



**Get the UV LED  
Production Boost!**

## Increase Converting Production Rates: Upgrade Traditional UV with UV LED Curing

Whether you manage a small converting operation or a large manufacturing plant with multiple converting lines, expanding production capabilities through higher production rates and/or new capabilities is a challenge. But if your converting operations use traditional medium pressure arc lamp UV curing systems, then product yield and production rates are not what they could be given advancements in UV curing technology. This article provides a brief introduction to UV LED curing technology and how it improves production rates for converting operations such as laminating adhesives (film-to-film, film-to-foil, and film-to-paper), hydrogels (transdermal patches, etc.), and nanoimprint lithography.

### Introduction to UV LED curing

Commercial use of UV LED curing technology is advancing at a rapid pace due to improvements in energy output and increasing availability of ink, adhesive, and coating chemistry formulations. Currently, UV LED curing is used commercially for graphic arts printing applications such as digital inkjet, flexographic, and offset sheet-fed printing as well as industrial inkjet marking/coding, adhesive bonding, sealing, screen print decorating, electronics encapsulating and potting, and photoresist applications.

As the intensity output of UV LEDs increased, at a rate of 12% annually, high speed converting applications became feasible. Retrofitting converting lines which have existing UV curing systems to UV LED curing systems (in addition to or as a replacement) is inevitable for certain applications given the significant improvements in production rates and resulting bottom line business benefits available.

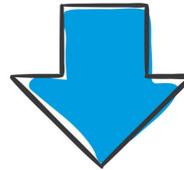
Let's look at some of the key characteristics of UV LED curing technology and how this impacts production rates.

## How UV LED curing delivers improved production rates over traditional UV curing

### 1. Instant on/off capability – reduces downtime

Arc lamps take 3-5 minutes to reach full output and require maintenance prone shutters for instant on/off control. In contrast, UV LED curing systems can turn on/off instantly meaning no more wait time to restart a line or unexpected downtime due to malfunctioning shutters. Converting production lines typically integrate the UV LED curing system controls so the lamp turns on/off instantly when the production line starts/restarts.

UV LED curing reduces downtime at the start of a shift or shift turnover, production line stops/restarts due to other production process needs, and there's less unexpected downtime which increases production rates.



**10% to 50%  
downtime reduction**

### 2. Longer useful life – more uptime

Compared to existing UV curing technology, UV LED curing systems have significantly longer useful life, operating up to 10 times longer (10,000+ hours) than medium pressure arc UV curing systems. **On average a production line has to stop every 1,000 operating hours to replace the arc lamp and probably more often for additive lamps. UV LED lamps need to be replaced 10 to 20 times less often! That results in significantly more uptime and higher production rates.**

### 3. Production flexibility and control – more uptime and machine utilization

UV LED curing systems operate at much cooler temperatures than traditional UV curing making it possible to run heat sensitive materials not previously possible. And UV LED dimming controls mean you can dial in exactly the UV energy needed for changing production needs. In addition to less product waste, this increased production flexibility and control can expand your production capabilities to new products and deliver higher converting line utilization. Assuming there is space on your line, adding UV LED to existing traditional UV curing can provide further flexibility for producing new products.

### 4. Maintenance time and frequency – less downtime

Arc UV curing systems have many components that require frequent and time consuming maintenance including bulbs, shutters, reflectors, ballasts, and cooling and exhaust fans. Maintenance tasks such as cleaning lamps, reflectors and shutters every 500 operating hours, rotating lamps once a week, replacing lamps and reflectors, and servicing cooling and exhaust fans and filtration. All this maintenance results in downtime.

UV LED system maintenance is significantly less since there is no shutter, reflector, or ballast, and essentially maintenance-free cooling fans. Maintenance tasks for UV LED curing systems include cleaning the quartz emission window, the working end of the UV LEDs next to the substrate, and cleaning or replacing cooling air filters. **Most commercial production lines using UV LED systems simply integrate their maintenance into the routine cleaning and service of other equipment on the converting line so there's no significant additional downtime.**

## Ideal converting applications for UV LED curing

In the same way that LED technology has replaced some automotive lighting, interior lighting, and other traditional light sources, UV LED curing will inevitably replace traditional UV curing technology for some converting applications due to the production advantages discussed here. The most promising wide web converting applications for UV LED curing (development work, pilot lines and a few commercial lines) are:

- laminating adhesives (film-to-film, film-to-foil, and film-to-paper)
- hydrogels (transdermal patches, etc.)
- processes where the UV energy can pass through one side of a substrate such as a transparent film to:
  - reach the chemistry beneath
  - create patterns (nanoimprint lithography) on the film

Any existing converting application using additive (iron or gallium) UV curing is a good candidate for UV LED curing because their UV energy output is long wavelength and essentially monochromatic at 365, 385, or 395 nm. Converting applications such as optical films that require a hard coat are especially challenging for UV LED curing since short wavelengths, well below 365 nm, are needed for surface curing. Pairing UV LED curing with existing UV curing can be an ideal solution for producing a wide variety of converted products on a single line.

### The bottom line and next steps

Based on the factors discussed here, **most converting production lines that replace arc lamps with UV LED curing systems will increase production rates by as much as 10% or more.** UV LED system manufacturers can help you assess the potential for your converting lines based on recommended maintenance practices, equipment design, and your specific production needs. Once you have an estimate of reduced downtime and higher machine utilization for your specific converting lines you can easily calculate increased production rates or yield possible using UV LED curing.

Use this to learn more about when choosing a UV LED curing system provider who can help you assess feasibility and production rate improvements for your converting manufacturing operations.

Thinking about or already assigned a [Process Development or Design Engineer](#) to investigate a conversion from traditional UV curing to UV LED curing? Share [these resources](#) to get them up to speed more quickly.