Waterbased Coating – Ink Color-Shift/Pigment 'Burn-Out'

Scope	- 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 'coatable' 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 ink and waterbased coatings can still manifest itself without the proper planning of consumables/materials and execution of the printing process.
Ink Color-Shift	- A visual and measurable (L*a*b*) change in the appearance of a Pantone or special-mix ink color can occur in which the ink color will slowly shift 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 once the printed/coated sheet has been produced and can become more pronounced and apparent in conditions where drying rates 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/stack. - 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 color 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 contributing to improved oxidative/evaporative drying of the ink/coating films compared to the interior sheet area. Use of spray powder in the appropriate micron size and quantity can help ventilate the press-load and contribute to an improved result, particularly along the perimeter edges of the sheets. - 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 several hours to produce a significant visual color-shift and will increase as the sheets age in the press-load.
Cause	- The cause of the ink color-shift/'burn-out' is due to a combination of chemical incompatibility of an alkaline-sensitive ink pigment and waterbased coating as well as prolonged drying times contributing to extended interaction between both ink/coating 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 generally 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 absorbed/reflected. - In these cases, alternative ink 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) • Warm Red • Reflex Blue • 072 Blue • Methyl Violet • Purple • Redlake C • Fluorescent/pastel inks

Drying	- In cases where incompatible alkali sensitive ink 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 interact in direct contact, the faster the effect will occur and the more severe the color-shift result 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 result. - Circumstances where the drying-rates of both ink/coating films are slowed or impaired will most likely result in a color-shift/'burn-out' when using inks formulated using alkali sensitive ink pigments: • Drying systems that lack capability/capacity for proper setting/drying of both inks and coatings • Non-absorbent/non-porous substrates – inks/coatings not formulated for drying on synthetic stocks
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 indeed 'coatable' and use suitable ink pigment substitutes when necessary.
Testing	- Testing of ink/coating compatibility is a proactive means of determining any possibility of ink color-shift/'burn-out' potential between the ink/coating products while including the paper specified for the job: 1) Produce two ink drawdowns 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 drawdowns and proceed directly to the next steps. If possible, take a spectral color-metric measurement of each draw-down and document for reference. 2) Immediately apply the desired waterbased coating onto/over one of the drawdowns and immediately cover both drawdowns with a piece of glass to prohibit drying of the ink/coating films. If capable, apply the waterbased coating with an anilox or proofing wire-rod to create a controlled coat-weight. 3) Periodically evaluate the condition of the coating applied draw-down for a visual color-shift and compare it to the draw-down that does not have waterbased coating applied. 4) If after 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 compatibility issues between the ink/pigment and waterbased coating.