area requiring glue, creating a stronger bond by enhancing adhesive penetration into the board.

Davis recommends testing the surface tension of the coating using a dyne kit. "Prior to committing to a job, it is recommended to conduct dyne tests and hand-gluing quality assurance testing with samples. Also, it is encouraged to knock out the glue tabs whenever possible," he said. Davis also explained that, generally speaking, a reading below 40 dyne is borderline for water-based adhesives, while some laminating and coating applications require surface energies of 50 dynes or more. "When using water-based adhesive, it is important for at least one of the surface areas to be porous, as non-porous substrates will trap the adhesive between the two surfaces, delaying set-up time because the water has no place to go," he explained. "For skive coated areas, see if a chemical primer or surface treatment such as corona, plasma or flame treatment will raise the surface tension of the coating."

Jeff Wilcox, product manager of PPC Technologies & Solutions LLC (PPCTS), said that many times there will be coatings covering the glue lap or panel of a carton blank. These coatings can be UV- or poly-based, foil, varnish, ink, laminates or simply the stock itself. Whatever the coating, it can alter the surface tension of the substrate, and it will affect the glue's ability to bond. "Specialty glue can be ordered from the glue supplier; however, it is possible that each different coating will require a different formula and, on top of that, specialty glues can be costly, so keep the size of the order and how often it will be used in mind," Wilcox said. Many times – if repeating orders will be processed – the glue manufacturer will work with the customer to decrease these costs.

There are several other ways to remedy a glue bond issue, and Wilcox recommends using a skiver – generally used to improve the glue bond of side seam-style cartons – because it cannot be attached in a way that will be helpful for the glue bond on automatic lock bottom-style cartons. "Some skivers have a replaceable razor blade or something similar that will remove the top layer of the substrate. This is very effective, but could be costly – upwards of \$70,000. Other skivers have a grinder with a high-speed carbide cutter. These systems also are very effective and will cost considerably less, with prices typically under \$7,500," Wilcox said. He recommends using a skiver in conjunction with a vacuum and filter system to prevent airborne particulates from either being inhaled or collecting onto the machinery.

Wilcox also recommends the plasma treatment system. Plasma is generated by high-voltage electricity applied to a tungsten carbide electrode. The electrode is housed in a stainless steel tip plasma head and inert gas, such as compressed air, is blown over it. The reaction creates a plasma flame, which can be directed to a small area(s) of the carton and will change the surface tension of the substrate enough for it to be able to accept glue. Plasma heads also can be attached inline with each other to effectively increase operating speeds or treated areas.

Verify that the plasma system is CE-certified and has an automatic stop feature that shuts off the plasma flame if the folder/gluer stops. Look for an individual on/off switch for each plasma head, so the heads not in use can be turned off. Because the plasma flame is affected by the amount of air passing over the electrode, a low air pressure alert also is good to have. "The cost of plasma treatment systems varies widely, depending on where it's manufactured, the features it has and its warranty" Wilcox said. "Generally, the price of a good system can start at about \$10,000."

What solutions are available if carton stock is damaged by humidity (i.e., curled or damp)?

While water or high-humidity damage are not uncommon, either can cause a variety of problems, including making the stock impossible to feed into a folder/gluer because the blanks are sticking together; causing discoloration of the board and the printing; and causing the liner of the board to loosen. "On chipboard, curling is the least of the worries because it may be overcome by a good folder/gluer operator. Even if the blanks are air-dried sufficiently to allow for production, the smell of mold or mildew can occur and cause the job to be rejected," Wilcox said. He recommends returning any carton stock (chipboard) that arrives pre-damaged by water or humidity.

In terms of preventing damage to carton stock (chipboard) once it arrives, Wilcox said that unless the facility is climate-controlled, stock usually will run differently as the seasons change. Chipboard will absorb and release the moisture in the air, which can cause the stock to change its folding characteristics. During the winter – when the air is dryer – the folds will appear more precise; however, sometimes a liner crack still will be visible due to a lack of moisture. During the summer – when the air is more humid – the stock can absorb more moisture, which sometimes will highlight missed folds and folds off the score as a result of higher production speeds. "Shrink wrapping the loads of stock as they come off the diecutter can be an effective preventative measure, helping to minimize or avoid costly replacement and waste," Wilcox said.

Leary recommends installing a misting system to assist with maintaining humidity levels. The system also will either help keep the boards flat or help return them to their flat state. "Some plants even use spray bottles to create a mist over a pallet of flat cartons," Leary said. Davis recommends dehumidifying the stock by storing it in a cold environment, if possible, to help reduce moisture. He also recommends adding weight to try to prevent or flatten out any warped stock.

What are the best methods to test adhesive strength for cartons that will be subjected to extreme heat and/or cold?

All three experts recommend beginning with a discussion with the adhesive and board suppliers to see if the preferred raw materials have been designed for extreme conditions, followed by testing to try to duplicate the "real world" environment that the finished substrates will encounter. "One of the best ways to test adhesive strength for extreme temperature conditions is to use a third-party lab to perform a variety of tests that will determine bond integrity," Leary said. Wilcox added, "This comes into play when a carton contains a product that will go from the freezer to the oven or microwave. Glue manufacturers make products that can withstand this test, and they guarantee results."

Before environmental testing, Davis suggests applying adhesive under normal circumstances and curing at room temperature. Once cured, test the finished substrates in an oven or freezer, based on anticipated temperature extremes, and then check the adhesive bond after 24 hours.

InsideFinishing thanks Sam Davis, Capital Adhesives; Chris Leary, W.H. Leary; and Jeff Wilcox, PPC Technologies & Solutions LLC (PPCTS) for their assistance with this article. Capital Adhesives (www.whleary.com) is one of the world's leading manufacturers of automatic glue application equipment and quality assurance systems. PPCTS (www.ppcts.com) provides the industry with specific and custom equipment solutions through R&D, market research and representation of select equipment manufacturers and other strategic alliances.

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