INK DRYING ON PAPER

The most important elements in determining the drying speed of ink on paper are the porosity of the paper, the degree of humidity and temperature, the wetting solution in the case of offset printing, and the pH of the paper.

Porosity of the paper

In the manufacturing of paper, fibres are distributed more or less evenly, leaving small cavities or depressions called pores which foster the penetration of ink by means of a capillary effect. When coating is applied, the porosity of the paper diminishes dramatically, making it a microporous paper. The microporosity of paper depends on the amount of coating applied as well as the amount of calendering: the more coated and calendered a paper, the less porous it will be. Matt paper is therefore more porous than glossy paper, and industrial coated paper is more porous than art paper. There are even papers (metallic or superglossy paper) whose treatment closes them in completely. These papers lack absorbency, and special ink is required for printing them.

Ink drying depends on the absorbency of the paper. However, using highly absorptive paper does not guarantee that the ink will dry any better, and the different components of the ink must therefore be kept in mind. Ink contains a solid component called pigment, responsible for color that diffuses in a liquid component known as vehicle or varnish. The

latter, in addition to transferring the pigment from the ink fountain of the machine to the substrate, is responsible for the hardening of the ink, that is, for drying. Varnish is made up basically of resins, vegetable oils (such as linseed oil) and petroleum-based mineral oil with a high boiling point. The resins and vegetable oils oxidize when spread out in fine layers; mineral oils, on the other hand, do not undergo oxidation of any kind and therefore must be absorbed by the substrate in order for the ink to dry. Ink drying occurs in two stages. First mineral oils are absorbed, resulting in an increase in the thickness of the ink. This is followed by oxypolymerization of the resins

and vegetable oils. Excessive ink absorption will increase the drying time, causing a delay in the oxidation of resins and vegetable oils, for as these elements become absorbed the amount of oxygen that reaches them decreases.

Ink drying is optimal when paper absorbs the mineral oils and other products (resins and vegetable oils) that remain on the surface of the paper. As the absorbency of glossy paper is lower, the ink remains to a larger extent on the surface and as a result, drying occurs faster. Paper should, of course, always possess a minimum of absorbency, for if mineral oils are not absorbed offsetting will occur, that is, the printed sheets will stain the backs of the sheets that fall on top of them during printing. It is therefore important that the paper at least be minimally absorptive and that the absorption not be prolonged. This is because if absorption takes place too slowly, offsetting can occur.

Humidity and temperature

An excess of humidity in printing not only risks damaging the paper but also can slow down the drying process. This delay occurs because ink contains components similar to water vapor which, when excessive, will delay drying due to oxidation.

An increase in temperature benefits ink drying by reducing the thickness of the ink, thereby fostering its penetration of the paper and minimizing the risks of offsetting. In fact, one of the best ways to improve ink drying is through the use of infra-red rays when the paper exits the machine. Temperature is also important in terms of ink preservation. Conditioning of the print will improve conservation of both the paper and the ink.

Wetting solution

In offset printing, the separation of print and non-print areas is achieved through the use of oil-based ink and water. The printing surface is chemically treated for the reception of water in non-print areas and ink in print areas. The separation is achieved through the repulsion of oil and water. Despite this repulsion, a small quantity of water always passes into the ink; the higher the quantity, the more difficult drying will be. For this reason, it is very important that the printer control not only the quantity of water, adding the minimum amount possible, but also that the water be treated with the proper conductivity and an appropriate pH (5.3-5.8.).

Paper pH

In the manufacturing of paper, substances are added that ultimately form part of the fibrous mass and will determine the acidity or alkalinity of a paper. The most important factor in this are sizing products, as compounds are added to paper to regulate the penetration of water.

Depending on the products used for sizing the paper; or rather depending on the manner in which the surface of the paper has been treated, the paper will have an acidic, neutral or alkaline pH.

Nowadays papers are generally manufactured to neutral conditions, that is, the pH oscillates somewhere between 6 and 8, which is to say, is slightly acidic, neutral, or slightly alkaline.

The pH of the paper does not significantly modify the speed of ink drying when the ambient humidity is low. However, if the relative humidity is high, the paper can deactivate the drying components of the ink, lengthening drying time. This is especially important in the offset system because the impression is made through the combination of ink and water, and even when the degree of humidity of the printer's shop is not excessive, the process can become complicated if the printer adds too much water, which will result in an increase in the humidity of the paper.

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