QUALITY IMPROVEMENTS WITH BACKSIDE COATERS FOR RECYCLED PAPERBOARD

Herbert B. Kohler
Vice President
The Kohler Coating Machinery Corporation
9701 Cleveland Ave. NW
Greentown, OH 44630

Abstract

Backside coating of recycled paperboard can minimize problems with contamination of the coated board in the reel or cutter box. It can also be the key to making coated recycled board competitive with SBS in some applications. Application of barrier coating materials can can be the key to development of new value-added grades. An air-tube-loaded rod coater is a good choice for backside coating. The backing roll can be fitted with an enclosed pond applicator to provide simultaneous surface sizing of the top side. A recently developed dryer section applicator can provide increased flexibility in backside coating and chemical treatment.

Introduction

Coated recycled boxboard has traditionally been manufactured as a C1S product. Emphasis has been placed on improving the side of the sheet which becomes the outside of the box. The past several decades have witnessed a progression from a single air knife coating to wet-on-wet coating, rod precoating and multiple rod/blade coating. Through all of this, the backside of the sheet has remained a stepchild. Backside treatment has been limited to calender box sizing. In the past few years, a number of factors have contributed to an interest in backside coating:

- Use of coated recycled boxboard in packaging applications that had been exclusively the domain of SBS, driven by environmental consciousness. This created a desire on the part of packagers for a box made from 100% recycled fibers with an interior that is “white and attractive” rather than “gray and ugly.”
- Need for back printing on some packaging applications.
- Recognition of quality problems on the coated side of the sheet-- such as linting, pickouts and surface debris--that are caused by an untreated backside. These problems have increased as papermakers changed from on-machine cutters to Pope reels and off-machine sheeting.
- Emergence of new paperboard grades requiring the application of a barrier coating on the backside of the sheet.
- Recognition of potential furnish cost improvements obtainable through backside coloring or tinting.

Backside Coating Equipment Options

The furnish for the back liner ply usually contains significant percentages of unbleached and mechanical pulp fibers, and it is likely to be relatively rough. The relatively soft surface would be likely to cause streak and scratch problems if a blade coater were used. The rough surface would cause uneven coverage with a transfer roll coater. The air-tube-loaded rod coater shown in Figure 1 is a good choice for backside coating. It can apply a wide variety of coatings at relatively high solids with minimal potential for scratches and streaks.

The rod coater is a post metering coater. An

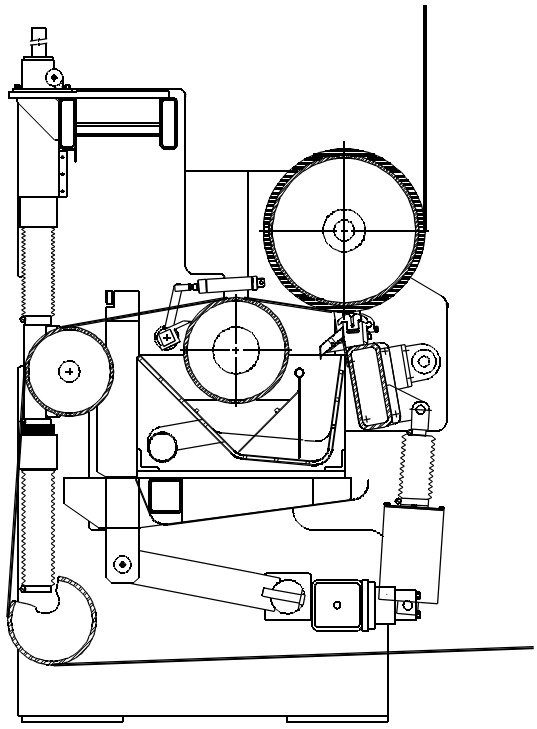

Figure 1 Air-Tube-Loaded Rod Coater

excess of coating color is applied to the sheet

by a chrome plated applicator roll. The coating is metered and distributed by a rotating rod pneumatically loaded against the backing roll. Use of air tube loading provides equal metering pressure across the entire width of the web. Coat weight is controlled by varying the rod loading pressure, eliminating web tension as a metering variable.

For installations where there is very little space available in the machine for coater installation, the rod coater design can be modified to the configuration shown in Figure 2. This design modification can often be fit into or onto existing machine frame columns.

The backing roll of the rod coater can be fitted with an enclosed pond applicator. The enclosed

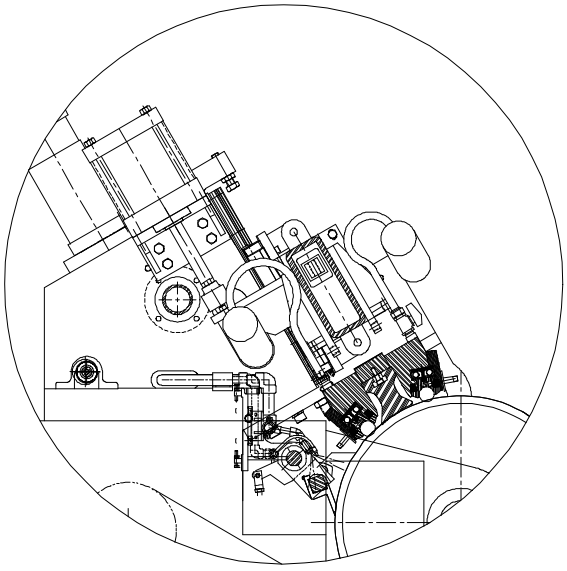

Figure 2 Enclosed Pond Applicator

pond applicator system consists of a small cross section stainless steel beam machined to form a closed chamber when placed next to the rotating backing roll. Sealing for the chamber is provided by two individually air-tube loaded rod metering elements. During the start up sequence, the applicator is positioned with the rods close to but not touching the rolls, referred to as the "ready" position. The air bladders under the rod holders are pressurized to load the rods against the roll surface; this is referred to as the "run" position. Size solutions are supplied through a header and multiple pipe inlet to provide equal flow rates and pressure into the chamber between the two rods. Within the chamber, the solution circulates around a hydrofoil to provide uniform laminar flow.

Excess solution is withdrawn from the chamber both at the ends and through a multiple pipe outlet at the back of the chamber to carry away contaminants and allow air to escape. The feed and return ports are offset to minimize any cross machine pressure variation within the chamber.

The deckle system is simple and easy to adjust on the run. The entire chamber is always flooded so that a uniform metered fluid film exits the metering rod across the entire face of the roll. This minimizes rod and roll wear by eliminating heat generation between a dry rod and the roll. The deckle consists of an air loaded plastic doctor blade mounted so as to be adjustable from each side. The doctor blade is designed to channel the unwanted excess to a side funnel where it joins with the recirculation liquid drawn from each end of the applicator unit. This coating is piped back with the rest of the material recirculated from the chamber.

The excess recirculation rate for each chamber is designed to be no more than 2 to 1 compared to the amount actually applied to the sheet; it can be adjusted downward to as little as 10% of the amount applied. The actual internal volume of the applicator unit is small at approximately 4 liters per meter of machine width. The minimized internal volume provides virtually instantaneous on/off control.

On shut down or an extended off sheet condition, the applicator system can be purged with a hot water wash. This washes down both the supply and return ports on the applicator system.

The applicator head is supported by its own structural steel framework sized according to machine width. Since the applicator head has multiple feed ports and support points across the machine, applicator geometry is nearly constant for any face width of roll. Each rod bounding the pond has its own drive system with variable speed control. Rod drives are dual directional. Independent pressure control of each metering rod system is provided through air tube loading systems.

An individual positioning beam with support frameworks is used to mount and position the enclosed pond applicator system. The positioning beam system consists of a rugged steel pipe across the width of the machine. The applicator is mounted to the pipe in a way that would allow for thermal expansion and alignments. The ends of the support pipe are moved in and out by two air stroke bladders. In the “ready” or “run” position, the air stroke bladders will rotate the arms that carry the coating head to the gap set at the size press rolls. The rods, once under pressure, will close up the gap and come in contact will the roll for metering. In the “retract” position, the applicator is rotated 100 mm away from the roll surface. Roll adjustments are made by a pair of jacks. The jacks push a set of sliding block which holds the coating head support pipe assembly.

To facilitate cleaning of the applicator and for rod changes, the head is rotated to the desired position. The rotating mechanism consists of a pair of air activated cylinders with mechanical stops for safety.

The metering rod determines the wet film thickness of surface size or coating applied to the roll and transferred to the sheet. Rod pressure is controlled by changing the air pressure in the bladder beneath the rod holder. Two types of metering are available:

- Volumetric metering
- Pressure dependent metering.

A grooved rod is used for volumetric metering. Significant changes in coat weight or wet film thickness are achieved by changing rods to obtain more or less open groove area. With a given rod grooving, changes in pressure in the air tube loading may be used to make minor adjustment in coat weight or wet film thickness.

For pressure dependent metering, a smooth rod is used. Significant changes in coat weight may be obtained by varying pressure in the air tube loading bladder beneath the rod. Various diameters of smooth rods can be used to obtain a wide variety of operating conditions.

A rod coater fitted with an enclosed pond applicator can apply starch film to the top side of the sheet while back side coating. This coater configuration can also be used as a high solids surface sizer. Figure 3 shows a rod coater fitted with an enclosed pond applicator.

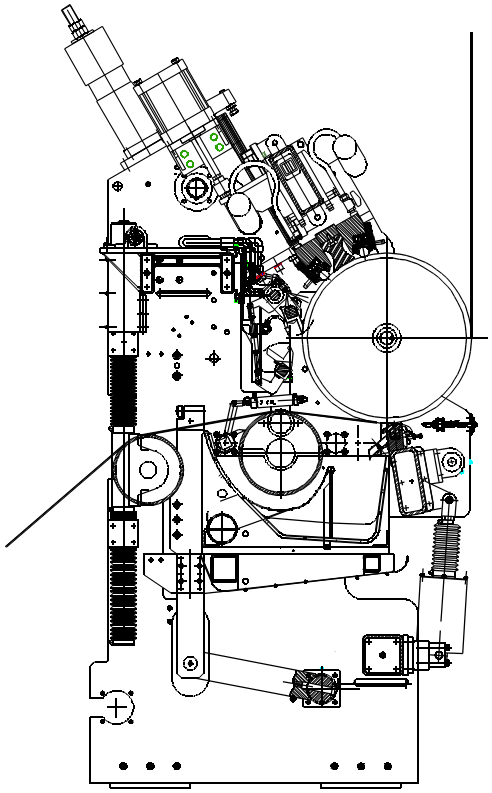

Figure 3 Air-Tube-Loaded Rod Coater with Enclosed Pond Applicator on Backing Roll

An alternative equipment choice is the dryer section applicator shown in Figure 4. This device can be used for application of starch or barrier coating materials. The dryer section applicator consists of a coating supply chamber bounded by an overflow shoe and a metering rod, which forms a nip with the surface of a dryer cylinder. Coating is applied just ahead of the metering rod. Recirculated coating flows back over the shoe, preventing air recursion and skip coats. Coat weight is controlled by varying the pressure in the air tube, which loads

A rod coater fitted with an enclosed pond

the metering rod. It is essential that the dryer

cylinder have a smooth, uniform surface. The amount of penetration into the sheet when using a dryer section applicator is dependent on its location in the dryer section. If it is desired to keep the material applied near the surface, the applicator should be located near the dry end when the sheet is at low moisture content. If the applicator location is moved up the machine toward the wet end, the material applied will penetrate further into the sheet. Water remaining in the sheet structure will facilitate capillary transport. This penetration and distribution can be useful for materials such as fluorochemicals which require distribution through the sheet to obtain creased grease and oil resistance.

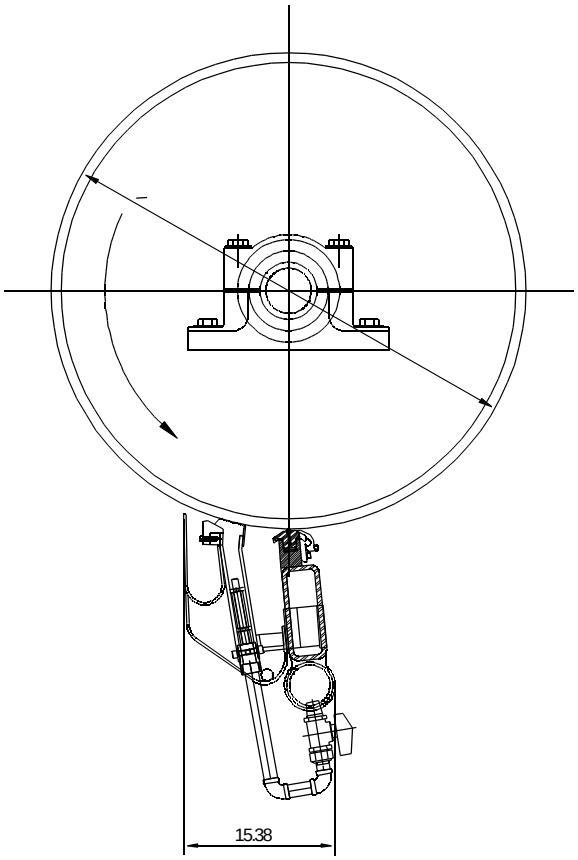

Figure 4 Dryer Section Applicator

Benefits of Backside Coating or Chemical Treatment

Backside coating can minimize problems with contamination of the coated side of the sheet. With an uncoated/untreated backside, fibers or debris from the backside can transfer to the coated side in the reel or in the sheet stack. This material is likely to pick out on the offset blanket, causing hickies or other print quality problems. Customers of one mill that installed a backside coater reported a 70% reduction in press washups. If it is not essential for aesthetics, the backside coating need not be pigmented. Starch, CMC or other film formers may be applied at high solids to achieve the needed sealing or surface strength of the backside.

Environmentally sensitive packagers can be attracted to coated boxboard made from 100% recycled fiber as an alternative to SBS. However, the packager or consumer can find the gray interior of the box objectionable. Backside coating can produce a sheet which can compete in some applications that were exclusively the domain of SBS in the past. Backside coating can also produce a surface that is suitable for backside printing for applications such as “inside the box” directions or coupons.

A backside color coating or tinting can be the key to making a kraft back type sheet with a back liner furnish less expensive than DKL.

Backside coating or chemical treatment can improve liner bond.

Surface sizing of the side to be coated using an enclosed pond applicator on the backing roll can improve coating holdout. It can be the key to lower coat weights to achieve the same brightness and smoothness. Other potential benefits include the potential to either use a lower cost furnish in the top liner ply or reduce the amount of titanium dioxide required to achieve a desired brightness level.

A backside coater equipped with an enclosed pond applicator can be an effective surface sizing device. It can surface size both sides of the sheet simultaneously, applying starch, CMC

or other materials at high solids to maintain good film integrity. Calender box sizing densifies the sheet structure, reducing bulk and stiffness; it can also lead to localized areas of differential coating holdout, causing mottle in the finished sheet. Rod coater/enclosed pond applicator surface sizing provides uniform coating holdout.

A backside coater can also be used to apply barrier coating materials. For some products such as detergent boxes, there is a need to apply greasproofing material which penetrates the interior of the sheet and also to produce a coated surface with excellent printing quality. Use of a combination of a dryer section applicator and a backside coater can facilitate manufacture of these grades. This equipment combination can also provide the capability to produce board with good MVTR resistance.

Conclusion

Backside coating can be a valuable tool to improve the quality of coated recycled paperboard. It can be a key not only to making existing grades with better profitability but also to development of new value-added grades.