Image Appearance Enhancements via NexPress 2100 5th Module Applications

Yee S. Ng
NexPress Solutions, Inc.
Rochester, New York, USA

Abstract

With the introduction of the 5th-module imaging unit in the NexPress 2100 color digital press (see Figure 1), many novel applications with improvements in image appearance have become possible. This paper describes the usage of clear DryInk™ (CDI) for image protection and reduction in print image differential gloss and image granularity with the NXP2100 5th module solution. With the proper combination of intelligent CDI application in NexPress 2100 in conjunction with NexGlosser gloss enhancement unit, uniform gloss enhancement with color gamut expansion for a wide variety of substrates can be achieved for many applications.

Introduction

With the addition of a 5th module[1] to the NexPress 2100 Color Production Digital Press (see Figure 1), many new applications and printing solutions are now possible.
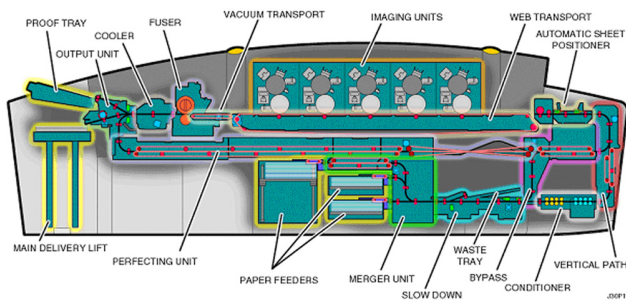

Figure 1. NexPress 2100 with 5 print units

In a four-color printing process, only a fraction of popular corporate identity colors and spot colors are reproduced accurate enough for acceptable commercial usage. Dedicated spot colors have been used in offset printing and some digital presses to deal with the issue. With a changeable 5th color station and Red, Green and Blue DryInk™ to choose from, using a pentachrome five-color multi-level halftone mixing process, the NexPress 2100 expands the available color gamut and spot color coverage to match ~85% of standard spot colors for acceptable commercial usage in the NexPress Intelligent Color printing solution.[1] If a clear DryInk™ (CDI) is used in the 5th station, along with the standard CMYK toners in an Intelligent Coating process that apply CDI in selective areas of the image, significant improvement on image abrasion resistance has been demonstrated.[1] The end result exceeds the capability of offset printing with aqueous coating for image protection. Further reduction in differential gloss and color granularity is also a benefit (as shown in the analysis below). With the introduction of a near-line Glosser, the CDI image can be further glossed up to a very high and uniform gloss (G20 = ~90 can be achieved) in an Intelligent Glossing process for photo-rich applications.

Differential Gloss and Color Granularity Reduction in a Intelligent Coating Application

A perceptual color granularity measurement method (based on mapping to the visually uniform CIEDE2000 color difference space[2]) using flat-bed scanner[3] is used to analyze the effect on color granularity after the application of the Intelligent Coating CDI to the four color images after color management is applied to insure consistent color output. The Intelligent Coating process is shown to improve color granularity of the image, especially in the highlight and mid-tone regions of the image as shown in Figure 2.
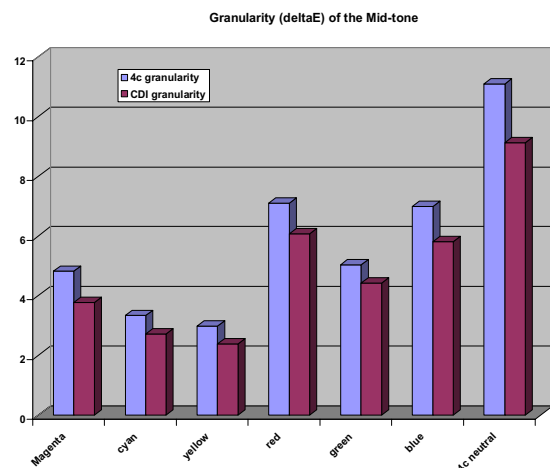

Figure 2. Color Granularity Improvement of CDI

Improvement in differential gloss is demonstrated with the CDI Intelligent Coating printing solution on various paper surfaces.[1] Using a Standard Differential Gloss test chart[4] and a method developed to measure

differential gloss perceptual scale,[5,6] one shows visual reduction in differential gloss for both glossy and matte papers from the regular four-color process with the application of the Intelligent Coating process to the point that it is comparable to or better than that offset printing as shown in Figure 3.
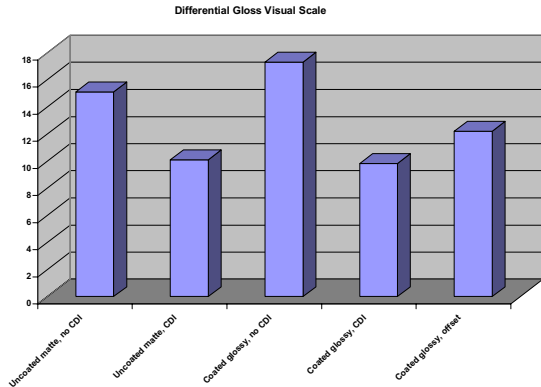

Figure 3. Differential Gloss Visual Improvement of CDI

Intelligent Glossing Solution

The NexPress Intelligent Glossing solution utilizes the near-line NexPress Glosser in conjunction with the application of CDI coating in selected image areas to achieve very high and uniform gloss (G20 ~ 90), thereby enabling many photo-rich applications in a large variety of printing substrates. In addition to the improvement of gloss appearance, the Intelligent Glossing process with CDI and system optimization, also increases the color gamut of the entire printing system for many substrates (coated glossy and coated matte of different weight) as shown in Figure 4.
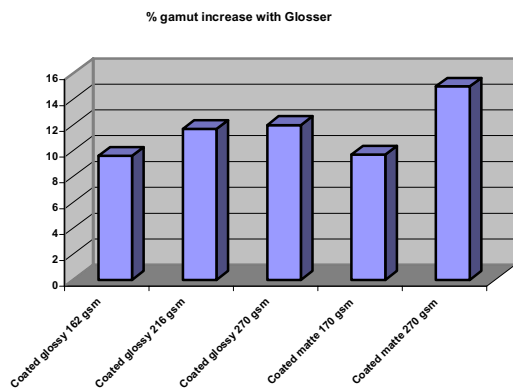

Figure 4. % color gamut increase with Glosser

Conclusion

With the 5th module and the many DryInk™ (Red, Green, Blue and Clear) available for the NexPress 2100 digital press, as well as the introduction of the near-line NexPress Glosser, many flexible applications such as expanded color gamut for spot color usage; short turn-around time, in-line image protection with improved image appearance (lower granularity and differential gloss); near-line image appearance enhancement (higher uniform gloss, increase in color gamut for the CMYK process) for photo-rich tasks have become feasible.

References

1. Dinesh Tyagi, Peter Alexandrovich, Yee Ng, H.T. Tai, Rich Allen, and Dianne Herrick; "Enabling Expanded Color Gamut and In-line Coating Processes", Proc. IS&T's NIP20, International Conference on Digital printing Technologies, pp.135-138 (2004).
2. M.R. Luo, G. Cui and B. Rigg, The development of the CIE 2000 colour-difference formula: Ciede2000, Color Research and Application, 26, 340 (2001).
3. Chunghui Kuo and Yee Ng, "Perceptual Color Granularity Metric via Scanner", Proc. IS&T's NIP20, International Conference on digital Printing Technologies, pp 373-377 (2004).
4. Yee Ng, Eric Zeise, Dale Mashtare, John Kessler, JeffreyWang, Chunghui Kuo, Eric Maggard and Prashant Mehta, "Standardization of Perceptual based Gloss and gloss uniformity for printing systems (INCITS W1.1)", Proc. IS&T's 2003 PICS Conference, pp 88-93 (2003).
5. ISO/IEC CD 19799, "Method of measuring Gloss uniformity for printed pages", 2005.
6. Yee S. Ng, Chengwu Cui, Chunghui Kuo, Eric Maggard, Dale Mashtare, Peter Morris, "Gloss uniformity measurement update for ISO/IEC 19751", SPIE Proc. Electronic Imaging Science and Technology, Vol. 5668, pp. 163-171 (2005).

Biography

Yee S. Ng is a Senior Research Associate of NexPress Solutions, Inc. Before that, He was a Chief Engineer with responsibility for engine image chain. He was a Project Chief Engineer and Distinguished Inventor (with >85 US patents) of Eastman Kodak Company when he joined NexPress in 1998. He joined Kodak Research Laboratory in 1980 after obtaining his Ph.D. in Physics from the Pennsylvania State University. He is a Fellow of IS&T, a Senior Member of IEEE and a member of the New York Academy of Sciences. He was General Chairman for NIP19 and the US Program Chairman for DPP2005. He received the Chester Carlson Memorial Award from IS&T in 2000.