UV LED Technology Update



UV curing technology is utilized for drying inks, coatings, adhesives and other UV-sensitive materials through polymerization. UV LED curing improves on the existing UV process by enabling thinner, heat-sensitive substrates, while eliminating harmful byproducts such as ozone, and improving workplace safety. Additionally, UV LEDs efficiently utilize input power, and can be turned on and off instantly to enable lower operating costs over the application lifetime.

The UV curing process has been in use in the printing industry for more than 30 years. LED curing technology for UV printers is rapidly growing with the compelling advantages of better operating economics, improved system capabilities, as well as environmental benefits. UV LED curing technology is ideal for the UV curing of inks in digital inkjet, screen, flexographic and other printing processes.

End users of UV LED curing technology should work with their system supplier and ink or coatings manufacturer to ensure all three components (ink/coatings, system, curing lamps) are compatible with each other. The three components must work together to effect optimal UV LED benefits for the end user and hence, their customer.

UV LED Curing Benefits

Today, UV LED curing technology continues to win over many users in the printing world, replacing traditional methods. To utilize the advances in technology from UV LED light sources, there has also been growth in high-performance, UV LED energy curing inks and coatings. UV LED curing is now in the forefront, because it provides many benefits, including increased production speed, lower cost of ownership and less waste, while also providing an enhanced visual appearance and packaging.

Innovative Printing Capability

UV LEDs are finally taking their place as a mainstream curing technology. Rapid technological advancements are being made in all areas of printing, demonstrating the growing acceptance of UV LED curing. End users are increasingly asking equipment manufacturers for LED options that enable new and innovative printing capability, and the market-leading vendors are responding. Confronted with such exciting and rapidly evolving technology, system builders and end users are closely monitoring the ever-changing UV LED curing landscape.

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Richa Anand, Product Marketing Manager, Phoseon Technology

Benefit	Feature
Advanced Capabilities	Heat Sensitive, Thinner Substrates Deep, Through Cure Small, Compact Machines Controlled Curing Intensity
Operating Economics	Energy Efficient Long Lifetime Low Maintenance Low Operating Temperatures
Environmental	Mercury Free Ozone Free Workplace Safety UV-A Wavelength Range

UV-LED Benefits

Digital Inkjet

UV LED curing is now an accepted tool in the printing industry. It allows for advanced capability on challenging applications for industrial printers. Printers can offer media versatility at its peak and can now run thinner materials through the machine without curling or warping. UV LED technology offers the ability to print on uncommon substrates. As a side benefit, these thinner substrates also reduce shipping costs, both of the raw materials and the finished product, providing further economic benefit to end users and their customers.

Here are some examples of applications enabled by UV LED curing technology.

Bottle Printing

Today, UV LED curing technology is integrated into printing units for a variety of label applications, including bottle labeling machines and systems designed for direct printing on cylindrical beverage containers. The small size of the light sources makes them ideal for machines with limited space. It also allows for printing on heat-sensitive substrates and ever-thinner labels. These solutions enable users to process a variety of materials at maximum production speeds, with low-input power requirements.



Bottles

Medical Labeling

The pharmaceutical industry demands exacting product development and production in a sterile and clean environment. The industry has continued to push the envelope of what is possible, enabling new advances in medicine. UV LED technology brings inherent advantages to the world of printing, including the lack of infrared radiation in heat-sensitive applications, in clean room conditions.

Printed Electronics

Mass produced consumer electronics and photovoltaic applications benefit from the long life and reliability of UV LED curing technology. The ability to function consistently for long periods of time at high volumes makes UV LED technology an effective solution for these markets.

Large-Format

The sign making industry has led the change for improved turnaround time, higher quality and more economical solutions for printers that serve this segment of the market. UV LED curing technology enables output on a wider media mix and an extended range of applications, while at the same time allowing for a low total cost of ownership.

Coding & Marking

The compact UV LED curing lamps offer advanced capability and energy savings for coding and marking applications. The LEDs are instant on/off, so only switches on when ink curing has to occur. This saves energy, and increases the life of the unit even further. UV LED curing is the ideal choice for high-resolution variable data printing on a wide variety of substrates.

3-D Objects

The small form factor of UV LED technology enables smaller machines with the ability to print on heat-sensitive substrates. During the process of 3-D printing, each layer is cured immediately after it is jetted, producing fully cured models, without post-curing. UV LED curing technology offers advanced capability, and can be used for the 3-D printing of jewelry, footwear, prototypes, automotive parts and many other applications.

Digital Printing Examples

The Amica TL2020/TL2024 series UV LED inkjet printer is suitable for a wide range of 3-D objects and other promotional materials. Equipped with industrial high-resolution DOD piezo electric grayscale printheads, TL series printers deliver vivid colors and fine details.

For wood, stainless steel, ceramic tiles, plastics and glass, the Direct Jet 1014UV and 1024UV accommodate the small-format UV LED flatbed market. These new UV LED printers are versatile, offering large table sizes and height allowances at an economical price point.

For the point-of-purchase market, the EFI™ VUTEk® GS3250LX is an LED-based printer designed to lower total cost of ownership over the printer's lifetime. "The GS3250LX has enabled us to print on thinner substrates," said Nick Olson, Owner of PVS In-Store Graphics. "This saves on both cost of materials and shipping. Now we can roll up output for shipping instead of using flat boxes, saving the customer about 30 percent on the job due to a lower cost of materials, as well as a 30 percent reduction in the cost of shipping. In addition, we are very excited about the new capabilities this printer has

enabled, including the ability to print on aluminum and steel, wood and artist cotton canvas. It will certainly be a growth engine for our business."

The INX Digital CP100 UV digital cylindrical printer utilizes UV-LED curing technology. Applications include two-piece cans, bottles or other cylindrical objects. The printer overprints, over-varnishes and fabricates, with specially formulated UV-LED inks.

The Atlantic Zeiser SMARTCURE and SMARTCURE AIR cater to the industrial personalization and coding markets. The UV-LED curing technologies, whether air-cooled or with coolant, are standing for drastically reduced operating costs, due to an increase in operating life and a decrease in energy consumption. All modules of SMARTCURE, SMARTCURE AIR and FREEZECURE ideally match with Atlantic Zeiser inks and printers.

Flexographic Printing

Flexography is a mechanical printing process widely used in the production of packaging materials and labels due to its high throughput speeds. UV LED technology offers superior performance with intense UV output, while using a fraction of the power required with traditional UV arc lamps.

Flexographic Printing Examples

Recognizing the fast-growing development of UV LED curing and ink products in the narrow web flexo industry, the research and development team at Mark Andy has created fully compatible print platform designs to integrate these latest curing solutions across their leading lines of performance series machines. The company realizes that UV LED technology demonstrates an important evolution in curing or drying in performance series, continuing to show measurable advantages in energy usage, reduced heat load for thinner substrates, smaller footprints and improved converter profitability.

In response to the increasing need for improved sustainable print solutions, Flint Group Narrow Web is introducing a series of ink technologies for UV LED curing under the EkoCure™ brand. These inks will be the first commercially available inks designed for combination print formulated specifically for UV LED curing.

EkoCure is developed using specially selected photoinitiators that match the narrow and targeted wavelength area typical for UV LED lamp output. The main advantages with UV LED can be summarized as ecological and economical.



Printed Electronics



Coding


3-D Objects

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Recent advances in LED lamp technology and UV screen printing ink formulations have proven LED curing as a viable alternative to medium-pressure mercury lamps.

- **Ecological benefits:** Energy will be saved; UV LED lamps are ozone- and mercury-free (improved worker and environmental safety); and EkoCure™ is formulated on bio-renewable resources.
- **Economical benefits:** Energy consumption will be significantly reduced; manufacturing space is reduced, and UV LED lamps are nearly maintenance-free.

Screen Printing

Recent advances in LED lamp technology and UV screen printing ink formulations have proven LED curing as a viable alternative to medium-pressure mercury lamps. UV LED light sources are ideal for high-speed curing in screen printing applications such as direct glass printing, printing on plastics, CD/DVD printing and Web printing.

Screen Printing Examples

For screen printing directly on glass and plastics, CD/DVD and web printing, the Kammann K61 ECO now utilizes UV LED ink curing. This technology integrates into the servo-driven press, ensuring the reduction of energy by up to 40 percent.

"The result of the collaboration between Nazdar, Empire, Phoseon and Kammann is a milestone in the future of screen printing," said Phil McGugan, Nazdar's global vice president of sales and marketing. "LED technology is a key to increasing productivity, reducing costs, and decreasing the impact on the environment all in one stroke."

Conclusion

UV LED curing technology has become widely accepted in the digital printing sector because it offers new and more advanced capability for printing applications. UV LED curing units have become more efficient in delivering higher energy to the media, thus driving not only environmentally clean, energy-efficient and compact-size units, but also increased throughput and process flexibility. UV LED technology offers advanced capabilities, economic advantages and environmental benefits.

Richa Anand joined Phoseon Technology, Inc. in 2011 as product marketing manager. Prior to joining Phoseon, Anand was product marketing manager at Electro Scientific Industries, Inc. (ESI) with a focus on laser-based capital equipment for trimming circuits to value on thin film on Silicon in analog IC market. Previously, Ms. Anand has held key positions covering management and engineering functions at ESI. At Phoseon Anand holds key responsibility of defining products working closely with Phoseon's customers, sales, operations and engineering.

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