

# The Economics of Sustainable UV Technology

By Michael Kelly

Sustainability is the new **Green....** and will continue to gain influence in the global marketplace. A major movement is underway—which includes efforts by environmentalists, government agencies, manufacturers, consumers and others—to improve sustainability worldwide.

The UV Coatings marketplace—consisting of raw material manufacturers, equipment suppliers and formulators—is using UV technologies to lead the sustainability effort worldwide and positively impact manufacturing, especially in the United States. This movement is called Sustainable UV™.

Sustainable manufacturing processes have the following characteristics:

- Conserve natural resources
- Save energy or water
- Avoid toxic or other emissions
- Contribute to safe, healthy environment
- Use products made from salvaged, renewable or recycled material

Clearly, UV coating technology meets the criteria of the first four items

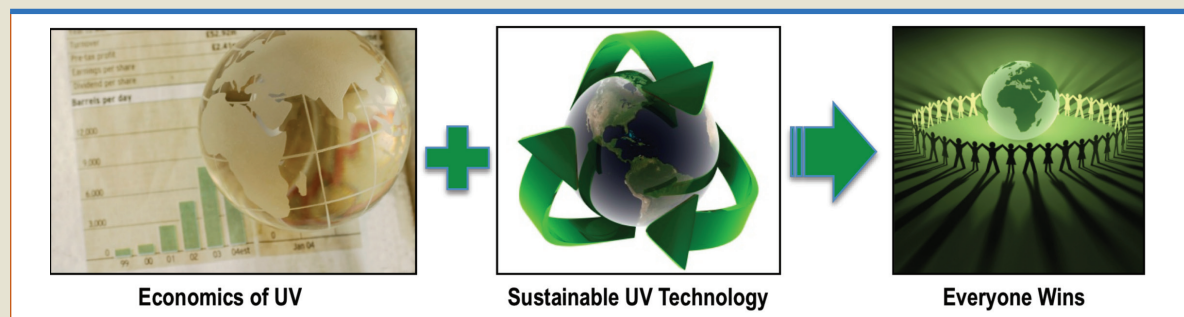
listed. Major efforts are underway today to meet the last criteria and to drive production of raw materials from salvaged, renewable or recycled materials.

UV is not only a “sustainable” technology, it is also—and more importantly—an economic solution; one that is critical for U.S. manufacturers today. The UV industry has a long history of promoting sustainable practices and continues to advance efforts that positively impact manufacturing. The UV industry also contributes to the environmental protection, economic performance and social well-being of the communities, customers and consumers they serve. This trend is here to stay and will gain importance in today’s worldwide marketplace. For additional information on this, please visit [www.Radtech.org](http://www.Radtech.org) and click on “Sustainable Solutions with UV/EB.”

Sustainability and economics are critical together. In fact, they are mutually dependent on each other. Responsible manufacturers are always

## FIGURE 1

### The economics of UV





Example of installed solar panels.

looking for new ways to be sustainable, but the competitive marketplace will not allow them to implement a new product or process unless it also makes economic sense (Figure 1). We refer to this as the “Economics of Sustainability.”

UV technology provides manufacturers the “Economics of Sustainability” and offers a process that is *faster, smaller and cleaner*; and delivers economic cost savings to the customer. Here’s how—

**UV process has faster:**

- Line speed
- Cure time
- Coating optimization

**UV technologies requires less:**

- Floor space
- Work-in-process
- Energy consumption
- Maintenance costs
- Capital equipment cost
- Quality costs

**UV technology is “green” with:**

- Zero volatile organic compounds (VOCs)
- No hazardous air pollutants (HAPs)
- No normal vinyl pyridones (NVPs)
- Reduced reporting
- Improved health and safety

The manufacturer is able to run their process at a higher line speed, which offers them more production capability without additional allocated capital. In addition, the UV process offers the manufacturer the benefit of a cure time that is less than two seconds; which offers many benefits—ranging from immediate handling to reduction

in quality costs. Also, UV coatings can be 100% solids, so there is no evaporation or solvent content, which allows the manufacturer to utilize all of their coating—100% optimization.

From a production standpoint, UV offers the manufacturer the ability to implement a process that consumes a great deal less floor space, mainly by eliminating conventional heat ovens and conveyors. Work-in-process is virtually eliminated due to the instant cure properties of the UV process. With the elimination of the ovens and additional conveyors, the result will be greatly reduced energy costs. Smaller capital equipment costs will also be significant due to less actual equipment required, typically in the range of 50 to 60 percent. Quality costs will be minimized due to the coat, cure and pack philosophy of UV technology, which allows for immediate inspection

after cure. UV technology is sustainable and offers significant environmental benefits such as no VOCs, HAPs or NVPs. Typically, UV offers the manufacturer reduced reporting and a cleaner and safer work environment

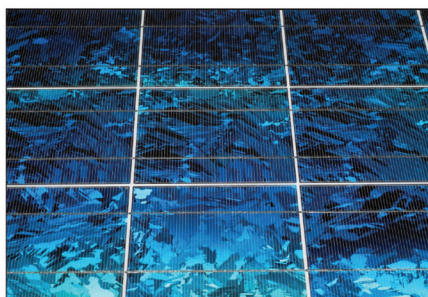
**Case Study: Photovoltaics**

Photovoltaics is rapidly growing in the United States and offers a great opportunity for implementing UV technology.

UV technology is being implemented for a variety of technical and economical reasons. Outlined in Pictorial 1, 2 and 3 are some examples of specific applications that are incorporating UV technology in their photovoltaic applications today:

- UV silver-conductive inks
- UV clear coat
- UV dielectrics

For this example, we have chosen the UV silver-conductive inks. UV technology typically replaces solvent-based, silver-conductive inks and delivers sustainability, *plus* significant economic savings to the customer. These are both critical to the customer’s financial bottom line.



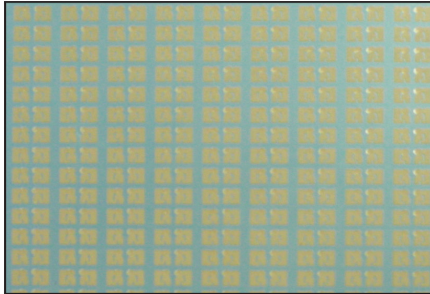
Pictorial 1: Close-up of solar panel / UV-conductive silver inks.

<b>Solution:</b>	UV Conductive Silvers
<b>Substrate:</b>	Glass
<b>Application:</b>	Screen Printer Flexo Printing
<b>Technical:</b>	Contact Resolution Resistivity



Pictorial 2: Close-up of solar panel / UV clear coat.

<b>Solution:</b>	Clear Coat / Exterior
<b>Substrate:</b>	Glass
<b>Application:</b>	Roll Coating
<b>Technical:</b>	Weatherability Adhesion



**Solution:** Internal Insulating layer  
**Substrate:** Proprietary  
**Application:** Roll Coating  
 Ink Jetted  
**Technical:** Specifications  
 Adhesion / Layers

*Pictorial 3: Close-up of UV dielectric coating.*

**Application:  
 UV Silver-conductive Inks**

Outlined below is a cursory review of the economic benefits to apply UV technology to photovoltaic manufacturing:

**Faster Line Speed:**

- Ability to run significantly more production
- UV-Conductive Silver ~ 40 ft. / min.

**Faster Cure Time:**

- Eliminate conventional heat ovens
- No substrate damage or impact to end product
- Minimal heat impact to the substrate
- This is an important area as more products today are pre-assembled and heat sensitive

**Faster Coating Optimization:**

- No evaporation / curing in-process
- ~ 98% efficiency
- No setup of materials in screen or flexo process / application equipment

UV technology delivers economic cost savings and sustainability:

**Less Floor Space:**

- Eliminate conventional heat ovens and related space
- Each square foot is dollars wasted

**Less Work-In-Process:**

- Almost no WIP / Associated cost savings
- Eliminate in-product contamination

**Less Energy Consumption:**

- Eliminate conventional heat ovens resulting in significant cost savings

Photo credit: [www.infraredheating.com](http://www.infraredheating.com)



*Thermal oven system.*

- “Using conventional heat ovens to cure a sustainable energy product”

**Lower Capital Equipment and Maintenance Costs:**

- Less equipment / less maintenance
- Less equipment required results in less capital investment

**Improved Quality Costs...**

- Immediate inspection resulting in less waste

**Cleaner technology:**

- Eliminates use of harmful chemicals—No VOCs, HAPs or NVPs:
- Sustainability
- Reduced reporting
- Impact local environmental

Photo credit: [www.alliancecorp.com/images/photos/](http://www.alliancecorp.com/images/photos/)



*RTO scrubber system.*



*Environmentally green and sustainable.*

**Improved Health and Safety:**

- Sustainable / better workplace environment
- Improvement for employees

**Conclusion:**

Organizations with an eye on sustainability are realizing that embracing green practices can be a direct route to a successful, profitable business that adds value to manufacturers, their customers and shareholders, and the planet.

While sustainability alone is important, the “Economics of Sustainability” is critical to manufacturing today and tomorrow, and both are mutually dependent on each other. Manufacturers must continue to implement sustainable technologies, but the success of this sustainable technology depends on the economic return/financial return to their operations. UV technology offers a definitive sustainable roadmap and delivers true economic savings. ▶

—*Michael Kelly is president of Allied PhotoChemical, Marysville, Mich.*