256 Shades of Gray
Raising the bar ... again

The groundbreaking technology introduced in the most recent addition to Kodak’s portfolio of digital sheetfed presses, the KODAK NEXFINITY Digital Press, enables a step-change in print performance. With print speeds up to 152 A4 pages per minute, over 12 specialty inks for CMYK enhancement, and support for a wide range of standard and specialty substrates up to 1.2 meters (48 inches) in length, the NEXFINITY Press can help optimize productivity and profit potential of high-volume commercial print operations. The heart of the NEXFINITY Press platform is a brand new writing system that delivers exceptional quality and consistency over long runs, advancements that are enabled by two fundamental technology innovations: multi-bit LED (light emitting diode) writers and Dynamic Imaging Technology.

Multi-bit LED writers enable higher resolution

The LED writing system found on NEXFINITY consists of five LED writers, one for each color, that quadruple the density of information capable of being delivered to the imaging cylinders to 1200x1200 resolution in each writer. In addition, each individual LED can adjust its exposure at 256 different levels. Imagine a room dimmer switch with 256 different settings, from off (no light) to 100% (maximum light), and 254 levels in between. Each individual exposure can be at any one of these 256 levels, which in turn creates different charge levels on the imaging cylinder. Higher charge areas attract more ink and lower charge areas attract less ink, enabling intensity-modulated screening that delivers extremely rich color and outstanding detail across the full tonal range.

This approach is similar in principle to gravure printing, where the depth of individual cells engraved on the printing cylinder determines the amount of ink that ultimately prints: the resulting image quality is exceptionally high, with superior saturation.

NEXFINITY’s LED writing system shares another desirable attribute with gravure processes: extremely hard dots that hold their shape for very long runs. Gravure has traditionally been used to deliver millions of impressions of the highest quality publications. The NEXFINITY Press is equipped to deliver similar quality and consistency in high-volume production environments with a level of precision and consistency well ahead of competing digital presses.
Dynamic Imaging enables exceptional quality and consistency

The NEXFINITY Press’ LED writers employ Dynamic Imaging, a unique and powerful technology that analyzes different areas within individual images, then automatically improves those areas using various tools that are deployed based on image content. Dynamic Imaging goes well beyond the conventional approaches currently used to correct or eliminate imaging problems that adversely affect print quality.

For example, conventional halftoning utilizes the same AM (amplitude modulation) screen for the entire image, which can lead to tradeoffs in overall image quality. The traditional answer for a problem with a specific analog halftone screen on a specific image was to try using a different halftone screen.

With the advent of digital screening, FM (frequency modulation) screening has eliminated some of the traditional problems, but created other operational challenges. An FM screen can show outstanding performance in highlight detail areas of an image, but can also easily exhibit artifacts in midtone areas. Hybrid analog and FM screens have been created, but they generally focus on improving specific areas of the tone scale, not on the actual unique content of the image.

Dynamic Imaging introduces an entirely new set of tools to tackle these age-old problems; it is not a single process, but the combination of multiple techniques that are invoked based on specific image content. Four key operations are employed to deliver image quality enhancements far superior to conventional AM and hybrid screening found on other printing processes.

COMPUTATIONAL HALFTONE SCREENING

One of the more common challenges with halftone screening is the creation of unwanted moiré patterns in an image. A simple description of the problem is that parts of an image can appear like you are looking at it through a screen door, with the image being distorted in an area of an image, typically a wavy appearance. It is often caused by re-screening a screen of some type – either a textile with a weave pattern or a scan of a previously halftoned image. A moiré can be classified as an auto moiré created in a single color separation of an image, or an overlay moiré, created by multiple screen separations, typically in four color printing.
In traditional laser-based digital imaging, the root of these moiré problems can often be found in binary dot formations that lead to division errors: the dots are not lined up with the visual center points required to maintain the specified line screen frequency (see diagram). The next dot center point can be off as well, leading to different frequencies, which in turn leads to auto moiré.

The NEXFINITY Press utilizes 256 levels of exposure per pixel, with variable pixels per halftone dot, resulting in over 4,000 tonal resolutions per dot. This capability allows for screening adjustments on-the-fly to correct for division errors that would be present in traditional binary dot formulations.

Another aspect of this technique is the ability to tweak the screen angle of a specific dot, so instead of all dots of a particular color separation being at 15°, some dots may be at a slightly different angle, based on the image.

Computational screening is a unique approach that resolves image defects inherent to other types of digital imaging systems, such as visible halftone screens. It also eliminates the compromises commonly made to preserve one desirable feature — such as image detail — that result in degradation elsewhere — such as skin tones, for example.

**GRAY RESOLUTION ENHANCEMENT TECHNOLOGY (GRET)**

When a portion of an image is not at 0° or 90°, screening will introduce a jagged edge at other angles. GRET fills in portions of this jagged edge, leading to smoother edges and better image uniformity in these areas.

**BORDER ENHANCED SCREENING TECHNOLOGY (BEST)**

BEST looks for the edges of an image where a tonal transition occurs and creates additional halftone dots that are the same color as the surrounding area. This technique optimizes screening in tone scales, stabilizes color and minimizes moiré effects.
SMART RGB

Smart RGB is a set of algorithms that smooth midtone areas while maintaining detail in highlights and shadows. It automatically searches for any RGB images within a file, and when it locates them, analyzes each individually to determine if its algorithms would enhance print quality. If the SmartRGB function determines that enhancements are in order for a particular image, it employs a multi-scale image processing algorithm to attain the best possible results. The NEXFINITY Press’s Digital Front End is so powerful that this extra processing does not have a meaningful slow down on either RIP speed or printing.

Ongoing commitment to excellence

The technologies described are fundamental to KODAK Dynamic Imaging Technology, which has been built on decades of investment and insight from scientists and engineers at Kodak. This unique and powerful suite of tools advances both the quality and productivity achievable on a digital press to new heights.

These innovations and many more are packaged into the NEXFINITY platform, with the goal of making our customers and their clients even more competitive in the marketplace, both today and well into the future. Our ongoing investment and focus will be focused on delivering the best products in their class to our customers, and further Dynamic Imaging innovations will be foundational to that continued success.
About Kodak

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