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In-line coating at the corrugator

Scope

Many applicators exist to apply coatings in-line at a corrugator. The boxmaker's choice is based on many -- and often conflicting -- requirements: running speeds, financial considerations, space availability, coatings to be run, etc. In-line coatings will be of two general types: functional and decorative. Functional coatings impact some type of performance characteristic to the liner or board. Examples include water resistance, grease resistance and non-abrasion. Since functional coatings are typically applied to what will become the inside of the container, they will be applied at the triplex area or at the singlefacer. Decorative coatings, which primarily enhance appearance, include color and white coatings and are applied at the doublebacker.

Coating equipment choices will fall into the following categories: Blade Coaters, Roll Coaters, Spray Coaters, Anilox Coaters, and Rod Coaters. The following paragraphs describe the operation of each, and the associated advantages and disadvantages.

Safety precautions

Nip points of all coaters while in operation.

Blade coaters

Blade coaters are perhaps the most common type of applicator for the coating of paper substrates. The style found in paper mills is typically much more sophisticated and precise than those found in-line at corrugators: a stiff blade is positioned at a particular angle relative to the liner until the desired appearance is obtained. The complexity involved comes into play when this angle is being determined and controlled (the explanation for this positioning is beyond this general equipment description). A bevel is sometimes machined onto the edge of the blade to produce a profile more conducive to the metering of the coating. An excess amount of coating is initially placed on the substrate and the amount of coating removed is determined by the blade angle, pressure, or bevel. The viscosity or rheology of the coating, as well as the substrate itself, also can affect the final coat weight.

The blade coaters commonly found in-line at corrugators are much less sophisticated than the mill type just described. While they incorporate a blade to perform the metering function, these blades are much more flexible and are not typically beveled. They also are brought into direct contact with the liner and perform the metering function by physically scraping the top surface of the substrate. Coating is typically pumped on top of the liner to create a small-width puddle just behind the blade. The coating is metered off as the paper or board is pulled under the blade. Coat weight is controlled by blade pressure and blade angle, coating viscosity, and the absorption of the liner. The flexibility of the blade presents another means of controlling coat weight if all other parameters are held constant. Typically, the functional coatings are applied with a more flexible blade than those used to meter the decorative coatings. Since these blade coaters are similar to a squeegee in concept, they are extremely simple to operate and to maintain. Merely flushing out all coating lines and changing a blade allow the operator to apply coatings quickly and effectively. The useful coat weight range of these applicators is typically between 1.0 to 3.5 wet lb/MSF. Functional coatings exhibit excellent

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performance characteristics when applied between 2.5 and 3.0 wet lb/MSF. Therefore, blade coaters are common when used to apply functional coatings at either the triplex or the singlefacer.

Blade-coated decorative coatings typically produce an appearance similar to mottled white liner. This is caused by the coating being deposited in the low sections of the liner (the valleys), and being scraped off the high sections of the liner (the peaks). One way to eliminate this mottled appearance is to deposit enough white coating on the peaks so that the corresponding values of brightness versus the valleys is not apparent. However, the lack of sophistication of a squeegee-type applicator does not accomplish this very easily.

The main problem associated with these in-line blade coaters is that by physically contacting the surface of the liner, a buildup of fiber dust behind the coating blade will occur. This accumulation of fiber dust causes streaks and/or scratches in the coated surface which is often undesirable. The functional coatings dry clear and the streaks and scratches are not apparent. However, with the application of white and/or color coatings, these streaks and scratches are not only apparent but are often not acceptable. And because blade coaters do not have the ability to control coat weights much in excess of 3.5 wet lb/MSF, they are unable to produce an impressive white-coated appearance similar to that of bleached liner. Another disadvantage is the relative inability of these applicators to apply coat weights evenly and consistently across the web. It is important that the blade be parallel to the paper at the beginning of the coating process. Also, blade wear is an ongoing problem due to the paper friction. Running speeds also are limited with a coater of this type; usually speeds under 650 ft/minute are possible. However, even given these limitations, the blade coater is a simple, economical, and compact machine which allows virtually any corrugator to apply coatings in-line at the corrugator.

Roll coaters

A roll coater can be as simple as a single roll rotating in a reservoir of coating and transferring the coating up to the web. The web is typically supported by another roller on the opposite side of the liner or board from which the coating is being applied. The coat weight is typically controlled by how tightly the coating roll is pressed against the paper. The advantages of the applicator are the ability to create a very inexpensive and compact machine. It also lends itself well to the ability to run coatings of various viscosities. Virtually any coat weight can be applied since merely moving the applicator roll away from the paper will allow more coating to flow through the nip. The disadvantages of this applicator type include the inability to create an impressive coated appearance using white and or colors. Since there is no element to smooth out or meter off the final coated sheet, all metering and coat weight control must be done using the applicator roll. Also, if the applicator roll is not parallel to the paper or backing roll, inconsistencies of coat weight application across the web is common. And since some coating will adhere to the liner and some will remain adhered to the applicator roll, an appearance often described as “turkey tracking” or “orange peeling” can result.

Spray coaters

Spray coaters usually take the form of nonskid applicators which spray silica or alumina to the bottom of the liner, improving its slide angle characteristics. Since no barrier properties are required, it is not necessary to produce good film formation. Also, these nonskid coatings are typically low in solids and allow them to be sprayed through small orifice diameter nozzles. The disadvantage of this machine is that it is not able to effectively apply either functional coatings (other than nonskid coatings) or decorative coatings. Again, as stated previously, a spray pattern does not allow for film formation and will thus not be effective in providing barrier properties.

Nonskid coatings are typically lower in solids percentage than other functional coatings. Functional coatings which provide good performance characteristics usually have solids in the range of 25-40%. This makes them difficult to spray through any type of spray nozzle without clogging. Since the initial excess application of functional coating will be further metered by another component on the machine, there is no clear advantage to spraying them in the first place. Better methods include using a roller to transfer coating from a reservoir to the liner or pumping the coating through large-diameter hoses or pipes. Beyond the application of nonskids, spraying coatings onto the liner does not represent a useful method of applying coatings.

Anilox coaters

Anilox coaters are basically printing stations in which the anilox roll itself is both the applicator and metering component. The coat weight applied is determined by both the cell configuration and cell size of the anilox roll. This design allows a predescribed amount of coating to be applied consistently and accurately across the web. However, many disadvantages of this applicator type exist for the application of coatings. Coatings are often not designed to release from