

MultiCure Techniques - High UV Irradiance with Low Thermal Rise

Ultraviolet Light (UV) curing is routinely accomplished by special UV lamp systems, which not only generate ultraviolet radiation through the plasma of the lamp but also infrared radiation (or heat) from the fused quartz lamp envelope itself. This is a direct result of lamp envelope temperatures well in excess of 1000 degrees Fahrenheit. Heat absorbed at the substrate is unwanted in most photocure processes since it can result in product deformation. The top UV lamp producers, including LESCO, incorporate special dichroic reflector and/or IR filters as well as specialized cooling techniques, which allow essentially all the UV energy to pass through but reduce, reflect or block much of the undesirable IR. But despite the best efforts, some Infrared energy component is part of every UV cure lamp output.

LESCO's *MultiCure* technology, simply put, allows natural air and convection to dramatically reduce the negative effects of IR on critical substrates in a multiple cure process. Rather than applying all of the required UV dosage / energy density in a single sustained low or medium intensity (irradiance) application, multiple high intensity UV light doses are applied to achieve the same cumulative Joule energy density. In LESCO's proprietary *MultiCure* conveyor curing system, special tailored UV lamps are reciprocated back and forth over the cure area as the conveyor belt carries product through the system. The heat rise on the substrate is sharply curtailed as natural convection and air (or nitrogen as applicable) cool all surfaces impacted by IR. The attached test traces compare a conventional UV conveyor system with LESCO's *MultiCure* system using identical lamp sources and belt speeds. The traces clearly document that for the same total UV energy density (3.0 Joules \pm 6%), the thermal rise is reduced by some 70% (23° C Vs 92° C), and peak temperature is reduced by well over 50% (127° C Vs 57° C).

LESCO has also pioneered *MultiCure* techniques using spot cures in high-speed process line application. Here, it is often critical that the lamp sources are the highest intensity/irradiance available due to throughput requirements and transitional cure strength. LESCO's SuperSpot MAX HP cure system can produce UV irradiance levels of 25 to 30 W (UVA). This is enough energy to survive light deliver losses and furcation splits to the cure site and still allow multiple sub-second cure applications with extreme strength at low thermal rise. Microprocessor controls and DataMAX software make programming the process painless. This technique is now standard on a variety of industrial lines worldwide.