



Coated Paper... The Importance of the Surface

“I was about to take over the world, but then I saw something shiny.”

~ Anonymous

When deciding on the paper to use for marketing materials, such as a brochure or sell sheet, many of our customers tell us, “I’d like a shiny paper; it looks so professional.”

We’re not sure how this association with shiny paper – which we printers refer to as coated paper – got started, but we have a theory. Full color printing requires a smooth, uniform paper surface and therefore almost always uses a sheet that has had a coating applied during the manufacturing process. The purpose of the coating is to improve the way the surface of the sheet receives the ink, and it works! Full color printing on a coated sheet looks sharp and bright – in a word, professional.

The Importance of the Paper Surface

The surface of the paper has a significant effect on the final appearance of a printed piece. For an image to appear sharp and true to color, the ink needs to stay on the surface of the sheet with minimal absorption into the fibers. Since ink dries by a chemical reaction, not by losing moisture, there is no advantage to its being absorbed – in fact, absorption can interfere with ink maintaining the proper size and shape of the dots used to create images and maintain color consistency (a process called dot gain).

The paper surface can be altered during manufacturing by sizing. Internal sizing is achieved by adding a solution of rosin, glue, gelatin, starch, or modified cellulose to the paper pulp during manufacturing to make the paper less absorbent. External sizing treats the surface of the paper after it has dried.

Paper Coatings

After paper is formed, it may have a coating applied to the surface. This is done to improve the paper’s properties – both decorative (such as whiteness and opacity) and



functional (smoothness and absorption).

Paper coatings are a mixture of a pigment and a binder. The pigment is a substance suspended in water that dries to form a hard coating. (In paper coatings, the pigment color is white.) China clay, known as kaolin, is a traditional pigment; calcium carbonate is now more common. Other pigments include: talc (for smoothness); silica (to improve water absorption for inkjet papers); titanium dioxide (for whiteness and opacity); and resins (to control the ink absorption rate).

The binder is a substance that holds the pigment particles in suspension and attaches them to the paper. Resins such as starch or latex are examples of binders.

Paper coatings come in three degrees of smoothness and hardness; dull, matte, and gloss, with gloss being the smoothest and hardest. All three control dot gain (the tendency of images to spread, affecting the sharpness of the image and color consistency), so the main difference among them is how light is reflected. By reflecting the most light back to the reader, a gloss coating makes all images appear the most distinct. However, gloss coating does have a disadvantage – it can provide a glare that tires the eyes.

Paper can be coated on one or both sides; this is easiest to see on cover papers. C1S is the designation for coated one side, while C2S means coated two sides. One type of coating, known as cast coating, creates a high-gloss, enamel-like finish by casting the coating paper against a highly polished, heated steel drum.

Coating the Printed Sheet

In addition to using a coated sheet to print, we can apply a second coating after the ink has been laid down on the sheet. The purpose of this coating is different than a paper surface coating. Now gloss provides a contrast to the paper – the gloss reflects back more light than the other areas of the printed sheet and so appears brighter. An after-printing coating can also be used to provide some protection to the printed surface against wear, fingerprinting, and scuffing that can occur with repeated handling of the printed piece.

There are three main types of coatings used after printing:

- Overprint varnish acts like a solvent-based ink. It is usually colorless (though may be tinted for a desired effect). Varnish can be applied over the entire printed sheet, or only in spots to highlight a specific area by making it reflect more light. It can also be printed as a half tone (i.e., a series of dots) to provide subtle effects, such as the appearance of dimension. Varnish is available in satin, dull, or gloss finish (indicating the amount of light it reflects back to the reader). Varnish made with tung or linseed oil may yellow over time, and all varnishes emit volatile organic compounds (VOCs) during application.
- Aqueous coating is, as its name implies, water-based. As with overprint varnish, it can be applied to the entire sheet (called all over aqueous coating) or just to specific locations. Aqueous coatings are available in satin, matte, and gloss finishes. Aqueous coatings dry quickly, meaning the printed sheet can be handled almost immediately. A distinct environmental advantage of aqueous coating is that it emits very low or negligible VOCs and can be recycled easily. Aqueous coating does not yellow on the sheet and has no residual odor.
- UV coating is a liquid or paste applied to the printed sheet that remains in this form until exposed to ultraviolet light. UV coating contains photo initiators that react immediately to UV light creating a hard, protective finish that has high gloss and hardness. UV coating offers the greatest protection for the printed surface and, because it reflects back the most light of all the post-press coatings, creates deeper, more vibrant colors and sharper images. UV coating does not emit VOCs.

Things to Remember About Coatings

When selecting the kind of coated paper to use for a job or post-press coating application, it is useful to know some of the drawbacks of the choices. Here are the ones we encounter most often:

- The resin binder typically used to surface-coat paper is sensitive to heat. So if you are printing shells or master sheets that will be imprinted at a later date, be aware that the high heat of a laser printer could cause the coating to soften and release the image from the sheet. Either ask us to test the sheet you are considering, or specify a laser-safe paper on which the surface of the sheet has been treated with UV light after being applied.
- If you are printing a direct mail marketing piece, be aware that not all mailing houses can address on UV or aqueous coating. Inkjet addressing systems require a special ink formulation and a dryer to address on aqueous and a separate ink-and-dryer to address on UV coatings. If we are handling your mailing, we will advise you or check with your mailing house.
- All post-press coatings require contrast with the printed sheet to be visible. If you are using spot varnish, aqueous, or UV coating – that is, adding the coating to selected areas of the printed sheet – we advise you to make the spots big enough to be visible. A hairline spot coating, for example, may provide too little contrast with the rest of the sheet to be noticed.

You Can Count on Us

As always, we hope this discussion has provided a useful overview. If you have a specific idea in mind for using a post-press coating or aren't sure whether to use a matte, dull, or gloss coated sheet, give us a call. We'll be glad to help.

a vocabulary of the graphic arts

worlds

Binder: solid ingredients in a coating that hold the pigment particles in suspension and attach them to the substrate.

Brightness: a measurement of the percentage of light in a narrow spectral range reflected from the surface of a sheet of paper. Not necessarily related to color or whiteness. Bright white papers illuminate transparent printing inks giving cleaner, crisper color and black contrast.

C1S, C2S: a designation indicating which side of a paper has had a coating applied. C1S indicates coating on one side; C2S, coating on two sides.

Calendering: the process of smoothing the surface of paper by pressing it between rollers.

Cast coated: a high-gloss coated paper manufactured by casting the coating paper while still wet against a highly polished, heated steel drum.

Dot gain: the increase in the diameter of a halftone dot during the pre-press and printing process. Total dot gain is the difference between the dot size on a film negative and the corresponding dot size on the printed page.

Ink holdout: the ability of paper to resist ink penetration and absorption into the fibers of the paper. Coated papers have greater ink holdout than uncoated papers.

Paper grade: a system used to classify papers by their common features or content, such as recycled, coated, or newsprint papers.

Paper opacity: a measure of the percentage of light passage through a sheet of paper. The more opaque a paper is, the less printing on the back shows through. Generally, opacity and brightness are inversely related to each other: the brighter the paper, the less opaque.

Pigment: a substance used as a coating to protect or decorate a surface (especially a mixture of pigment suspended in a liquid); dries to form a hard coating.

Sizing: a substance applied to paper to change its surface properties.

Substrate: the base material upon which images are printed.

Uncoated paper: paper manufactured with no surface coating.

VOCs: an acronym for volatile organic compounds. VOCs are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects.

T H E I D E A

Calendered Paper

There may be some printing applications where use of coated papers is undesirable, but there is still a need for good ink holdout to control dot gain. In these circumstances, select an uncoated stock that has been calendered or supercalendered.

The calender on a papermaking machine is a series of hard pressure rollers located at the very end of the

machine. Its purpose is to smooth the surface of the paper which increases its gloss and therefore its ink holdout. Paper can also be calendered in an off-line process, which is called supercalendering.

Uncoated papers that have been calendered will behave similarly (though not identically) to coated papers on press or in a laser printer.

C O R N E R

Spot Coatings

Spot coating, including varnish, aqueous, and UV, is a special effect that coats only a specific area of a printed piece. Spot coating can be used to call attention to an image or create an interesting effect. On press, the plate for spot coating is like an additional ink plate.

To create the artwork for a spot coating in your page layout program, create a new PMS color to represent the coating and name it “coating”. (When selecting the new PMS color to represent the coating, be sure not to duplicate a PMS color already used in the layout.) Set the new color to overprint so it won’t knock out any text or elements under the spot coating.

To indicate spot coating on areas of the page without ink, create the graphic element (such as a frame or box), fill it

with the PMS color you have selected to represent the spot coating, and place it on the page. To place spot coating over a printed element on the page, create a duplicate of the element, place it directly on top of the original element, and apply the PMS color you have chosen to represent the spot coating. When you submit the file, please be sure to mention that you are using a spot coating.

Remember that spot coating won’t show on a proof, and that its use will increase the cost of the job, just as using an additional ink color would. For example, using spot coating on a four-color process job creates the need for a fifth plate; using it on a two-color job creates the need for a third plate.

Q.

Is the whiteness of a paper the same as its brightness?

A.

No, these terms are not interchangeable. *Brightness* is the amount of light reflected back to the reader’s eye, while *whiteness* refers to the quality (rather than the amount) of light.

A bright sheet increases the contrast between the paper and the ink, which causes colors and photographs to “pop”. Grades of paper – premium, #1, #2, #3, #4 and #5 – differ from each other in the amount of brightness, with premium grade being the brightest. Bleaching paper increases brightness and moves paper up the brightness scale (with 100 being the brightest). Select a high-brightness sheet when your document has lots of photographs or lots of color.

A white sheet evenly reflects all colors of the visual spectrum (though papers inherently have either a warm, yellowish, or cool bluish hue). In general blue-white sheets appear brighter than yellow-white sheets (though this may change once ink or varnish is applied). If your document has a cool color palette (blues, greens, purples), a cool white sheet will make the colors appear brighter. If warm colors (reds, yellows, oranges) are dominant, they will appear clearer and more vibrant on a yellow-white sheet.

questions and answers