

OFFSET INKS

Offset inks are compounded especially for use on offset presses. Never use inks intended for other printing processes on offset presses.

REQUIREMENTS

Offset inks must be able to withstand reaction with the press fountain solution it encounters on the dampened offset plate. Ideally, the ink on the ink roller should not absorb water (*water-in-ink emulsification*), nor should the ink break down and combine with the fountain solution on the non-printing areas of the plate (*ink-in-water emulsification*). Either of these emulsification problems will tend to impair the body, color, or drying qualities of the ink, or cause tinting on the non-printing areas of the plate and printed sheets.

The ink used on an offset press must be able to carry the full-intended color and covering power to the paper despite the *split-film* action. This occurs because the offset blanket picks up only a portion of the ink from the plate and delivers only a portion of that to the paper. The film of ink reaching the plate, then, is very thin, and the ink must be able to show its full color and opacity with this film.

COMPOSITION: ink is made of three main ingredients: *Pigment*, which is the coloring material in the ink; *Vehicle*, which is the liquid that holds the particles of pigment; and *Modifiers*, which control the drying of the ink as well as other factors such as smell, scuff resistance, and fading.

PIGMENT: There are two basic types of pigment used in printing inks. *Organic pigment*, which is made from carbon, is used for making black ink. *Inorganic pigments*, which are made by mixing various chemicals together, are used for colored inks. For example, sulfur, silica, or china clay can be combined with either soda ash or sulfate salts to make ultramarine blue ink.

VEHICLE: Vehicle is the liquid that *holds the particles* of pigment and carries them to

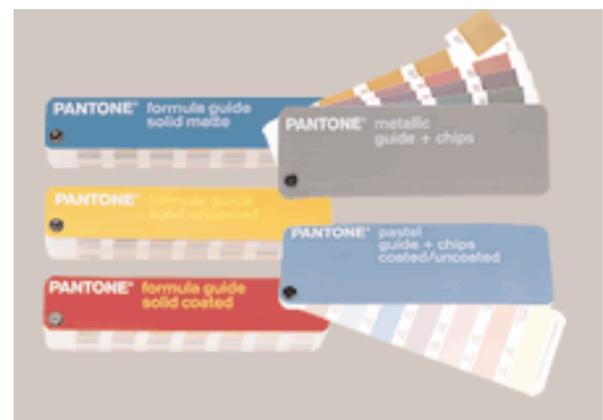
the paper. There are two kinds of vehicles used in offset inks: oils such as *soya oil* or *linseed oil* (which is a yellowish oil made from flax); and synthetic vehicles, which are liquids resulting from the mixture of chemicals. For example, *phenol* and *formaldehyde* mixed together make phenolic resins, sometimes used in printing inks as a vehicle.

MODIFIERS: Modifiers are ingredients added to the ink to control *drying* and other qualities such as *smell* and *resistance to fading*.

COLOR MATCHING

One of the most important qualities of ink is its color. If the customer orders black ink, there are few problems because black is essentially black. However, if the customer orders yellow-green, it is hard to know exactly what color yellow green she has in mind. To help solve the problem of mixing the exact color the customer wants, the ink manufacturing industry has developed a system of color classification known as the PANTONE MATCHING SYSTEM.

PANTONE MATCHING SYSTEM: The PANTONE MATCHING SYSTEM (PMS), consists of swatch books that contain samples of hundreds of different colors, each identified with a *code number* and the *formulation* for each color. In other words, the book tells exactly how much yellow and how much blue are required to make the specific color of yellow-green ink the customer chose from the book. Printers can obtain these books so they can



PANTONE MATCHING SYSTEM Books

order the exact color the customer wants.

The printer may also use this book to mix ink colors in the plant. The PANTONE MATCHING SYSTEM relies on ten basic colors (PMS black, PMS white, PMS rubine red, PMS rhodamine red, PMS warm red, PMS reflex blue, PMS process blue, PMS green, PMS purple and PMS yellow) which can be kept on hand and mixed using the proportions indicated in the PANTONE book to make the exact color desired. Beside quantities of the basic colors listed above, the printer must also have an accurate scale to measure the quantities of ink required for the color, ink mixing knives, clean-up solvent, and rags.

To mix the inks, the exact amount of each required PMS basic color is measured out on the scale (use only PANTONE colors for acceptable results). Then the basic colors are mixed together with the ink knives. The ink is then tested for correct color and, if it is correct, it is placed in cans for use later or put directly into the press fountain. Finally, the mess from mixing is cleaned up with solvent and rags.

TESTING FOR CORRECT COLOR: There are several ways to determine if the ink is of the color desired. The first is the most common and only one available to many printers. It is called the *drawdown* test. This test is made by putting a dab of ink onto paper and drawing it across the sheet with a spatula or ink knife. The resultant “undercolor” is approximately the color the ink will print on the press sheet. The dab can then be compared to the Pantone chart to assure accuracy of the mixing.

A second way requires the use of an ink proofing press. A measured amount of ink is applied to a small letterpress printing plate. The ink is then transferred from the plate to a sheet of paper through an intermediate blanket. The resultant print is a precise check of the printing color of the ink.

INK TACK

Another quality of ink, which must be correct to assure the good performance of the ink, is known as *tack*. Tack refers to the stickiness

of the ink, and it must be correct so that the ink will stick to the rollers of the press and not fly off, but still transfer from roller to roller, from roller to plate, from plate to blanket, and from blanket to paper.

TESTING TACK: The machine used to test tack is the *inkometer*. A measured amount of ink is placed on small rollers resembling press ink rollers. The rollers begin to turn and the tack of the ink is indicated on a dial on the machine. Most offset inks used to print color work have a tack numbering between 13–20. Lower numbers means less tack.

Newer presses, which have fewer ink rollers to soften the ink than older models, require less tacky inks.

INK OPACITY

Another important quality of ink is its opacity, or ability to hide the color beneath it. Sometimes, an ink with little opacity is needed, such as when overlapping two colors to create a third color. Other times, very opaque ink is needed to completely cover any color under it. The opacity must be suited in the use of the ink

Opacity is tested by spreading a sample of ink with an ink knife over a wide black line printed on a sheet of paper. The amount of covering is then compared to a standard to determine if the opacity is correct.

PRODUCTION MANUFACTURE OF INK

In production, large amounts of ink are made at one time. The process is basically the same as mixing PMS colors, but machines are used instead of hand labor.

The first step is weighing the ingredients. Instead of mixing premixed inks, the various pigments, vehicles, and modifiers are weighed out according to a formula and placed into a large vat.

The vat is taken to a large *dispenser*, which resembles a malt mixer. It is in the dispenser that all the ingredients are mixed together to a uniform consistency.

After the ink has been mixed, it is placed onto a machine call a *mill*. The mill makes the ink very fine and smashes all the particles of pigments until the ink is very smooth. The mill consists of three large steel drums turning at different speeds. The ink is placed on top of these drums and their turning motion forces the ink into *pinch points*, grinding the ink into very small particles. The ink is allowed to run through the mill until it is ground to the correct smoothness. Then the ink completed and it is packaged in cans of 1, 5, 10 or 50 pound capacity.

USING INKS

Obtain the correct can of ink for the job you are about to run. You should check the following things on the ink could label. (1) *The manufacturer's name*: the ink should be of a brand that has been tested in the plant and known to be of good quality. It is also important that brands not be changed when running the various colors of a multi-color job. (2) *The color name and identification number*: be sure to use the exact color of ink as given on the job envelope or ticket (expressed as a number or name: i.e. PMS 464, or "Reflex Blue"). (3) *The batch number*: in long-run color jobs, the cans of ink used should be of the same batch to assure exact color matching. (4) *The type of vehicle*: inks are usually oil-based or rubber-based inks. *Oil-based* inks are the better quality inks, drying to a gloss finish, and available in all colors. However, they dry on the rollers if the press is left stopped overnight. Therefore, the press must be washed up at the end of the day. Oil-based inks also form a *skin* on the top of the ink in the can if not protected with *anti-skin* spray and dry slowly on the paper. *Rubber-based* inks do not dry on the rollers if left overnight and do not form a skin. However the quality of the print is not quite as good as oil-based, and there are fewer colors available.

To use a can of ink, remove the lid and, with the tip of an ink knife, break away any skin that may have formed on the top of the ink. Lift the skin off the ink and place it in the

center of some scrap paper. Fold the paper so that the ink is wrapped inside, like a burrito. Then wrap the "burrito" in another sheet of paper, and throw it in the trash. *This is done so that the person who dumps the trash does not get his hands full of ink.* Now, remove the ink from the can, using a circular motion, leaving no gouges on the top of the ink. If the ink is extremely tacky, you may desire to *work* it by placing it on a metal-covered table and stirring it using an ink knife. Now, place the ink into the fountain and clean up the mess.

STORING INKS: After use, clean the outside of the ink cans, the lids (inside and out), and the rim with a rag and solvent. Make sure the top layer of ink inside the can is smooth and level. If it is an oil-based ink, spray some anti-skin spray on the top of the ink (if available). Oil the rim of the ink can, replace the lid, and put away the ink can.

INK TERMINOLOGY

Beside the term explained in the paragraphs above, these terms are used to describe various properties of ink.

VISCOSITY: is the resistance to flow. If ink flows or pours readily, it has a low viscosity. If it refuses to pour at all, it has a high viscosity. Offset inks usually have a relatively high viscosity.

LENGTH: Ink may be "*long*" or "*short*." Test it by tapping a puddle of ink with a corner of an ink knife and lift the knife up. The ink will follow the knife and stretch into a string. The farther it stretches without breaking, the longer the ink. Offset inks are generally long.

TRANSPARENCY: refers to the opposite of opaque. A transparent ink does not hide the color beneath it, but mixes with it to create a third color. All inks used to print full color work must be transparent.

PERMANENT: Permanent inks maintain their color and do not fade even though exposed to sunlight for long periods. They are especially suited to signs and posters. Permanent inks are also called "*fast*" inks.

FUGITIVE: A fugitive ink is one that tends to lose its color and fade when exposed to long periods of sunlight.

RESISTANT: Resistant inks are made to withstand the action of gases, chemicals, heat, moisture, or scuffing.

LAKES: Lakes are body colors—not particularly strong or bright.

TONERS: Toners are strong colors—highly concentrated.

JOB BLACK: Job black is an ordinary, inexpensive, black ink used for most jobs.

HALFTONE BLACK: Halftone black ink is made especially made for printing the small dots in halftones.

METALLIC INKS: Metallic inks are made with metal powders. Bronze powder in an ink makes “gold.” Aluminum powder makes “silver” ink.

PROCESS INK COLORS: Process inks used to print full color work are: Process Yellow; Process Magenta (red); Process Cyan (blue); and Process Black.