NexPress Glosser Process for Photo-Rich Applications

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

Abstract

In order to broaden up the type of substrates that can be used for high gloss photo-rich applications, a process combining the intelligent applications of clear dry ink to images printed from the NexPress 2100 digital press to a near-line Glosser unit is used. With the correct combination of clear dry ink and glossing conditions of the belt Glosser, a large variety of substrates are shown to achieve expanded color gamut, high and uniform gloss at the same time. The glossing/finishing process relating to the belt glosser both in the simplex and duplex modes will be discussed.

Introduction

With the introduction of a 5th module[1] to the NexPress 2100 Color Production Digital Press, Clear DryInk™ (CDI) can be applied to the four-color images for image protection and enabling other image appearance enhancements such as post-finishing high gloss applications via the near-line NexPress Glosser.[2] In addition to flood coating, the Intelligent Glossing process can apply CDI selectively[3] to the image area based on image content and substrate characteristics in the NXP2100 to provide for a uniform pre-finished surface for the Glosser, thereby enabling high and uniform gloss appearance for photo-rich applications. Uniform high gloss value of 90 (G20 gloss unit) can be attained with this process. The fusing parameters (fuser temperature, fuser nip pressure, etc) of the NexPress 2100 fuser are adjusted according to the substrate type in preparation for the Glosser. The Kodak NexPress glossing unit as shown in Figure 1 is a self-contained finishing unit designed to enhance the gloss level and color saturation on the sheets, which have been printed with a Gloss Coat of clear dry ink at the Kodak NexPress 2100 digital production color press. The glosser unit is classified as a near-line unit. Each individual printed job intended for glossing, displays a bar code on a printed banner sheet on exit from the NexPress 2100. The bar code contains the substrate information and glossing unit set points required to set up the gloss job. The Glosser can set up its finishing parameters when the printed job and the banner sheet are brought to the Glosser.

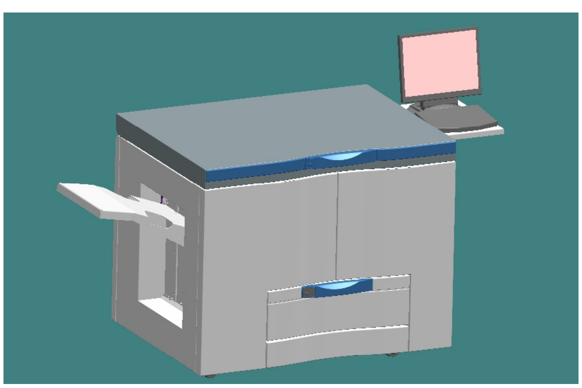

Figure 1. A prospective view of the NexGlosser

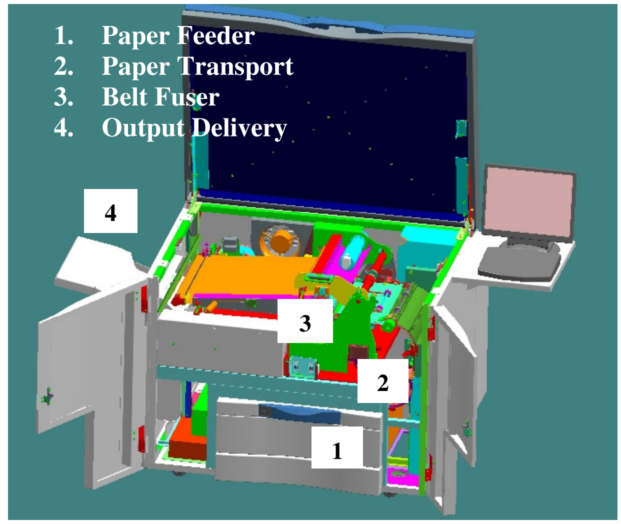

Figure 2. NexGlosser view with the front and top doors open

Salient Features of the Glosser Design and Glossing Process

The main components of the glossing unit are shown in Figure 2. The printed substrate for glossing begins at the Feeder (1). It goes through the Transport (2) and then enters the Belt Glosser (3) where a nip is formed between the heater roller and pressure roller assembly. The substrate is attached to the Fuser Belt by the heated dry ink. Heat, pressure, and the Fuser Belt produce the high gloss on the substrate. Finally, the substrate is cooled by the cooling plate assembly, separated from the fusing belt, and transported onto the Stacking Platform (4). Duplex glossing is accomplished by placing the simplex glossed prints back in the feeder tray manually and repeating the glossing process.

The Belt Glosser is shown in more detail in Figure 3. The glossing belt is a thin seamless web made of heat resistant polymeric material such as polyimide. It is further coated with low surface energy wear resistant coatings[4-7] to improve print release without image interruption and the durability of the belt surface. The glossing belt is entrained around the heating roller, which is driven by a motor, and the release roller. The release roller is also used for steering the glossing belt.

With conventional electrostatic process and fusing the obtainable gloss level is a strong function of the amount of toner deposited. In un-toned areas, no gloss (other than that of paper) is obtained. The resulting differential gloss on the image can be quite objectionable. Furthermore, the fused toner image is released while hot from the fusing surface, exhibits some taffy pull effect that causes uneven image surface and gloss. The Intelligent glossing process selectively lays down CDI in the NexPress 2100 based on image contents and substrate surface characteristics, in order to ensure that the image surface presented to the glosser has a uniform surface characteristic across the whole image area before the glossing process starts. In the belt glosser, the toned print is heated under pressure in the fusing nip formed by bringing together the heating roller and a compliant pressure roller. The heated and softened toner makes the print stick to the glossing belt as it is transported over the air cooler towards the release roller. Before the image is separated from the glossing belt at the release roller, it goes through a relatively long heating and cooling cycle during which the dry inks are completely melted and then cooled down to be cast against the belt surface. On release, the image exhibits the gloss and surface characteristics of the glossing belt and enhanced color fidelity. The high gloss or other surface finishes of choice on the image can be achieved and are dependent primarily on the surface finish of the glossing belt. The glossing belt finishes and the method to make the same are discussed elsewhere.[5]

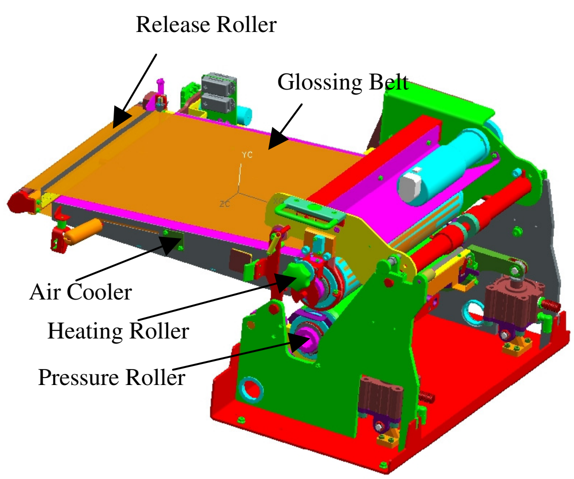

Figure 3. Side view of Glossing Belt assembly

The normal operation of the glosser in a single sided glossing mode provides a throughput of 35 A4 or Letter size sheets per minute. For the second side glossing the throughput speed is reduced to 28 A4 sheets per minute to match gloss on both sides of the sheet. Furthermore, the glossing temperature for the second side is also reduced to prevent damage to the side that has already been glossed. When a perfecting glossing mode is selected or banner sheet is used with that information, the glosser automatically sets up the glossing conditions and process speed for each glossing side of the selected paper. The Glossing Belt can be cleaned of any toner contamination by using Cleaning Sheets (any discarded sheets in good physical condition having gloss coat can be used).

The following are the recommended paper sizes and weights for the glossing applications:

Paper width	279 mm – 350 mm
Paper length	210 mm – 470 mm
Paper weight for one side glossing	118gsm – 300gsm
Paper weight for two side glossing	150gsm – 300gsm

The recommended maximum stack height of the paper for the Feeder Tray is approximately 4.25 inches (108 mm) or 850 sheets of 118gsm coated paper.

Intelligent Glossing Process Results

The Intelligent gloss process can be used on a broad range of substrates (coated glossy, coated matte paper and some uncoated paper of different weight) to produce uniform high gloss images with the proper combination of CDI laydown, NXP2100 fusing condition (fuser roller temperature, fuser nip pressure, fuser energy flow etc.) and NexPress Glosser finishing condition (heating roller temperature, nip pressure of the belt pressure roller, etc.). Tunable (uniform target gloss value ranging from 60 to 90 in G20 gloss units) uniform high gloss images can be obtained with the proper choice of substrate, fusing and finishing conditions. In addition to that, it has been shown that the optimized process can increase the color gamut of the entire printing system for many substrates (typically in a range of 10% increase in gamut volume).[2] In Figure 4, one compares the cross-section (a*, b* plots) of the color gamut of a regularly fused image and an image that went through the Intelligent Glossing process with the Glosser Finisher using a 270 gsm coated matte paper. The cross-sections are shown at the L* values of 20, 40, 50 and 80. As one can see, there is substantial increase in the color gamut, especially in the red, green, blue and other darker color regions of the color gamut due to the Intelligent Gloss process.

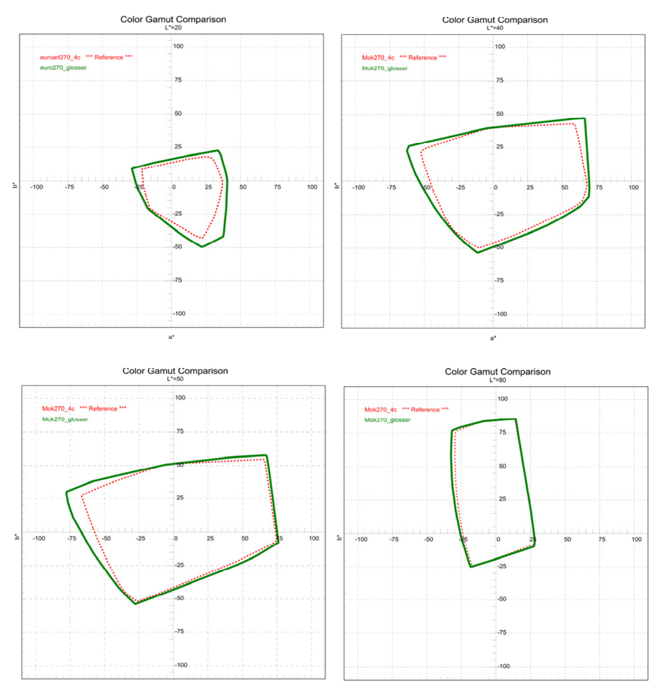

Figure 4. Cross-section plots (a, b*) of color gamut (dotted line for 4-color regular fusing, solid line for glosser output) at L* of (20, 40, 50 and 80)*

In Figure 5, we show magnified views of the solid green patch (the regularly fused image is on the left, the glosser finished image is on the right). Yellow toner is in the bottom layer (closer to the paper) and the cyan toner is on the top. Due to the irregular surface of the paper and the development process, there are some yellow toners not covered by the cyan toner in the regularly fused green image, therefore reducing the green saturation. However, in the glosser-finished image, the finishing process promotes much better color mixing, thereby increasing the green saturation. As a result, we get larger color gamut in addition to high and uniform gloss for a large variety of substrates (coated glossy, coated matte and some uncoated paper of various paper weight).

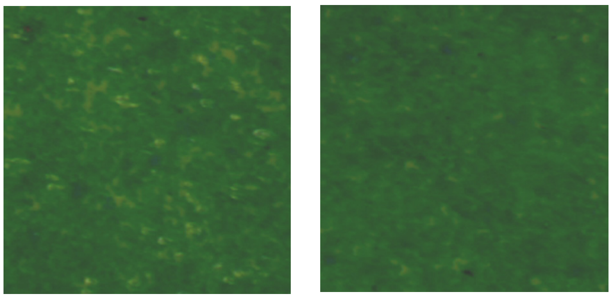

Figure 5. Magnified view of a green patch (left: regular fusing. Right: after glossing)

References

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Author Biographies

Yee S. Ng is a Senior Research Associate and Intellectual Property Coordinator for NexPress Solutions, Inc. (a Kodak Company). He was a Chief Engineer with responsibility for the engine image chain and image quality before that. He was a Science Associate and Project Chief Engineer at Eastman Kodak Company before joining NexPress in 1998. He is a Kodak Distinguished Inventor and holds >85 US patents. He is a Fellow of IS&T and a senior member of IEEE. He is a member of New York Academy of Sciences and APS. He is Project Editor for ISO/IEC 19799 (Gloss Uniformity), and ISO/IEC 24734 (Printer Productivity) and Liaison officer from ISO/IEC JTC1 SC28 (Office Equipment) to ISO/IEC TC130 (Graphics). He was General Chairman of NIP19 and received the Chester Carlson Award from IS&T in year 2000.

Muhammed Aslam is a Research Associate and Chief Engineer at NexPress Solutions, Inc. (a Kodak Company). In this capacity he is responsible for directing research and development activities in the areas of Image Fixing for the electrophotographic print engines. Prior to joining NexPress in 1998, he was a Senior Scientist and Team Leader at Eastman Kodak Company guiding various research and development projects. He is a Kodak Distinguished Inventor and holds over 70 US patents.