Cork Tech Talk News

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

2/95

SURFACE ENERGY & PRINTING SUCCESS

Continuing last issues' discussion, surface tension and surface energy are two parameters that affect printing, especially on non-porous substrates. All liquids have a surface tension and all solids have a surface energy, both of which are measurements of force per square centimeter, expressed as dynes per sq. cm.

Nature will always move to cover a high energy surface with a lower energy surface. This can be thought of as a force of attraction and a potential for surface wetting.

In printing and/or coating, two basic rules apply:

-substrate wetting must be optimized to achieve good lay and adhesion.
-optimized wetting occurs when the surface tension of an ink or coating is equal to or less than the surface energy of the substrate

All printing and coating processes are affected by surface energy. For example, consider lithography:

Every supply item, ink, coating, and fountain solution, (as well as every interacting contact surface), which includes rollers, plates, blankets and substrates along with their interacting surface energies, affect printing.

Similarly affected will be all other printing and/or coating processes such as flexo, gravure, and silk screen.

In offset lithography, ink travels from the ink supply fountain, transferring from roller to roller, until it reaches the plate and finally the blanket from which it is printed to the substrate. This occurs as conventional ink with a surface tension in the range of 30-32 dynes, and UV ink 34-35 dynes readily covers both higher dyne rubber and copper rollers.

What's the interaction concerning fountain solution? Well, the surface tension of water at 73 dynes is lowered to be about 35 dynes due to the addition of alcohol or substitute. Because this is below the dyne level of copper, water (fountain solution) would eventually wet out these rollers. When this happens ink would not be able to wet out the water wet copper and we would have a condition called "stripping".

Continuing, let's consider the plate next. When fountain solution reaches the plate it readily wets out the much higher (as much as 400 dyne) non-image area while adjacent it is repelled by the lower dyne image area where it beads. When ink arrives from the form roller, it comes under pressure along with the non-image area fountain solution in the nip. At the backside of the nip, the layer of ink and fountain solution split at the weakest point which is within the thin film fountain solution. This process leaves a very thin film of fountain solution on the non-image plate area, and also a layer on the ink form roller, where it beads up since the 35 dyne fountain solution will not wet the lower dyne ink. While there will be some beads of fountain solution on the image area when the inked form roller hits it, they are pushed aside as the 30-32 dyne ink covers the higher dyne plate image area. Then, where the nip opens, the ink film splits as it now contains the weakest point in the absence of fountain solution so that some of the ink remains on the roller and some transfers to the plate image area. Most critical is what happens to the beads of fountain solution that are left on the ink forms after contact with the plate non-image area.

These beads come under pressure in the nip between the form and vibrator rollers. This squeeze forces the fountain solution droplets into the ink, emulsifying it. These tiny droplets on the surface of the ink help replace fountain solution on the plates non-image area. Ideally, the fountain solution being added exactly equals that which is being removed by the plate.

When the form-vibrator nip pressure (stripe too wide or form roller too hard) is excessive, fountain solution beads are made so small that they will not transfer back to the plate. Seen as scumming, fountain solution build-up ruins ink properties. Opposite, when the pressure is too little (stripe too narrow), large beads of fountain solution will be forced onto the ink film halting ink transfer which will result in a light print and piling on the rollers.

Scumming can also result from too high a fountain solution substitute level, which can produce beads that are so small that they build up in the ink. Further, high fountain solution salts as measured by conductivity or high pH, can also produce scumming.

OVER

Cork Industries, Inc. 500 Kaiser Drive Folcroft, PA 19032 610.522.9550 F 610.522.9659
Elmer W. Griese, Jr. 440.353-0980 ewgriese.cork@att.net
Website http://www.corkindustries.com

Water soluble gum as a fountain solution component is known for it's ability to coat the plates non-image area. This guarantees that ink and/or ink oils will remain separated from the plate non-image areas by fountain solution, gum or both. Gum which swells in the presence of water helps break up an ink whenever it gets into the plates' image area.

Taking all of this into account, it is still said that most ink and fountain solution problems are in fact **ROLLER SETTING PROBLEMS.**

Now, back to getting a print. Ink is transferr-ed from the plate image area to the printing blanket when the 30-32 dyne ink film splits at the plate/blanket nip, wetting the higher dyne blanket. In the non-image plate area the 35 dyne fountain solution also splits leaving a very thin wetting layer. As the inked blanket is forced into contact with the substrate being printed, the ink film splits, transferring an image. Remember the ink

must be attracted from the blanket to the substrate. This transfer will not take place if the surface tension of the ink is higher than the surface energy of the substrate. Further, if the surface energy of the substrate is lower then that of the blanket then the ink will be more attracted to the blanket than the substrate. The same rules apply to coating.

In the non-image areas the fountain solution is transferred to the substrate wetting it. On porous clay coated paper board it soaks in. However, on non-porous stocks like poly board and films with low surface energy, any fountain solution that transfers cannot be absorbed and will build up. Ft. sol. build-up on a substrate's surface is one reason why it can become harder and harder to obtain good ink transfer throughout a press run.

What does this have to do with aqueous coating? Well, importantly poor printing is never improved by coating, and waterlogged inks and substrates only make the drying of aqueous coatings more difficult.

Moreover, an ink that is not set will not be protected well from rub damage in delivery by an aqueous over coating, nor will poor ink adhesion be improved.

Whether printing or coating, whenever the surface tension of an ink or coating is greater than the surface energy of a substrate, then a tendency to not wet will produce a defective print or coating film.

As a bottom line, it is well to remember that surface tension and surface energy are integral considerations that affect printing but also they are key to successful overcoating.

LOOK TO CORK!....... for your coating and varnish needs, for both aqueous & UV/EB coatings/ and varnishes.