Cork Tech TalkNews

Manufacturers of Waterbase, UV+EB Curable Coatings, Varnishes and Adhesives

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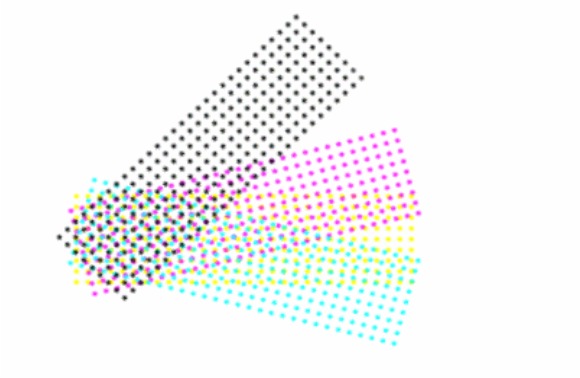
MILL APPLIED PAPER COATINGS

Why, we might ask, does the paper and paperboard industry offer coated paper products? Why do paper and board mills apply coatings? After all isn't paper just paper? Well yes, but if we want to print on it we need a surface that will accept various inks and top-coatings in a way that optimizes print quality. We need a surface that has a proper porosity such that we have "holdout", limiting an inks penetration into the paper fibers thus producing sharp print half tone dots (print quality) and maximum gloss.



Getting back to paper, basic paper product sheet is formed from cellulose fibers obtained from trees. The finished paper mill product has a somewhat rough and porous surface. These surface characteristics present a problem from the viewpoint of the graphic arts industry and its desire to print and top-coat on these plain paper (uncoated) substrates.

The problem is simply that when printing on a plain base paper sheet, inks readily penetrate the sheets porous surface and don't cover the rough surface continuously. This results in the requirement that heavy, thick ink films must be applied in the hope of achieving acceptable coverage. Nevertheless, low ink gloss and variable ink holdout inevitably results. Most halftones are not reproduced faithfully nor can color proofs always be acceptably matched.

Enter the era of paper coating. Recognizing the issues involved, the basic paper industry long ago responded with coated paper products. Paper mill technology has been developed that allows the application of formulated primary paper coatings to the cellulose paper substrate. This effective-ly provides a surface that is smooth and of a nature that printed inks and top-coatings can be applied acceptably. The coating modifies the paper surface, limiting ink penetration (provides holdout), so that inks can be printed with sharp halftone dots and high gloss.

Primary paper coatings in order to be effective must:

1. **Cover the cellulose fibers.**
2. **Bond to the cellulose fibers.**
3. **Provide a smooth surface.**
4. **Provide ink /top-coating holdout.**
5. **Allow adequate ink oil penetration.**
6. **Allow sharp halftone dots**
7. **Allow best possible print/coat gloss.**
8. **Resist picking during printing.**
9. **Exhibit paper machine runnability.**

Primary paper coatings consist basically of a mixture of water, pigments and adhesives. The water is the compatible carrier for the other coating components. The pigments cover the fibers of the base paper sheet and improve whiteness as well. The adhesive part performs as a glue to stick everything together and bind effectively to the cellulose fiber base sheet. The coating formulation must perform properly in the paper mills paper making process, and at the same time provide the necessary end product properties to the printer. Key among these would be,

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smoothness, oil ink setting, absorption and drying properties.

PIGMENTS

Pigments used are:

1. **Clay**
2. **Calcium carbonate**
3. **Titanium dioxide**
4. **Synthetic**

Clay, an inexpensive inorganic material, is the primary pigment used. It typically consists of a mixture of aluminum and silicon (aluminum silicate). Basically, this high brightness china clay has a platelet form that lays like roofing shingles when applied to paper. This property produces a high gloss coating with high holdout. Clay used alone in a coating formulation seals paper so well that ink oil absorption is prevented.

Calcium carbonate, (ground limestone), is also an inorganic material. The pigment is known for its extreme brightness, particulate shape and low cost. When it is used in combination with clay, coating porosity can be modified such that the absorption property can be adjusted. While desirable for its high brightness, its use in a paper coating formulation must be carefully controlled or the coated paper surface may be too porous or "open" to absorption.

Titanium dioxide (TIO2) obtained from titanium ore processing is used because of its opacity property resulting from its inherent high density. Unfortunately, it is very expensive which limits its use in paper coating formulations. It finds use on some high quality paper grades where opacity is very important.

Certain plastic (synthetic) pigments are also in use. The major property of these pigments is particle shape and size uniformity. Some feature hollow particles, and contrasted to titanium, are very low in density. When used, these pigments contribute to the gloss of a paper coating. Unfortunately, these pigments are high in cost and low in opacity. Nevertheless they find some use in paper coatings as formulators use them to balance finished coated paper product properties.

BINDERS (Adhesives)

Two classes of materials are in use, natural occurring and synthetic. Early primary paper coating binders (adhesives) were natural materials such as casein, protein and starch. Over time, improved synthetic binders (petroleum derived) have been developed. Synthetic adhesives, because of the range of engineered properties that are possible, find the most use today in the formulation of mill applied paper coatings.

Contemporary paper coatings are very much like common latex house paints. Similarly, in these formulations, the latex binder provides the required adhesion and the pigments provide brightness, opacity and coverage. Paper and paperboard mill coatings are often proprietary formulations, blending pigments binders and additives to provide a desired porosity, gloss, white-ness and brightness.

Similar coated stocks from different paper mills may offer different print-ability properties even though they are sold as competitive products. Printers need to be careful and be certain that they know the printability characteristics of the various stocks that they chose to use.

When considering coated papers, the more coating that is applied to a base paper, the more value that is added. Generally, the more coating, the higher the paper cost, the better the acceptance of ink/coatings and the highest resultant print quality.

The highest quality premium gloss coated papers can carry as much as 50% of its weight in coating while uncoated stocks would essentially be almost 100% cellulose fiber.

Whenever you consider primers, top-coatings and varnishes, in the production & converting of graphic arts products, consider *CORK!*

LOOK TO CORK! **..... for all of your coating and varnish needs, for both aqueous & UV/EB coatings, vanishes and adhesives.**