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FEATURED ARTICLE:

UV LED for IML and IMD - Competing Today While Preparing for Tomorrow

Jennifer Heathcote, Technical & Commercial Consulting Advisor, UV Curing

The US economy is strong. The real GDP quarterly growth rate has held between 2.2 and 4.2% for the previous eight quarters, and the first quarter of 2019 was a healthy 3.1%. US manufacturing consistently represents greater than 10% of total GDP¹, and according to the Bureau of Economic Analysis, recent manufacturing related contributions included increases in private inventory investments, greater exports, and a resurgence in non-residential fixed investments. The US unemployment rate for May was 3.6% which is the lowest since 1969, and there is currently neither inflation nor deflation on the radar. Volatility in international tariffs and an inability to protect intellectual property is even driving manufacturers to reassess the true cost of manufacturing abroad with some opting to strategically re-shore for the first time in decades.

Manufacturing, which currently employs more than 8% of the entire US population¹, is both contributing to and benefiting from the strong economy. Coupled with a shifting geopolitical climate, some areas of domestic manufacturing are experiencing renewed interest. Such a scenario creates revenue generating opportunities for those in a position to capitalize, but it also brings challenges. Two of the leading issues facing manufacturers are an inability to attract and retain critical talent and difficulty keeping up with and utilizing new technologies.

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UV LED for IML, Continued

The skilled labor reality is that 6 out of 10 open positions in the US are unfilled.¹ Another 4.6 million manufacturing jobs will be added in the US over the next decade with nearly 2.4 million of those expected to go unfilled.¹ Leading factors are a shifting skill set due to advanced technology and automation, students as well as parents not viewing manufacturing as a suitable employment or career option, and the retirement of baby boomers.¹ 51% of executives responding to a 2018 Deloitte survey felt that an inability to fill open jobs over the next three years was the biggest hinderance to *maintaining or increasing production levels to satisfy growing customer demand.*¹



Just as manufactures are becoming increasingly stretched by increased demand and staffing limitations, the manufacturing industry is simultaneously developing a plethora of new technologies. Unlike any other time in history, an abundance of decentralized innovation is happening at an increasingly high rate of speed, leaving most manufactures overwhelmed and indecisive about how to fully incorporate the latest solutions into both existing and new products and processes.²

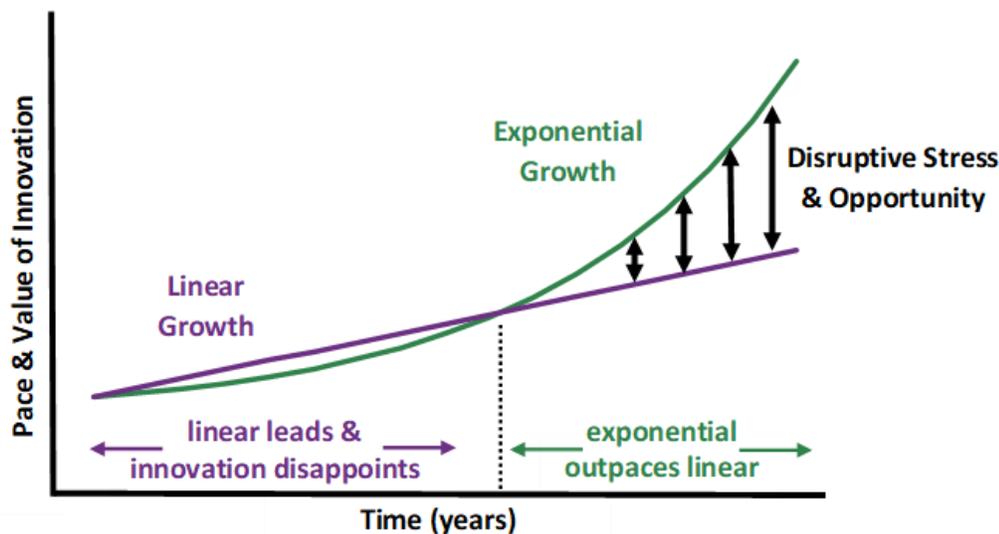
Herein lies the dilemma of UV LED curing. Manufacturers are being presented with a fundamentally different yet viable new technology that will eventually push out conventional mercury-based UV systems, but UV LED curing and its potential for IML and IMD product and process innovation struggles to capture the time and attention of the very manufactures it is meant to benefit. New technology today must not only compete with its most obvious alternatives, it must also compete with new and completely unrelated technologies that span all aspects of business as well as the precious time that increasingly stretched manufacturers must dedicate every day to get quality production out the door.

Smaller and mid-size manufactures increasingly want proven, drop-in solutions and are relying on vendors and even larger competitors to work out the development and implementation before committing themselves. Many manufacturers don't have the internal resources or time to investigate, evaluate, and develop new technologies for their own use in anticipation of future needs. They generally wait until existing equipment fails and needs replaced or production needs drive expansion. In these circumstances, purchasing decisions are often made quickly. In cases where manufacturers haven't previously explored the potential of UV LED technology and haven't been working closely with formulators on development, there is generally a reluctance to proceed. A natural fear lies in an inability to replicate exactly what the current mercury lamp process does today. The true potential of UV LED technology is often discounted by the buyer because further development requires time and resources.

The result is that the majority of UV curing purchasing decisions are conservative and risk-averse. Manufacturers either stick with what they know or play it safe with a hybrid solution. In the case of UV LED curing, playing it safe means continuing to use arc and microwave lamps. Dipping a toe in the water means going with a hybrid solution that offers the ability to swap back and forth as needed between conventional mercury and LED lamps.

With growing customer demand, a strained labor supply, and an abundance of new technologies, how do manufacturers successfully compete today while preparing for tomorrow? They do so by consciously managing dual strategies. Present planning (today-for-today) requires one clear strategy and future planning (today-for-tomorrow) another.³ Present planning is a vision of how to operate now given core competencies, target markets, and current opportunities and then fine-tuning alignment across the organization.³ The role of each key function must be clearly defined and optimized for excellence. Doing so allows manufacturers to compete within today’s market space. Future planning is built on a longer-term vision of change and a strategy for getting there.³ It almost always *involves bold moves away from existing ways of conducting business*.³ Future planning better positions companies against tomorrow’s competitors and enables the development of new competitive advantages that will be necessary in the coming years. Planning for tomorrow enables manufactures to navigate geopolitical developments and innovate the products and corresponding processes customers will demand in the future.

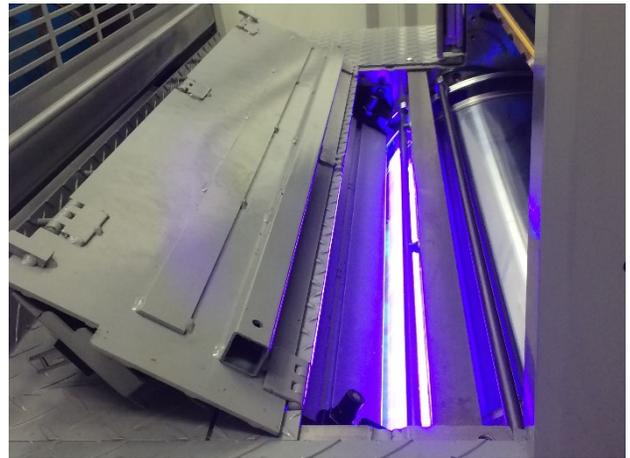
The following chart plots the pace and value of innovation (y-axis) against time (x-axis). The purple line represents existing technology and linear growth, while the green curve represents new innovative technology and exponential growth. With respect to UV curing, conventional microwave and arc lamp systems as well as conventional UV ink, coating, and adhesive formulations are linear growth products. Linear growth introductions incorporate minor changes in design or process and introduce features that modestly improve efficiency, operation, and performance. Meanwhile, the basic technology and utilization of the technology remain the same. Classic linear growth technology is best suited to manufacturers solely focused on present planning. It’s what they know and trust, and any misgivings with the technology, they generally learned to accept and accommodate long ago. The green curve illustrates the ongoing evolution of UV LED curing including systems, formulations, presses, manufacturing lines, and end products. This is where innovative companies that establish and implement parallel short-term and long-term planning strategies operate and drive development. Through these concerted efforts, innovative companies *create the fundamental industry shifts and put others in the position of reacting to its initiatives*.³



When technology is new and not yet proven, the exponential growth curve falls below the linear growth curve. Existing technology appears to be the better option because the new technology fails to deliver all the same results as current processes. Risk-averse companies will always focus on one or two things the new technology cannot do while discounting every other way in which it is superior to the current offering. At some point, the curves cross one another, with the exponential growth curve rapidly outpacing the linear growth curve. It is precisely at this moment that disruptive stresses and opportunities clearly materialize and lead to genuine manufacturing advantages. Some curing markets such as digital inkjet wide format printing and IML offset label printing have crossed to the right of the dotted vertical line for UV LED technology, but many markets such as those that use UV curable industrial hard coats on molded or thermoformed plastic products and wide web converting are still operating to the left.

Innovation does not occur when companies implement UV LED curing in ways that produce similar or only marginally better outcomes than conventional curing; although, a hidden benefit to this approach is that it often provides manufacturers a safe environment to get comfortable with the new technology. The reality is that it takes experimentation and imagination to create novel and better uses for new technology. Real exponential growth in UV LED curing for IML and IMD will ultimately come from opportunities that leverage less heat transfer to parts, substrates, and machine components. This directly translates into less scrap, less part warpage, less wear and tear on material handling equipment, more immediate post cure part processing, and the ability to use thinner walled parts, lower gauge substrates, and new materials in revolutionary ways. Innovation will also arise in IMD and IML part design due to the unique and unlimited ways in which LEDs discretely deliver UV light during the photopolymerization process, much of which has yet to be explored.

A major UV LED success story is IML label printing where the integration of UV LED curing enables offset converters to reduce heat transfer during printing of very thin, heat sensitive polypropylene films and increase press speeds upwards of 50%. The increase in UV LED press speed is because offset presses equipped with mercury lamps must be run at low power to minimize heat transfer, avoid film distortion, and create good IML labels. Even at higher power levels, UV LED technology often transfers less heat than mercury lamps at low power. Running mercury lamps at low power, however, requires converters to slow the press speed as a means of increasing exposure time underneath the lamps which is necessary to increase energy density and achieve sufficient cure.



In some UV LED IML applications, energy consumption can be reduced up to 75% since offset presses running IML can often operate with 1 or 2 LED systems instead of 5 or 6 mercury lamps.

There are currently over a dozen IML film lines running UV LED worldwide with more installations coming online. Most of these, including the press in the photo, are equipped with AMS Spectral UV LED curing systems. AMS Spectral is the leading supplier of UV LED systems for offset IML printing. Once a press is equipped with UV LED, manufacturers are better able to develop novel print innovations that leverage the ways in which UV LED output is different than mercury output.

Waiting to adopt new technology until the growth curves in the previous chart cross one another, puts laggards at a disadvantage and requires significant catch-up to understand the true value and best uses. Those who choose to get in early and learn to use the technology where it makes the most sense are the ones most likely to identify and capitalize on genuine innovation, thus enabling them to stay ahead of competitors and more effectively satisfy customer needs. This is surely the case for IML label printers using UV LED today and will be the case for those companies driving innovation in UV LED hard coats.

Unlike conventional curing, the discrete nature of solid-state UV LED technology allows irradiance (Watts/cm²) and energy density (Joules/cm²) to be independently applied to chemistry in ways that cannot be done with mercury lamps. UV LED curing systems have the ability to emit irradiances that range more than 10 times the span of conventional systems while also transferring less heat to the substrate or part. The raw diodes used in the LED lamp head as well as the manner in which the diodes are arranged, packaged, and powered also allows for a much greater range of energy density options. Those companies who are studying this and driving their vendors to study this are already at an advantage. Planning is discovery-driven.³ *Managers probe the future by conducting ongoing series of experiments* and scheduling time to learn how new technology may be a fit for an organization.³ Companies with big imaginations and a willingness to understand the nuances of LED technology will capitalize on disruptive stresses and opportunities to shape the future of plastics decoration.

While UV LED curing technology isn't going to solve the skilled labor shortage, the technology will ultimately replace conventional mercury-based curing systems, and due to its ease of use, longer life, reliability, and need for less maintenance, UV LED technology will make life better for operators and maintenance crews, increase yields, and improve manufacturers' bottom line. For those companies who choose to engage in forward thinking innovation and development, UV LED technology will enable the creation of new plastic part designs that cannot be done today. It will also enable better ways of processing and decorating plastic parts.

The decision of when to adopt UV LED technology as well as how to allocate the necessary development time varies by company and is based on how each company addresses both present and future strategic planning. It also depends on whether a company is more comfortable playing it safe on the linear growth curve and following more innovative competitors or committing time and resources to experiment on the exponential growth curve and drive industry shifts. Where does your company operate today? How will that position your company ten years into the future? Is it time for a new approach?

1. 2018 Deloitte and The Manufacturing Institute skills gap and future of work study. <https://documents.deloitte.com/insights/2018DeloitteSkillsGapFoWManufacturing>
2. 13 Tech Experts Predict the Industry's Biggest Challenges in 2019, Expert Panel, Forbes Technology Council, December 27, 2018. <https://www.forbes.com/sites/forbestechcouncil/2018/12/27/13-tech-experts-predict-the-industrys-biggest-challenges-in-2019/#4866899f1bcd>
3. Competing Today While Preparing for Tomorrow, Derek F. Abell, MIT Sloan Management Review, April 15 1999. <https://sloanreview.mit.edu/article/competing-today-while-preparing-for-tomorrow/>

FEATURED ARTICLE

Do you have an article relating to IML, IMD or IME that we can add to our next *In-Mold Messenger* Newsletter.

Send it to our editor;

Ron Schultz

Ron.schultz@imdassociation.com

480-993-9818

2019 PACK EXPO LAS VEGAS

It's easy to become blasé about industry trade shows after so many years working them but PACK EXPO Las Vegas 2019, September 23-25, 2019, at the Las Vegas Convention Center had an energy about it that was quite exciting. Initially forecasted by show organizer PMMI to exceed all previous attendance records, the isles were crowded from the 9:00am show opening right through to the 4:00pm closing on the very first day. By the end of the show on Wednesday, we had logged 126 visitors which was 50% more than at the 2017 PACK EXPO Las Vegas show.

IMDA members assisting us in our extra-large booth were kept very busy greeting visitors and answering some challenging questions about IML, IMD, IME and IMDA. Our visitors were attracted by our display of diverse IML packaging and IMD and IME durable products, including the winners of the IMDA 2019 Awards Competition. They were able to set up appointments in advance with our "Meet the Experts" team to discuss their specific in-mold issues.

Always well organized, PACK EXPO is one of the best run trade shows in North America.



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AUTHENTIX, www.authentix.com

2020 IMDA SYMPOSIUM AND SPE TOPCON DUAL EVENT

Planning is well underway for the IMDA 2020 Symposium, June 16 – 18, 2020, at the Ann Arbor Marriott Ypsilanti at Eagle Crest in Ypsilanti, MI, USA. The 2020 Symposium, *Where Durables Meet Packaging*, is co-located with the SPE Decorating and Assembly Division Topical Conference (TopCon).

CALL FOR PAPERS

IMDA has issued a call for papers for its 2020 Symposium. IMDA focuses on advancing the In-Mold Labeling and In-Mold Decorating industry through education. We invite speakers to submit their technical, non-commercial, educational papers for our next Symposium.

If you have an interesting, informative IML/IMD related topic you want to share at the IMDA 2020 Symposium complete the form below and send it to info@imdassociation.com as soon as possible but no later than April 30, 2020. Papers should be no longer than 30 minutes in length including time for questions and answers.

Your company's participation will be promoted in multiple ways including the Symposium brochure, the IMDA website, press releases, IMDA newsletter and during the Symposium.

This is a wonderful opportunity to interface with the international IML/IMD/IME community.

Name:

Position:

Company:

E-mail address:

Paper Title:

Summary of planned paper:

Fill out the form, save to your computer and send to info@imdassociation.com



MARK YOUR CALENDAR...

Upcoming IML/IMD Related Events:

JUNE, 2020

- IMDA Symposium 2020, June 16-18, 2020, Ann Arbor, MI, USA
www.imdassociation.com
- Thin Wall Packaging Conference, June 23-24, 2020, Wheeling, IL, USA
www.amiinternational.com

SEPTEMBER, 2020

- Label Expo Americas, September 15-17, 2020, Rosemont, IL, USA
www.labelexpo-americas.com

NOVEMBER, 2020

- **PACK EXPO International 2020, November 8-11, 2020, McCormick Place, Chicago** <https://www.packexpointernational.com>

PRESIDENT'S MESSAGE

PACK EXPO Las Vegas 2019 was a big success for the IMDA. As luck would have it, we were given the adjoining space to our booth and we made the most of it. Our new expense helped us feature more products right along the aisle and we saw a significant increase in traffic - you might say we packed them in.

Many great conversations were started, new opportunities un-covered and it appears we may have added a handful of new members! The theme at the show was clearly centered around sustainability and we can participate in that conversation, but there were other topics that fit us just as well or even better. Innovation, re-shoring and automation were clearly top of mind for many of our visitors and we can all agree that IML/IMD solutions can help in those areas. The excitement and support for IML/IMD only continues to grow and this year's PACK EXPO reminded everyone of it.

Thanks to everyone who assisted in the booth and brought extra IML/IMD products to show; it made a huge difference. And as usual, many thanks to Ron and Myra, for their tireless hours organizing, setting up and tearing down. In the future, we will want to schedule our members to assist in the set-up and the tear down, it's a lot of work and Ron and Myra should not be doing it alone.

Respectfully Submitted,

Bob Travis

IMDA President

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Solid Films:

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- Transparent, high clarity

Films for Thermoform IML

Cavitated White Opaque Films:

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StackTeck is a leading source of high productivity **tooling solutions** for the injection molding industry. StackTeck supplies a wide range of injection molds used to produce plastic parts in applications such as **caps, closures, medical, food service and thinwall packaging**; as well as complete system integrations, **In Mold Labeling systems** and mold bases. StackTeck has dedicated R&D, testing and part sampling facilities including a **dedicated IML Pilot Cell** for prototyping, in addition to plastic part design, prototyping, engineering, and manufacturing capabilities. With over four decades of mold building innovation, **StackTeck has the solutions to make your project a success!**
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IMDA is an organization of molders, label printers, material suppliers, equipment suppliers and others committed to the development and growth of in-mold decorating products, technologies and markets. Its mission is to raise the level of awareness and acceptance of in-mold decorated durable products and packaging by OEMs, brand owners and marketers. **IMDA** equally represents and supports all of its member companies across the entire in-mold decoration supply chain.

Serving the IML and IMD value chain through Real Experts, Real Answers, Real Value

Ron Schultz, Executive Director, In-Mold Decorating Association
4957 Oakton #305, Skokie, IL 60077 USA
Phone: +1 (480) 415-3379 eFax: +1 (480) 237-2738
Email: ron.schultz@imdassociation.com