COATINGS & ADHESIVES CORPORATION

Ink Color-Shift/Pigment Burn-out v1.1

Ink color-shift, also known as ink pigment “burn-out”, has become less common over the years as improvements have been made in the formulation of inks with alternative pigments, improvements to waterbased coatings for improved drying performance and more efficient drying systems on modern printing presses. Despite these chemistry and equipment improvements, the negative results of an incompatibility between printing inks and waterbased coatings can still manifest itself without the proper planning of materials and execution of the printing process.

Ink Color-Shift

A visual and measurable change in the appearance of a Pantone or special-mix ink color can occur in which the ink color will slowly drift to a yellow/brown hue due to physical changes in the ink pigment altering the properties for light absorption/reflection. This change can occur over a period of time once the printed/coated sheet has been produced, and can become more pronounced and severe in conditions where drying of the wet ink/coating films are significantly impaired, commonly inside of the press-load located at the center of the sheet. Press pull-sheets and sheets on the top of a press-load are less likely to exhibit this effect as improved drying of these sheets is achieved compared to captive sheets inside of the press-load. Additionally, first-side printed/coated and single-side printed/coated sheets are less likely to exhibit this effect due to the un-printed/un-coated opposite-side of the sheet being available for the absorption of water/solvents emitted from the drying ink/coating films to promote continued drying in the press-load. Any visual or measurable change in the ink film is most likely to be noticed after second-side printing compared to the first-side printing. Within the press load, ink areas along the perimeter of the sheet can have improved results compared to the center of the sheet, with the color-shift becoming progressively worse from the perimeter of the sheet towards the center. This is due to increased ventilation of the sheet perimeter edges in the press-load created by anti-offset powder application contributing to improved oxidative/evaporative drying of the ink/coating films compared to the interior sheet area. Typically, changes to the ink color will not take place immediately after printing as a prolonged interaction between the wet ink/coating films is required. This interaction can take >24 hours to result in a significant visual color-shift.

Ink Color-Shift Cause

The cause of the ink color-shift/burn-out is due to a combination of chemical incompatibility of the ink pigment and waterbased coating as well as prolonged drying times of each contributing to extended interaction between both films in a wet/semi-dry state. In certain cases, the alkalinity of the paper can also contribute to or exacerbate the results of the color-shift.

pH Incompatibility

Waterbased coating products are alkaline formulations with a typical pH range between 8.0 - 9.0. Ink pigments which lack alkali resistance can become physically altered when exposed to waterbased coating, changing the way in which visible light waves are reflected. In these cases, alternative pigments are required as substitutes in printing inks that need waterbased coating compatibility.

Ink pigments identified as having alkali sensitivity:

- Rhodamine Red(Yellow and Blue shades)
- Reflex Blue
- Methyl Violet
- Redlake C
- Fluorescent/Pastel inks
- Warm Red
- 072 Blue
- Purple

REV 04/20_v1.1

Ink Color-Shift Cause - continued

Drying

In cases where incompatible alkali sensitive pigments are being used, the speed and severity of the resulting color-shift can be determined by the amount of time required for the ink and coating films to individually and collectively dry. The longer that the wet/semi-dry ink and coating films have to interact in direct contact, the faster the effect will occur and more severe the color-shift can be. If both films are capable of being dried in a short period of time, the less likely or less severe the color-shift can be. Circumstances where the drying of both ink/coating films are slowed or impaired will most likely result in a color-shift when using inks formulated using alkali sensitive ink pigments

Ink Color-Shift Avoidance

Proper planning is the best method of avoiding situations where ink color-shift/burn-out can occur. For jobs which require the use of waterbased coating, always specify with the ink manufacturer that the inks being used are compatible and use suitable pigment substitutes when necessary.

Testing

Testing of ink/coating compatibility is a proactive means of determining any possibility of ink color-shift/burn-out occurrence between the ink/coating products while including the paper specified for the job:

- Produce two ink draw-downs on the specified paper targeting a visual and/or measurable ink density to create a color match to the desired color standard; do not dry the draw-downs and proceed directly to the next steps. If possible, take a spectral color-metric measurement of each draw-down and document.
- Immediately apply waterbased coating onto/over one of the draw-downs and immediately cover both draw-downs with a piece of glass to prohibit oxidative drying of the ink/coating films. If capable, apply the waterbased coating with an anilox or proofing wire-rod to create a controlled applied film thickness.
- Periodically evaluate the condition of the coating applied draw-down for a visual color-shift and compare to the draw-down that does not have waterbased coating applied. If at 24 hours there has been no visual or measurable change in color of the coating applied draw-down, it can be presumed that there are no issues of incompatibility between the ink product/pigment and waterbased coating.

REV 04/20_v1.1