Cork Tech Talk News

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

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DRYING - WHY THE MYSTERY?

Clothing dries when the wash water is evaporated. Paint dries when the diluent solvent is evaporated.

Aqueous coatings dry when a large amount of water, about 60% by composition, is removed, leaving the coating solids behind to form a thin film.

Most aqueous coatings consist of 30 - 40% thermoplastic resin solids, combined with a variety of other ingredients to improve properties. Routinely included are an amine, plasticizer, waxes, surfactant, coalescent aids, and an anti-foam.

When the volatile non-solid components are evaporated, the resin molecules join or link together by a process called coalescence. The coating is 90% dry with a thin film formed during this fast initial drying phase, allowing a coated sheet to be handled. Post cure that goes on over time accounts for the remaining cure and complete coating property development.

In the case of aqueous coatings wet trapped in-line over litho inks in the sheetfed offset process, the film formed is microporous allowing oxygen to reach the underlying setting, but not yet dried, inks.

Drying may be said to have taken place when the coated sheet can be handled safely, permitting additional processing without creating scrap.

How are aqueous coatings dried in hi-speed printing processes?

Well simply, drying systems are built that are able to remove a large amount of water by evaporation in a very brief time.

Yes, a very brief time! The time to move a sheet through the delivery of a litho sheet-fed press at speeds that now reach 15,000 IPH an hour.

So what is done? For one, extended delivery is offered by the press manufacturer allowing more time to dry. Second, the dryer manufacturers have evolved drying systems that give the capability of evaporating great quantities of water very quickly. Incorporated are devices to provide continuous drying air flow, and exchange throughout the drying space. These may include hot, warm and ambient air knives that direct a blast of water evaporating air toward the coated surface. Also included may be multiple panels of short (preferred) and/or medium wave IR emitters. Medium wave IR, slow to heat up and cool down, radiates energy that heats the air layer above the substrate. Short wave IR radiates heat energy that will not heat the air layer above a substrate but will be absorbed very efficiently by any darker image areas and even lighter areas penetrating the substrate. IR also supplies a hot dry air source in some con-figurations. Too much IR can result in set-off, blocking, and even resoftening of the thermoplastic coating itself in a pile that gets too hot. This is critical whenever coating both sides of a substrate.

Equally important in any functional efficient drying system is the exhaust air. The air that has impacted on the wet coated substrate is now moisture laden. It must be effectively exhausted from the drying and delivery space, including the space beneath the press. **IT IS CRITICAL TO REMOVE AND EXHAUST THIS MOIST AIR OR DRYING WILL BE IMPEDED!**

Never forget that a voluminous supply of warm dry air must be continually available in order todry aqueous coatings by the required evaporation of a large amount of water.

We should remember that wet laundered clothing will not dry, very rapidly hanging on a line on a windless, damp, humid day. However, try it on a sunny, dry windy day and marvel at how fast drying takes place.

Ideally, a properly designed printing process drying system consists of enough capacity in terms of time, heat, air flow and exhaust to dry effectively. Using the minimum amount of energy necessary, the result should be material that can be safely processed further.

Once again, let's talk about the goal of producing a print that can be handled at the end of the press. In conventional litho printing, emulsified inks set and dry (eventually) by oxidation polymerization. Sett- ing is understood to occur when volatile solvents evaporate and /or are absorbed with other low viscosity materials into the printed substrate. When inks set fast enough on a given substrate the sheet can be handled with-out setoff, marking or smearing occuring in the pile. Ink film thickness also is a factor in ink setting and drying. We are often asked to provide an aqueous coating that will dry effectively over very heavy ink coverage. However, the more

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

ink there is the more time it takes to set and dry. Even a dry aqueous coating over an unset, heavy ink film will not resist marking or smearing when rubbed lightly.

Control of the litho printing process is most important. It is said that nothing affects ink setting and drying more than ink and water balance. The move to alcohol free fountain solutions and new aqueous developed electronically charged grained plates, makes **OVER DAMPENING** all the easier. An ink high in water pick-up is an ink that has a compromised drying rate. Duke tested ink water pick-up (emulsification) should not exceed a range of between 40-55%. Low pH (high acid) fountain solution will also retard ink drying. Target a 4.0 - 5.0 pH.

You may also want to limit your use of Soya based inks because of their slower drying speed.Drying is no mystery but many elements are involved. All must be controlled in order to optimize the result expected from aqueous coating, especially some of the slower drying very high gloss formulations.

Check your HMIS and MSDS too, as some faster drying coatings offered may be alcohol laden.

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