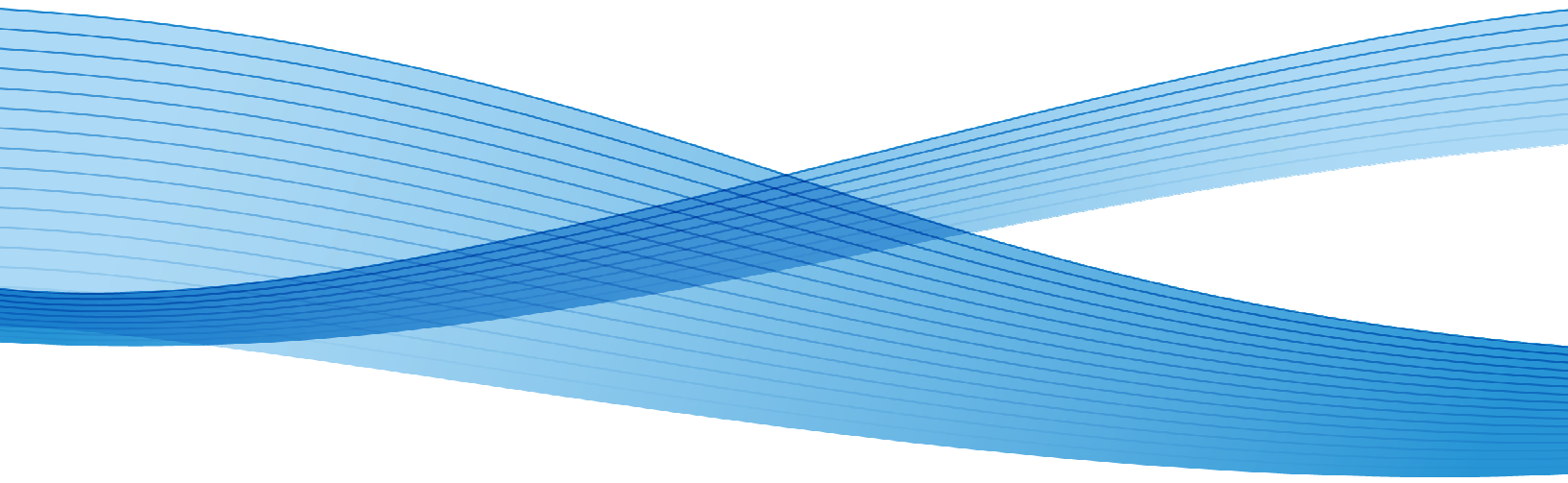
Laser vs. LED

Featuring Xerox Hi-Q LED Technology



Conventional LED vs. Laser Printing

A brief history

Back in the mid-1990s, LED (light-emitting diode) page printing was poised to be the next big thing in the workplace. LED technology offered a less complicated and quieter method of using the same basic technology as laser printers. LED devices were more compact and use significantly less power, all factors which encouraged buyers. Five years after they were introduced however, LED systems still hadn't made much of an impact on the market—or on users.

While traditional LED devices provided more reliability than laser printers in some ways, their design limitations also proved to be problematic. LED printers featured shorter light and paper paths and fewer moving parts. Still, their light intensity and timing accuracy varied from LED to LED resulting in highly inconsistent image quality. Print quality, especially in terms of resolution and reliability, became LED's primary disadvantage, and lasers retained their dominant position in the marketplace.

Similarities at work

LED and laser systems employ the same basic method of applying toner to paper using a static electrical charge that is built up on an insulated object (media)—and light emitted from lasers or LEDs. In simple terms, the process works like this:

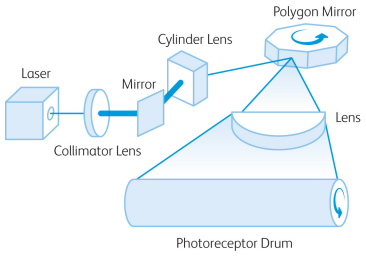
- Both LED and conventional laser printing apply a static electrical charge to a photoreceptor, typically a revolving drum or cylinder. The drum assembly is manufactured from highly photoconductive material that is discharged by light photons.
- As the positively charged drum revolves, the printer shines light across the surface to discharge certain points, effectively "drawing" the letters and images to be printed on the drum as a pattern of electrical charges, also called an electrostatic image.
- Next, positively charged toner is applied, which sticks to the negatively charged areas of the drum.
- The toner image is then transferred from the drum to an intermediate transfer belt or directly to the media.
- Using heat and pressure, the toner is then melted to the paper through a fuser, producing the printed page.

Illuminating the differences between light distribution methods

Laser devices

Using an optical scanning system, laser printers distribute a light beam through a polygon mirror and through a series of focusing lenses in order to make the fine adjustments needed for better print quality. Methodically, the laser scans from one end of a line to another, and then starts the next line, to form the latent image, bit by bit, on the photoreceptor drum.

To deliver optimum results, the components of a laser system must stay in alignment throughout their use. Automatic adjustments are built into many of today's laser printers to maintain this level of accuracy. One of the primary characteristics of laser printers is their high resolution—or how many dots per inch they lay down. Today's laser printers commonly print at up to 1200 dpi. By comparison, in offset printing, resolution generally ranges from 2400 to 9600 dpi. The laser system's moving parts also contribute to greater noise in the workplace.

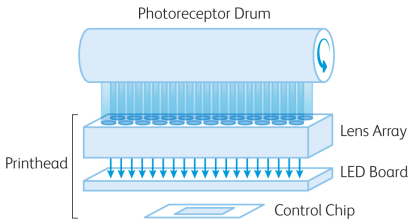


Laser technology

LED printers

In traditional LED printers, the print head consisted of a wide linear array of digitally controlled, light-emitting diodes, which were often built into the cover of the printer. Instead of scanning the image, as a laser printer does, the LEDs selectively flash to create a pattern of dots on the photo-receptive drum as it rotates; creating a latent image that is transferred to paper via electrically charged toner.

Important aspects of LED printing work well and offer real advantages to users. In addition to LED's mechanical reliability and compact design, it's a simple design overall, with fewer moving parts than laser printers. The major disadvantages to existing LED technology are image quality and resolution: if only these two limitations could be improved, LED promises to offer print quality and resolution similar to what can be achieved with print systems utilizing laser technology.



LED technology

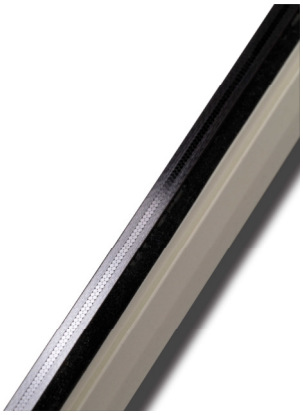
LED re-invented by Xerox

In 2011, Xerox introduced the first printer utilizing the next generation of LED technology—HiQ LED-- which includes self-scanning integrated circuitry and optical technology. Researchers paired these with a newly developed ASIC (application specific integrated circuit) chip driver to create the new Hi-Q-LED print head, which offers uniform optical characteristics and achieves resolutions previously unmatched by LED technology. When combined with Xerox EA Toner and electro photographic marking technology, the result is a new generation of LED printing technology, This accomplishment is an award winning innovation that redefines the print process and brings to market a new generation of high performance products.

Xerox Hi-Q LED: Putting a new focus on high-resolution imaging

The new Xerox Hi-Q LED print head contains an array of 10,240* light-emitting diodes, or LEDs. Miniaturized, self-scanning driving circuitry is partially located adjacent to each LED, with the remaining circuitry integrated into the ASIC driver chip, located on the LED bar itself. Each print head also features a new self-focusing lens array. The array is configured in clusters of lens elements with uniform optical characteristics that systematically overlap to produce high-resolution imaging. The LEDs flash through this lens array to form latent images on the photo-receptive drum.

In a color printer, there are four individual print heads. With each LED array packing 1,200 diodes per inch, the print head can create many more, and much finer, dots for exceptional resolution, while also saving space in the system's overall design.



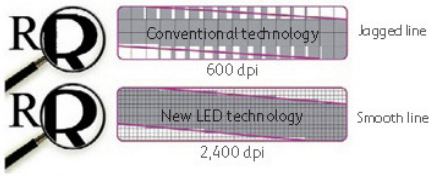
*A/A4 products. A3 products will have more due to wide media support.

The brains behind high print quality

The "brain" behind the entire print-head process is the new application specific integrated circuit (ASIC). This high-performance ASIC precisely controls the intensity and timing of the 10,240 dots of light (LEDs) in each print head to achieve 1200 x 2400 dpi resolution—print quality that's equivalent to, and often better than, comparable laser systems. By continually and automatically monitoring information about each LED, the ASIC driver can adjust each diode's light intensity and timing. This ensures uniformity across the entire LED array—and produces consistently high print quality.

Achieving accurate high-definition output

Hi-Q LED technology along with Digitally-Enhanced Lighting Control Imaging System (DELCIS) chip enables precise control of all light-emitting elements by a single high performance ASIC, It offers better dot-to-dot intensity and timing control, and produces more precise color registration. Image registration control technology corrects images using ultra-fine pixel control that fills in gaps and evens jagged edges. The result of all this technology is improved reproduction of individual characters and fine lines, smoother edges on printed solids and halftone images.



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