



TECHNICAL C&A INFORMATION

De-Wetting/Ink-Density Loss v1.1

De-wetting is a printing phenomenon that results in a loss of visual and measurable ink density when a waterbased coating is applied in-line over a conventional printing ink. When coating is removed, the ink film appears at a normal visual/measurable density, however, the addition of coating over the ink results in a “faded”, “hazy” or “milky” appearance. This result can appear in a single ink color on a specific job, or multiple ink colors, and is most commonly observed on non-absorbent/low-absorbency substrates. Dry-trapping coating over dry inks will not produce this result compared to in-line wet-trapping.

De-Wetting

De-wetting is attributed to an incompatibility of the wetting agents used in a waterbased coating and the wetting agents used in fountain solution chemistry that is contained in the applied ink film. The result of this incompatibility is a discontinuous ink film containing voids when viewed under magnification. The voids in the resulting ink film allow for beneath paper-white to become visible, creating a visual and measurable loss in ink density. The thicker the ink film layer containing high concentrations of fountain solution and the thicker the applied waterbased coating layer, the more significant the de-wetting results can be.

The occurrence of de-wetting is most commonly found when the conditions of a non-absorbent substrate, saturated/heavy ink film thickness, high wetting concentration fountain solution and slow-drying coating are collectively present. In this case, changing one or more of these variables can lessen or eliminate the de-wetting result.

Substrate

Non-absorbent/low-absorbency stocks are most likely to contribute to de-wetting as the fountain solution contained in the applied printing ink films along with fountain solution applied by the printing plate/blanket to the substrate in non-image areas cannot absorb/wick into the substrate surface. In the case of printing inks, the in-ability for contained fountain solution to absorb into the substrate surface contributes to slow “setting” of the inks and traps fountain solution droplets in the ink film. In the case of fountain solution transfer in the non-image areas, this contaminates the substrate surface with fountain solution that can be absorbed into printing inks applied in these areas by subsequent printing units increasing the concentration of fountain solution contained in the subsequent ink film layers. In circumstances where de-wetting occurs, the substitution of a more absorbent stock can cause this result to improve or become eliminated.

Substrate Temperature

Substrate temperature compared to ambient conditions for temperature/relative humidity can influence the surface condition as it pertains to moisture absorption for paper or the presence of moisture when using non-absorbent stocks. Cold stock un-wrapped in warm conditions that are high in relative humidity can cause moisture to condense on the substrate surface, resulting in surface-wicking in the case of paper and surface contamination in the case of non-absorbent stocks. During the printing process when sheets are fed individually through the press, cold paper will cause condensation on the paper surface which can cause for excess moisture absorption prior to and during the printing process, and contribute to slow setting of applied ink films. Paper should be completely acclimated to ambient press-room temperature prior to un-wrapping and use.

Paper Moisture Content

Paper will typically be manufactured with a moisture content of 4-7%, with 5-6% being most desirable for sheetfed applications. The moisture content of the paper in addition to the surface coating will influence the absorbency of moisture and fountain solution through the paper surface. Paper that is high in moisture content will impair the absorbency of fountain solution from the printing inks and printing unit non-image areas.

De-Wetting - *continued*

Paperboard Surface Coating	De-wetting can occur when using paperboard that has a thick surface coating that can impair moisture absorption into the substrate. Substrates such SBS, CCN and CCB that is constructed with a thick surface coating with high hold-out/low-permeability can result in poor moisture absorption from the applied ink/coating films contributing to a de-wetting occurrence. Substitution of a paperboard product that has a more porous and permeable surface coating can result in an improvement or absence of de-wetting.
Non-Absorbent Substrate Surface Energy	When using non-absorbent substrates, it is important that the surface energy/tension of the stock is sufficient to promote adequate wetting of all applied ink and coating films. Insufficient surface energy of the substrate surface can result in reticulation of the applied ink/coating films and contribute to an effect that is similar in appearance to de-wetting. In certain cases, due to an uneven and irregular ink/coating film being applied to low surface energy substrates, de-wetting can occur in conjunction to ink/coating film reticulation resulting in a severe circumstance of visual and measurable ink density loss. Prior to printing, the substrate should be tested using dyne test solutions to make a determination of the actual surface energy/tension of the printing material. For reference, >38 dyne/cm is an accepted industry standard for surface energy to promote adequate wetting for lithographic inks and coatings. For more information regarding dyne testing, please consult the website www.accudynetest.com .
Printing Inks	High-solids oxidative printing inks should be used in order to achieve a color-match at a thin ink film that contains a minimal amount of fountain solution. Inks that are formulated with good 'water-fighting' qualities should be employed to minimize fountain solution absorption into the ink. This is particularly important when using non-absorbent substrates as a high concentration of fountain solution contained in the applied ink film is a key contributing factor to the de-wetting interaction. Slow-drying, 'stay-open' ink types should be avoided along with any ink additives/sprays that may impair/retard the setting/drying process of the inks. Inks should be run at typical ink densities to avoid excessive fountain solution 'pick-up' by the inks that can contribute to a poor ink/damp emulsion stability. Utilize UCR(Under Color Removal) to control over-printing ink areas/densities to promote improved ink setting/drying and reduce the amount of fountain solution that can be contained in the applied ink layers. Printing aids such as 'take-off bars' to increase ink consumption/through-put can help to prevent an excessive amount of fountain solution contamination into the inking unit. Additionally, mechanical aids of the printing unit such as de-segregation of the dampening system from the inking system can help to improve ink/fount emulsion stability in the inking unit. When running special ink colors on non-absorbent stocks, increased pigment strength should be considered and discussed when ordering from the Ink Supplier.
Fountain Solution	Fountain solution chemistries formulated for non-absorbent substrates are recommended and should be dosed to the Manufacturer's recommendations. Fountain solution chemistries containing slow evaporating glycol components should be avoided. If possible, the use of IPA as a wetting aid in the fountain solution is recommended. Fountain solution parameters such as pH, conductivity, temperature and Brix % should be monitored regularly and fountain solution should be re-batched prior to use on problematic jobs. A Brix % of 1.5-1.8% is recommended for proper solution wetting; >2.0% can be problematic. When using an automated dosing system for fountain solution mixing, it is important to test and maintain the calibration of this system to avoid improper dosing.
Printing Inks Sequence	The sequence of printing inks has proven to influence the effects of de-wetting on printing jobs. The first-down ink in the sequence tends to exhibit the least effects for de-wetting due to: <ul style="list-style-type: none"> - No sheet surface contamination with fountain solution by previous printing units - Increased dwell for ink setting prior to waterbased coating application - Increased dwell for fountain solution absorption/evaporation prior to waterbased coating application

De-Wetting - *continued*

Printing Ink Sequence <i>(continued)</i>	<ul style="list-style-type: none"> - Improved condition of printing inks for ink/fount emulsion stability by contact/impression with subsequent printing unit blankets prior to waterbased coating application <p>Transversely, the last-down ink in the sequence tends to exhibit the most significant effects for de-wetting due to:</p> <ul style="list-style-type: none"> - Sheet surface contamination with fountain solution by previous printing units; non-image area of previous printing units becomes an image area on subsequent print units - Minimal dwell for ink setting prior to waterbased coating application - Minimal dwell for fountain solution absorption/evaporation prior to waterbased coating application - Printing ink condition for ink/fount emulsion stability is worst, ink film varies in film thickness and contains larger, isolated droplets of fountain solution <p>Due to these variables, it is typically observed that the incidents of de-wetting become progressively worse from the first-down ink to the last-down ink, with the last-down ink showing the most significant result. When running a problematic special ink color, it may be beneficial to run this color first-down as opposed to last-down as is typically performed to improve the results for de-wetting. If the printing press has a sufficient number of printing units, leaving units open and on impression after the last ink color and prior to waterbased coating application can improve the overall results as mentioned above.</p>
Waterbased Coating Product Selection	<p>To avoid a prolonged interaction between wet ink film layers and a wet waterbased coating film that can contribute to a de-wetting occurrence, it is important that the appropriate waterbased coating product is selected for problematic jobs. In the case of non-absorbent substrates, special coating products will be necessary to ensure proper drying rates as moisture absorption into the substrate to facilitate drying is not possible. In this case, fast-drying coating products will be necessary to achieve a proper drying rate and help avoid a de-wetting occurrence. Special coating products may be necessary for the following conditions:</p> <ul style="list-style-type: none"> - Low-absorbency/non-absorbent substrates - Insufficient or poor condition press drying system - Ambient conditions for high temperature/high-humidity exist in the press area <p>For coating product recommendations, contact your CAC Technical Sales Representative.</p>
Waterbased Coating Application - Anilox	<p>The degree of de-wetting occurrence can be exacerbated by the amount of waterbased coating that is being applied over the ink areas. Excessive coating application can contribute to a greater number and larger voids in the ink film as the coating film migrates into the ink film layer. In cases where de-wetting occurs, the amount of coating should be observed on the sheet and determined to not be visually excessive. The following should be checked to avoid excessive coating application:</p> <ul style="list-style-type: none"> - Check coating viscosity/temperature - Check for proper anilox volume if multiple rolls are available - Check doctor-blade condition in the metering position, change as needed - Check coating blanket/plate for proper packing/height <p>If lower volume anilox rolls are available, it is recommended to change to a lower volume roll and test for results.</p>
Waterbased Coating Application - Roller/Nip	<p>The following should be checked to avoid excessive coating application:</p> <ul style="list-style-type: none"> - Check coating viscosity/temperature - Check operational setting for coating pan roller speed - Check operational setting for coating pan roller speed compensation curve - Check mechanical setting for coating pan - applicator roller

De-Wetting - *continued*

Waterbased Coating Application - Roller/Nip
(continued)

- Check mechanical setting for applicator roller - sheet/impression
- Check durometer of the rubber roller of the coating system

Reduce coating application rate until visual starvation is observed on the sheet and increase incrementally until adequate coating coverage is restored. If coating application remains excessive, a harder durometer rubber roller may be required to improve metering.

Drying

Proper drying system operational settings should be employed to aid in setting the ink and coating films to avoid prolonged interaction of these films in a wet-state. Extended wet-state interaction between the applied ink and coating films can cause a de-wetting effect to occur. Improper drying system operational settings and/or drying system condition can contribute to extended setting/drying times for both ink and coating films. The drying system condition should be determined to be fully functional with all components in good operating condition. Proper maintenance of the drying system should be conducted at Manufacturer's recommendations. IR bulbs and reflectors should be cleaned and replaced at proper intervals to ensure optimum performance of the drying system, particularly for ink film setting/drying.

The combination of Infrared Energy(IR), Hot-Air Knife(HAK), Air-Extraction and Dwell(press speed) will all contribute to the quality of setting/drying achieved by the applied ink and coating films. Each component of the drying process should be managed to achieve the best results for setting/drying prior to sheets reaching the delivery-pile. If possible, spray powder should be used to improve sheet separation in the delivery-pile to ensure continued drying of ink and coating films. For more information regarding drying system settings/operation, please consult our **Waterbased Coating - Sheetfed Drying** technical document.