Coatings in Digital Printing

As already experienced with regard to other printing methods, the varnishing of digitally printed folded boxes, labels and commercials gains more and more importance. Coatings do not only offer a protective function, but they also provide finishing effects, for example from gloss to matt. This White Paper shows which criteria to consider when choosing your coatings and it explains the challenges for coating manufacturers.

TECHNOLOGY PART 1: DIGITAL PRINTING

Digital printing has become increasingly important in many application areas. It includes a group of printing methods where the printed image is directly transferred from a computer to the printing press – without the use of a static or solid printing form. Some advantages of digital printing are as follows: A high efficiency with regard to limited editions, the possibility to realize individualization or a high flexibility due to print-on-demand. In graphic arts, we mainly distinguish between three basic technologies:

- Electrophotography based on dry toner (DEP)
- Electrophotography based on liquid toner (LEP)
- Inkjet (water based versus UV based inkjet)

Electrophotography

Simply spoken: By means of highly collimated light beams (e.g. LED), a photoconductor is exposed with the optical image of a master copy. Thus, a latent image of electrical charge is created. The toner adheres to those areas charged and is transferred to the substrate correspondingly.

In electrophotography, we use dry or liquid toner. Those technologies provide advantages and disadvantages. The widely spread dry toner is fixed to the paper by means of heat which may dehydrate the substrate. Liquid toner requires the use of a primer for a better toner adhesion and color transfer. Both systems offer a high printing quality, but may be liable to scratching without overprint varnishes (topcoats).

Inkjet

By means of a print head with nozzle, finest droplets of liquid ink are placed onto the substrate. In general, inkjet printing systems are classified as either drop-on-demand or continuous. Drop-on-demand (thermal inkjet, Piezo inkjet) produces drops from the print head only when required for the printed image. Talking about continuous inkjet technology, a continuous stream of ink droplets is generated. Droplets that are not needed for the printed image are deflected, collected and re-used. Apart from solvent based systems, especially UV based and water based inks are applied (water based versus UV based inkjet).

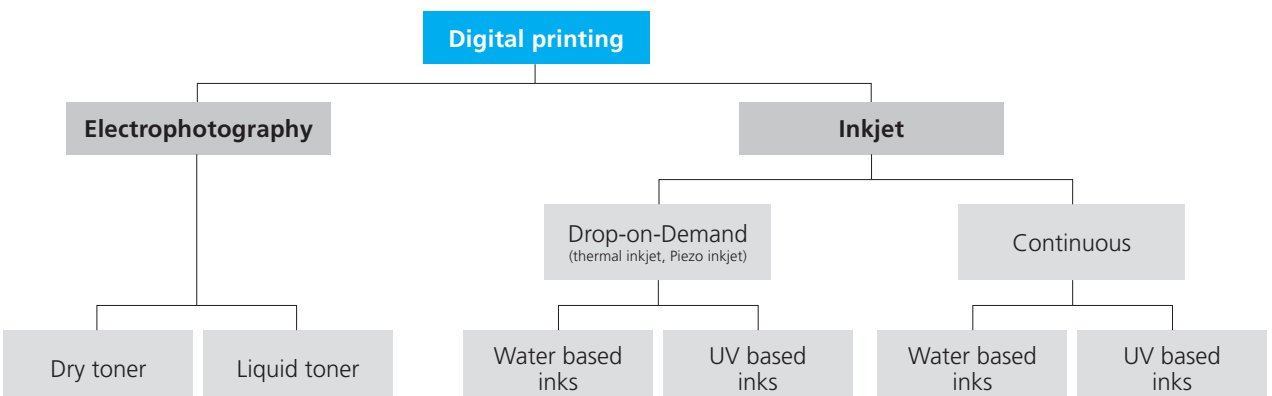

Image: Digital printing in graphic arts

TECHNOLOGY PART 2: COATING

There was a focus on technology perfection when developing the various digital printing processes. Only limited attention was paid to the later requirements of printed products. But as digital printing conquered the traditional areas of analogous processes, we also faced a change in expectations of customers and markets. Not only technical aspects had to be considered, such as an efficient and smooth further processing, but also the successful differentiation at the point-of-sale.

Analog varnishing offered a solution, mainly with regard to smaller coating equipment to comply with customer requirements. Also today, the analog varnishing plays an important role – apart from digital presses with "finishing options" or digital converting machines. Thus, we can find a combination of coating units that are directly linked to the digital printing press (inline) or coating units that follow the digital printing process (offline). In the latter case, printing and varnishing are separated procedures. **The advantage:** There is no need to stop the production for cleaning purposes or a change of coatings.

The role of coatings and primers in digital printing

In digital printing, coatings and primers have to fulfil specific requirements. Printing processes and the way of varnishing play an important role (see section "TECHNOLOGY"). Correlations between substrate, toner/ink, primer and coatings must be carefully considered.

Coatings

Coatings are a liquid, mostly transparent material, thinly applied to objects or substrates. By means of chemical or physical processes, a solid coating layer is formed. Decisive for a successful coating in the area of overprint varnishes – also called topcoating – is the good adhesion between coating and inks.

Important product characteristics of overprint varnishes in digital printing are:

- good wetting capabilities on the respective ink systems
- no penetration on unprinted areas
- fast drying
- no yellowing and block resistant
- low odor
- no influence on the printing inks
- high reactivity with regard to UV based coatings

Primer

In contrast to overprint varnishes, primers are applied prior to the printing inks (pre-coating). Thus, they provide an optimal surface adhesion between substrate and inks.

In addition, they increase a dot-sharp color reproduction and prevent the absorption of the inks into the substrate. Especially electrophotography with liquid toner requires the use of pre-treated substrates or substrates with primers.

Primers can be applied inline (in one process), nearline (in-between primer and printing are < 7 days) or offline (in-between primer and printing are > 7 days).

Here are some examples for the interaction of the various materials:

- Toners used in electrophotography may contain specific oils. On one hand, these oils are important for the printing process, but on the other hand, they may disturb the development of an even coating film. They accumulate on the printed surface, depending on the toner application amount. Results can be improved by means of a lagged varnishing process (offline) or by means of a heat treatment prior to varnishing. If the applied toner amount is very high, effectively a "relief" structure, the coating shows a rough surface, too. Choose troubleshooters - coatings developed in order to solve particular challenges in the printing process – as they offer support in many cases.

- Using UV coatings, there is the possibility of an unrequested matt and gloss development considering unprinted and printed parts of the sheet. The reason: A different penetration behavior of the substrate printed with toner in contrast to unprinted areas. The solution are coatings with anti-penetration characteristics for a homogenous gloss effect.

- Water based inkjet often works with primes or bonding agents. These products increase a dot-sharp and high-contrast reproduction of the printed image. They also prevent ink absorption into the substrate. However, often fluids are characterized by a very low pH-value and thus, they do not only react with the inkjet inks (coagulation), but also with the water based topcoat. The latter loses its gloss and may show a level of grayness. Choose overprint varnishes that have been adapted to the applied primer in order to allow a good gloss development.

Challenges presented here show: In order to find the right primer or coating, it is important to consider the overall printing process including those consumables applied. From coating manufacturers this requires a high expertise for product formulation as well as for the suitable product recommendation.

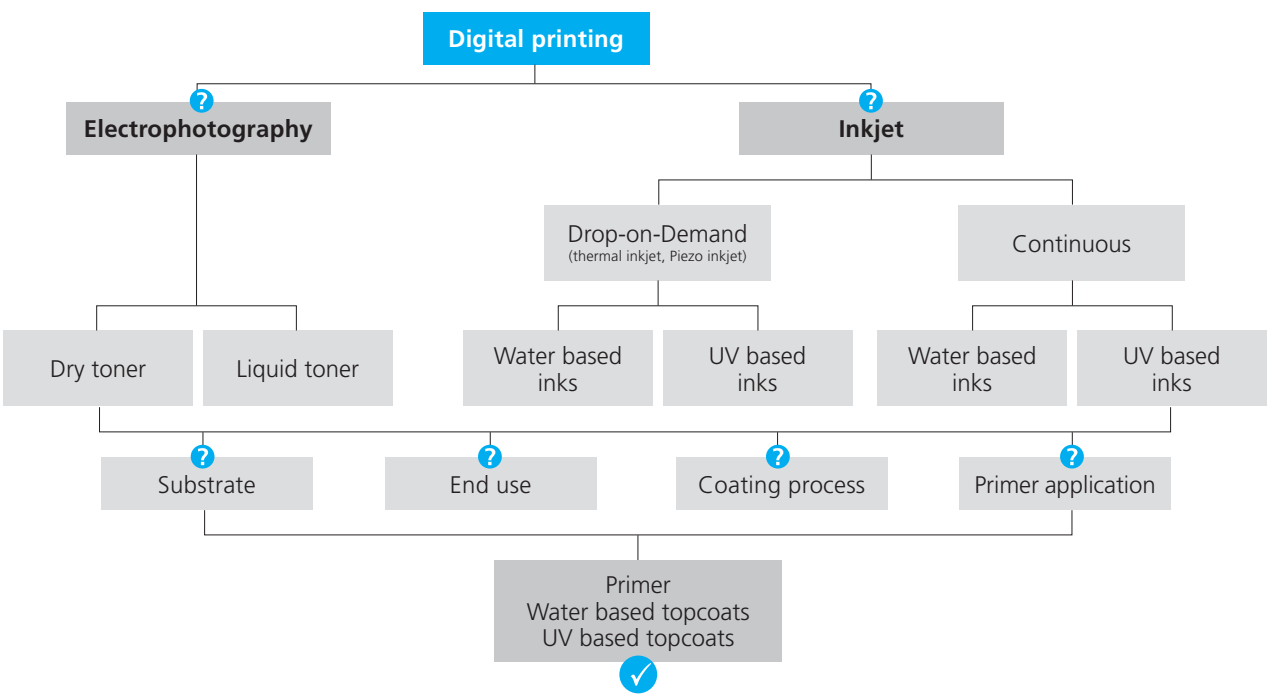

Image: Finding the suitable primer and coating recommendation

Our conclusion

Until now, it is not possible to quit the analog varnishing in digital printing. Whether talking about packaging, labels or brochures, the coating of digitally produced printed products affects all printing processes. The more information a coating manufacturer receives, the better and more reliable the coating or primer recommendation. Apart from the coating equipment used, also toner/inks, the substrate, the intended final product as well as the requested finishing effects play a major role.

ACTEGA Terra – Your coating specialist

ACTEGA Terra develops, produces and distributes overprint varnishes for the graphic arts industry. This includes water based coatings, UV coatings, effect coatings as well as coatings based on renewable resources for packaging, labels and commercial prints. Long-time experience with the various printing processes, first-class references as well as technically well-engineered products characterize ACTEGA Terra. Our customers profit from a fast recognition of problems and the corresponding solutions. For a fast reaction to new challenges, there is a strong focus on research and development.

Especially for digital printing, a competent team is available including experts from research and development, technical services as well as product consultation.

Please contact us for your coating recommendation.

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