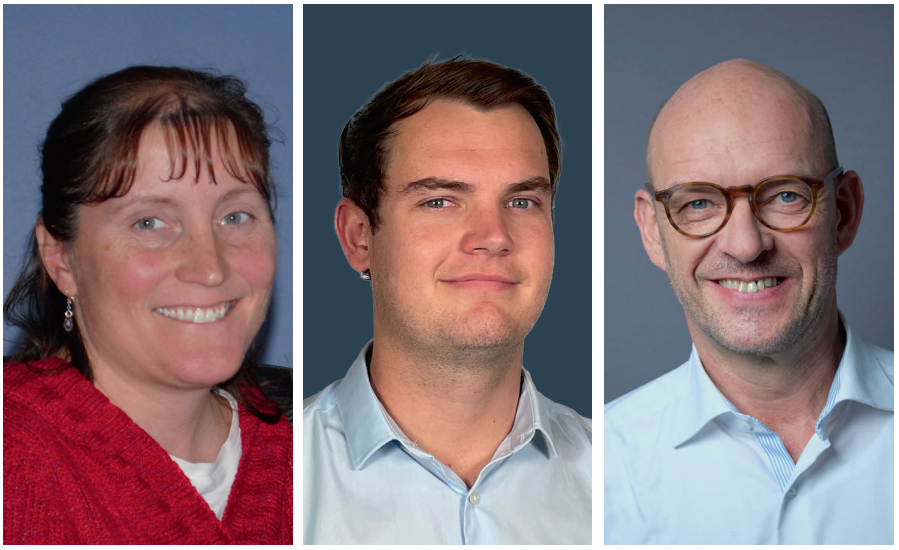
Taking the temperature

***FlexoTech* checks in with a panel of UV curing equipment suppliers to ask about the latest trends in the sector. Featuring: Stacy Hoge, marketing manager, Excelitas; Jamie Neill, sales manager, UK & Ireland, GEW; and Arnd Riekenbrauck, head of sales Web/Converting at IST Metz.**



From left: Stacy Hoge, Excelitas; Jamie Neill, GEW; Arnd Riekenbrauck, IST Metz

What are the latest developments in terms of curing technology for flexo?

Stacy Hoge, Excelitas: Every year, UV LED curing systems are becoming more efficient, smaller and more cost competitive. With multiple UV curing suppliers, printers have more product options and range of sizes than in the past.

Advancements in chemistry and cost competitiveness have led to more flexo presses being built or retrofitted with 100% LED curing technology. The flexibility of UV LED inks has continued to improve to the point where they can be run on a large selection of presses and substrates at increasingly faster press speeds. The latest UV LED curing systems on the market include application and cloud-based remote monitoring capability. This capability makes managing the press much easier for the operators.

Jamie Neill, GEW: Developments in curing for UV flexo have continued in the direction of LED UV curing. While LED UV curing has been available for many years it has become far more prominent in recent years with environmental and financial considerations being the key factors in decision making. Recent development in new LED technology has all been focused around increasing the power of air-cooled LED UV systems. An increase in power leads to an increase in performance and press speed. GEW's recent development has been to launch AeroLED2, an air-cooled system that now achieves an output previously only attainable with water-cooled products. Even at an increased LED power there are still savings of over 60% in energy.

Arnd Riekenbrauck, IST Metz: IST Metz has developed two key solutions for modern UV curing demands: FREEcure and Smartcure. FREEcure enables photoinitiator-free UV curing, a pioneering step toward sustainability and food safety. By eliminating photoinitiators from ink formulations, it helps reduce potential migration issues and supports compliance with stringent regulatory standards.

Smartcure is an intelligent curing system that automatically adjusts UV output to match job-specific requirements. This not only increases energy efficiency but also minimises wear on components, thereby extending system lifetime and ensuring consistent curing performance across various substrates and ink types.

How can printers manage the transition from traditional UV to LED, including while in a hybrid situation of using both?

Stacy Hoge, Excelitas: Before transitioning from traditional UV to LED, printers will need to work with the ink company and curing supplier to make sure the inks are optimised to work with LED on the stations being upgraded. Many of the inks are dual cure and work with both UV and LED, but testing may be required to confirm.

The additional infrastructure required by traditional UV lamps will likely need to be removed from the press when upgrading to LED. The exhaust systems required by mercury UV arc lamps to extract toxic fumes from the presses are not required with LED and can be removed, making it a far more environmentally friendly process. In many cases, a maintenance person could help support the removal.

For the LED installation, printers will want to consult with the LED supplier first. Certain LED suppliers will help to support a new installation or retrofit. If they cannot support, they might be able to recommend a third-party integrator to help manage the installation.

Jamie Neill, GEW: The transition to LED is most easy if you are an

existing GEW customer with a Rhino power unit. The upgrade from E2C to AeroLED2 only requires the addition of an AeroLED2 cassette. This patented technology means that the power supply recognises which cassette is inserted into the system and changes power settings accordingly. For customers with other UV systems, it is still relatively cost effective to upgrade to LED with a return on investment typically realised within a couple of years.

The development in dual-cure UV flexo inks has been paramount in customers' ability to migrate to LED UV technology. This means that with one ink set it is possible to cure with both arc UV and LED UV technology. A customer can either move to dual cure inks before upgrading to LED UV technology so that they can have a seamless transition when they begin to upgrade their hardware; or, if they choose to upgrade press by press, they can have some presses running LED UV and some running arc UV without the need to stock two different ink technologies.

While there has been a shift to LED UV technology the need for arc UV is still very much there. LED UV inks are available for varnish, but the cost and post-cure properties of arc UV varnishes have the edge. This is what GEW's ArcLED provides customers: the ability to run both arc UV and LED UV technology on the same systems completely interchangeably,

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so customers can tailor their system to each individual job.

Arnd Riekenbrauck, IST Metz: The shift from conventional UV to LED technology presents both opportunities and challenges for flexo printers, especially when operating in hybrid environments.

LED systems emit electromagnetic energy primarily around 3.1 electron volts, whereas traditional mercury-based UV lamps can deliver over 6.3 eV. This difference in spectral energy has practical implications: while LED curing is highly effective for many low- and medium-energy ink systems, certain high-performance applications – such as overprint varnishes requiring scratch resistance or tack-free finishes – still depend on the higher-energy output of conventional UV systems.

Printers can strategically deploy LED for linework or fine detail jobs, where lower ink volumes make the higher initial ink cost more economically viable due to reduced energy consumption. Full solid area applications, meanwhile, often remain with conventional UV, leveraging lower formulation costs despite higher operating energy needs. A hybrid configuration allows printers to balance these considerations dynamically, optimising both performance and cost efficiency.

GEW's UV LED curing systems: the Leo is a water-cooled device, while AeroLED is air-cooled

How is the rise in use of LED impacting on the substrates that flexo printers can use for UV printing?

Stacy Hoge, Excelitas: UV LED curing technology opens the door to a wider variety of substrates and new applications, enabling users to print on a variety of labels and packaging materials at high speeds. LED emits significantly less heat than traditional UV, expanding the choice of substrates significantly. Flexographic labels can be printed for beverage, household, medical, personal, promotional and many other industrial markets. UV LED curing can also be utilised for printing on flexible films, boxes, cartons, corrugated containers and a wide variety of other packaging materials.

UV LED technology is superior to traditional UV systems for curing substrates with opaque whites, dense blacks, metallic and other densely pigmented colours. The critical element that each of these has in common is the requirement that UV energy penetrates through dense pigments, additives or films without being prematurely absorbed before full cure is achieved.

For label and packaging applications where black, white and metallic inks represent process bottlenecks, switching to a UV LED process with its ability to penetrate deeper into the ink will result in increased press speed, more opacity, stronger colour, greater adhesion, better cure, greater yields and less scrap.

LED technology also excels at decorative printing processes that require ultra-high gloss, matte and holographic effects. 'Cast and Cure' is a fast-growing technology that creates a holographic style decorative finish on a variety of substrates for sheet-fed and web applications. Cold foil allows the decorative printing application of metallic foil, in line, at press speed in an infinite spectrum of colours. These

effects can be created in a variety of label and narrow web environments. With the continued widespread acceptance of UV LED systems, availability of suitable substrates continues to grow.

Jamie Neill, GEW: LED UV can be used for a similar range of materials as arc UV. Where LED UV has the edge is that it does not produce any IR (infrared) radiation like an arc UV lamphead does. This means that the heat impact of LED UV curing on the material is less. While this does not always mean that thin films can be printed without chill rollers it does reduce registration issues and other temperature related problems.

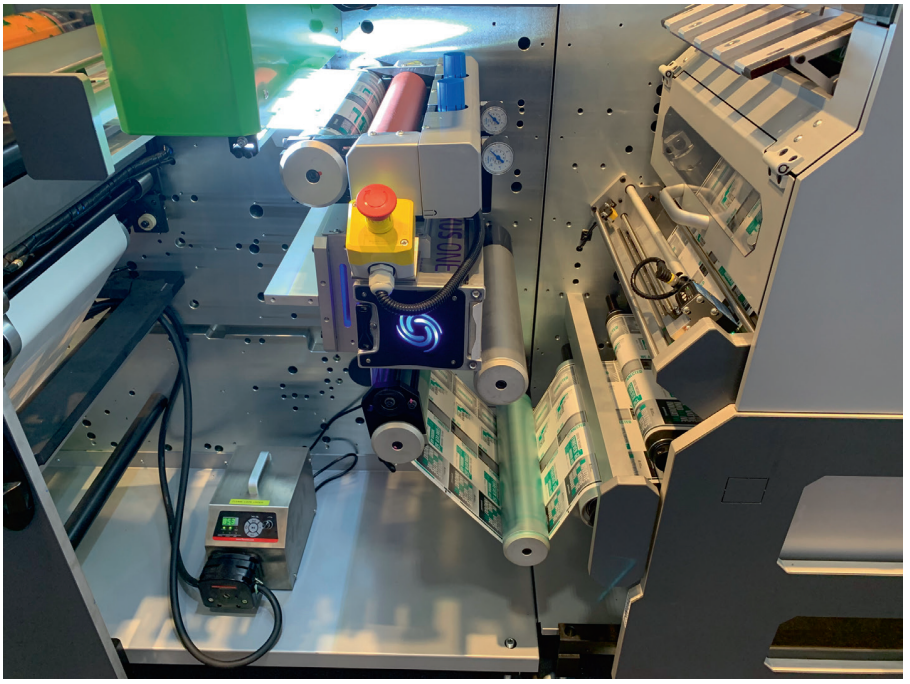
Arnd Riekenbrauck, IST Metz: LED curing's lack of infrared radiation significantly alters the thermal load during the curing process. As LEDs are monochromatic and generate heat only through substrate absorption, the mechanical requirements for cooling – from an engineering perspective – are substantially reduced.

This thermal efficiency makes it feasible to process heat-sensitive substrates on less complex and more cost-effective machinery. It also opens new possibilities for lightweight and specialty materials, broadening the scope of LED UV applications in flexo printing.

What innovations are you seeing in terms of how curing technology is being used or set up at the printer end?

Stacy Hoge, Excelitas: To increase operational efficiency, printers and converters are developing innovative automated processes for UV curing. With instant on/off and consistent UV output, UV LED curing technology allows flexo presses to be more reliable and easier to automate. UV LED also allows for increased throughput, shorter runs and more personalisation options for customers.

As sustainability becomes an increasingly important goal worldwide, printers are building their factories with new innovations to reduce emissions and meet their sustainability requirements. For example, one label printer utilises water that is naturally cooled in the earth instead of using chillers to cool its flexo presses. After the water is cooled by the earth, it is fed into the factory's water supply to cool the presses and the building in the summer.



The Phoseon Nexus One UV LED curing system from Excelitas on a flexo press

Printers are adapting digital platforms with UV curing into their flexo processes. Digital platforms bring more capability for foil and embellishment effects for printers.

Jamie Neill, GEW: A big benefit of LED UV curing that doesn't always get the headlines is its repeatability and process control. LED UVs have a very stable UV output that gradually reduces over a long period of time – often 40,000-plus hours to reach 70% output. In comparison, an arc UV lamp typically has a lifetime of 1,000 hours, which is the point when many printers change them to return to 100% output efficiency; however, if the new lamp is coupled with older and degraded dichroic reflectors, this will also affect the overall output of the lamphead and therefore lead to more regular lamp changes than required. With LED, the printer can be confident that from day to day, week to week, month to month, the output of the LED is sufficiently above the threshold requirements of the dual cure ink. This leads to more confidence in the process, more reliable speeds and less under-cured product.

'To increase operational efficiency, printers and converters are developing innovative automated processes for UV curing.'
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Arnd Riekenbrauck, IST Metz: A growing industry trend reveals that UV curing units often operate at full power regardless of the actual job requirements, leading to substantial energy waste. Recognizing this, IST Metz is actively exploring the integration of AI-based algorithms that enable intelligent control of curing parameters during job setup.

These advancements mark an important step toward the digitalisation of the flexographic process. By dynamically adjusting curing intensity to specific substrate, ink, and press conditions, printers can achieve significantly greater energy efficiency, reduce operational costs, and ensure consistent curing quality. This is a key innovation in the sustainable evolution of UV curing technology. ■