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PRINtips

What Was Old Is Now New: Recycled Papers

Have you ever considered the profound effect the invention of paper has had on society? Paper made ideas portable, enabled the sharing of discoveries and inventions, and changed human history from oral to written. Literature, art, education, and communication were all accelerated by the invention of paper.

The technology for making paper as we know it today from the cellulose fibers of wood wasn't developed until the mid-1800s. Originally natural materials like silk, parchment (the skin of a sheep or goat), or vellum (fine parchment made from the skins of calves, lambs or kids) was used as paper.

Following Gutenberg's invention of movable type and improvement of the printing press, new papermaking technology was developed based on the fibers from linen rags. The appearance of newspapers in the late 1600s and early 1700s created a severe shortage of rags that led eventually to substituting wood for the fibers in paper. The process was fully developed toward the end of the 19th century.

The ancient roots of recycling in papermaking

The invention of paper is usually attributed to Ts'ai Lun, an official in the Chinese royal court, in A.D. 105. He recycled rags, used fishing nets, hemp and China grass to create a substitute material for silk which

was the predominant writing material of the time. The next development in papermaking was also based on recycling, using rags and old clothes to make paper.

Use of virgin materials vs. recycling

Throughout the 20th century, when trees were considered to be in endless supply, most paper was made using trees cut from forested land. Today wood fiber is still the predominant material in paper, though it comes from different sources. Paper companies grow trees on farms specifically for use in papermaking; and wood fibers are recycled from post consumer waste. In fact, since 1993 more paper has been recycled than put into landfills. This has helped increase the supply of waste paper available for re-use in papermaking, and has also reduced the costs of recycling.

Recycled paper: is it good as new?

In the early 1980s when recycled papers were being developed, they were hard to use on press and in copiers. Besides jamming and not always receiving ink evenly, there were problems with linting, dusting, and picking (the tendency of the ink to pick fibers from the surface of the paper). Today, however, recycled paper performs quite well though there may be some minor aesthetic issues (such as lower brightness than virgin paper). On the other hand, recycled papers may have higher opacity (meaning they are harder to see through) which is an asset for two-sided printing.

Selecting a recycled paper

When selecting paper for a project, please let us know if you would like to use a recycled stock. A good selection of papers are available with up to 30% post consumer recycled content; for higher content, your choices may be more limited, especially if you wish to use 100% post consumer recycled paper.

The characteristics of paper that are important for your project are its surface appearance and strength. The surface appearance affects how the ink or toner will lay on the paper surface; how light reflecting from the paper will interact with the ink color; whether the sheet will conceal print on the reverse side; and how the paper feels when touched.

The strength of the paper is especially important when there are post press operations like folding or binding or when the printed piece will be handled a lot.

Paper surface

Smoothness: this characteristic describes paper surface qualities that are important for image appearance and printability and is a function of the calendaring process in the final stage of papermaking. Increased calendaring results in a smoother, glossier sheet of uniform thickness with less opacity and brightness.

Brightness: the brightness of a paper measures the percentage of light it reflects which in turn controls readability. A high brightness provides the greatest contrast but can contribute to eye strain. A low brightness provides less contrast but can produce a blurring effect. Brightness is a characteristic mainly applicable to white paper grades.

Opacity: the degree to which a sheet conceals print on its reverse side, opacity is influenced by basis weight, brightness, and the type of fiber and filler added to the wood pulp.

Finish: the surface of the paper can be coated with a clay-like substance then calendared to produce an extremely smooth sheet with excellent ink holdout properties. Coated sheets are often used when printing in full color, especially for brochures, sell sheets, and similar marketing materials. Alternately, a finish may be added to paper during the manufacturing process. Common finishes for writing and book papers are felt, laid, cockle, antique, eggshell, vellum, smooth and lustre. Yet other finishes are embossed on the surface of the paper after manufacturing is complete. Popular embossing patterns are linen, tweed, and pebble.

Color: for full color printing, white is the most popular color, though how white the sheet appears is affected by its brightness. Bright whites accentuate the contrast between light and dark while off whites produce less glare. For colors other than white, the paper color may affect the perception of ink color.

Paper Strength

Formation: formation is the physical distribution of fibers and solid additives in the sheet which can often be observed by holding the sheet up to light. A poorly formed sheet is one in which the fibers are unevenly distributed; this can cause ink to absorb at different rates and create a mottled appearance.

Grain: the direction in which most fibers of the paper align is called the grain. Paper is more flexible along the grain and stiffer against it. The test for grain direction is to tear the paper. It will tear easily with the grain and crack or create a ragged edge against the grain. Paper should always be folded and bound with the grain. Recycled paper is less apt than virgin paper to crack when folded against the grain, because the fibers are shorter and the bond not as strong.

Caliper: caliper is the thickness of the paper, measured in thousandths of an inch. Printers often refer to this measurement as a *point* and will describe a paper measuring .012 inches thick as "12 point".

Weight: the weight in pounds of one ream (500 sheets) of the paper's grade size. Weight is often confused as describing the thickness of a paper; however, a thick small-sized paper may have a basis weight identical to that of a large, thinner paper. For example the basic size for bond paper is 17 x 22 inches. If 500 sheets of bond in its basic size weighs 20 pounds, it is classified as 20 lb. bond. However, if it weighed 24 pounds it would be called 24 lb. bond.

Bulk: the thickness of a paper relative to its basis weight. An uncalendared uncoated paper has a higher bulk than gloss coated paper. Bulk does not predict basis weight.

Got questions? we're here to help

We know paper characteristics can be confusing, and made more so when selecting recycled sheets. That's why ***George and Rich*** have been trained in the best paper for various kinds of offset and digital printing applications.

Call us at ***Burlington Press*** and we'll clear up the confusion, ***609-387-0030*** or check us out on the web where we have online Tips and Tricks -

www.BurlingtonPress.com

THE idea words

a vocabulary of the graphic arts

PAPER

When selecting a paper for your company's letterhead, you will want to consider not only how the ink will look on the paper, but also how it feels when handled and how the sheet will perform when put through your desktop laser printer.

Writing grade papers offer a wide selection of colors and finishes, even in recycled sheets and will often have matching envelopes and business card stock. Because of the finishes, writing grades can have a bulk that is very satisfying to the touch.

You may also want to consider using a text grade paper for letterhead. The basis weight is higher than writing grades, and the caliper and bulk can also be greater. Paper manufacturers sometimes produce identical finishes and colors in both writing and text papers, so finding matching envelopes may not be hard.

Finally, a duplexed paper – two sheets of paper fused together to produce a thick stock that is different colors on the front and reverse – can be very dramatic when used for business cards.

Acid free paper: paper manufactured to a neutral pH reading of 7. Acid free paper is less susceptible to deterioration, and is therefore used for fine art prints, limited edition printing, and other types of archival printing.

Antique finish: a type of paper surface characterized by a random pattern that is created during the paper manufacturing process.

Brightness: the light reflecting property of paper, as measured by blue light.

Basis weight: The weight of one ream of paper (500 sheets) when cut to the industry standard size for the specific grade of paper.

Bristols: Solid or laminated heavy-weight printing paper, having a thickness of .006" or higher. Often used for printed items that require frequent handling.

Bulk: The thickness of paper when compared to its weight. A *high bulk* paper is thicker but less compact than a *low bulk* paper of the same weight and size.

Calendaring: a step in the paper manufacturing process where the paper web passes between polished metal rolls to increase the paper's smoothness and provide a uniform thickness (caliper).

Caliper: the thickness of a sheet of paper expressed in thousandths of an inch. Caliper is measured with a micrometer.

Carbonless paper: paper coated with chemicals that have been encapsulated before applying to the paper. When pressure is applied, the capsules break, releasing the chemicals which mix and produce the image.

Equivalent weight: a way of finding comparable papers that have different basis weight.

Lignin: a natural glue-like substance that binds the cellulose fibers of tree cells together. Approximately one-third of the tree is lignin.

Post consumer material: paper that has been used and discarded, then separated or diverted from the solid waste stream.

Ream: usually 500 sheets of paper, although a ream can be less (often 250) for heavy papers such as bristol, index or cover.

Recycled paper: paper manufactured from the waste paper stream and containing specified percentages of post consumer material and/or recycled fiber.

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TRICKS & tips

Because of the difference in the processes of offset printing and digital imaging, paper manufacturers have formulated papers specifically for the conditions inherent to each process. Imaging papers have now been developed with qualities that maximize image clarity and quality. Please be aware, however, that the selection of recycled papers is still somewhat limited for imaging papers.

Papers for color copiers have a lower moisture content to compensate for the intense heat needed to adhere toner to paper. In addition, smooth surfaces are best when toner application is heavy.

Papers for inkjet printers require a smooth surface that allows the ink to be absorbed without smearing or running.

Papers for laser printers are manufactured with a very smooth finish and low moisture content. In addition some manufacturers increase the brightness so images will contrast well.

Papers for high speed copiers have a surface formulation designed to minimize jams and a moisture content to prevent curling at the edges of the paper. These sheets are also a good choice for FAX machines.

When you are ordering a printed product you will be using in a digital imaging device or inkjet printer, please mention the use to us so we will print your product on the correct sheet.

Q. How is paper made?

A. Wood is the basic raw material for making paper. Harvested logs are put in a large, open-ended cylinder called a *debarking drum* where the logs collide with one another and rub together to remove the bark. The bark falls through slots in the cylinder walls and is collected and burned as fuel in the power boilers. The debarked logs are conveyed to a chipper, which reduces them to small 1.5- to 2-inch squares with a 0.25-inch thickness.

Wood is made up of small cellulose fibers, bound together by a glue-like substance called *lignin*. Wood chips and chemical cooking liquors are loaded into large vessels called *digesters* which act like a kitchen pressure cooker. The chips and cooking liquors are steamed under pressure for 90 minutes to four hours, reducing the chips to a wet, oatmeal-like mass called *pulp*. This process dissolves the lignin which frees the cellulose fibers so they can be suspended in water.

Once the fibers have been loosened, they are separated from the *black liquor* (the dissolved lignin and cooking liquors). The chemicals contained in the black liquor are processed and recovered to be used again in another cooking cycle, while the fibers are bleached to the proper shade of whiteness. Next the pulp is *refined* which roughens the surface of the individual pulp fibers by loosening the threadlike elements from the cellulose fiber walls so they cling together when formed into a sheet.

After adding dyes and other additives to give the finished paper its desired properties, water is added to the pulp in a ratio of 200 parts water to one part fiber. The resulting pulp, called *furnish*, is run onto the forming fabric or wire of the paper machine. The *forming fabric* is an endless mesh screen that circulates at the wet end of the paper machine. There the fibers become interlaced, forming a mat of paper, and much of the water is extracted.

Traveling at speeds of more than 3,000 feet per minute, the paper is pressed between water-absorbing fabrics and wound through a series of steam-heated cylinders called *dryers*, where the last of the water in the sheet is removed. At this point, the paper passes through a *size press* that applies a starch solution to both sides of the sheet. Sizing seals the surface so ink cannot soak into the paper during printing. Since sizing wets the paper, the paper must again be dried by traveling through another series of steam-heated drums.

After drying, the paper goes through a *calendaring* process that irons the sheet between heavy, polished rollers. Calendaring provides a smooth finish to the paper. At the dry end of the papermaking machine, the paper is wound onto spools to form a machine reel and then rewound and slit into smaller rolls on a winder. Some of these rolls are sent for sheeting and packing into cartons. Others are rewound to smaller-sized rolls and wrapped for shipment.

Explanation courtesy of International Paper

Q & A questions and answers