UV Reflector Considerations:

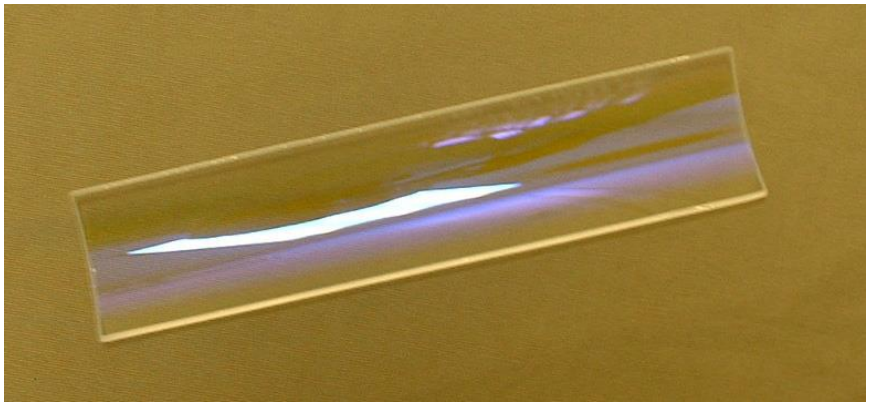
4/18/17

If you read my article regarding the different UV Lamps and why one versus another would be used to properly cure the thick screen printing ink layers, you learned that white pigment absorbs UV light very efficiently which results in less energy being available to through-cure the UV ink (change it from a liquid to a solid).

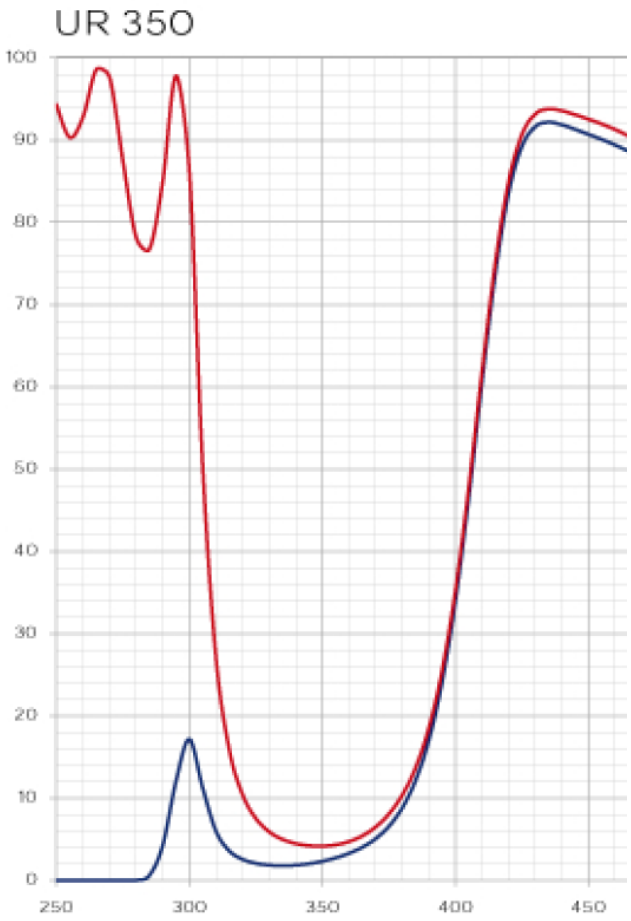
A major issue with UV curing is that the bulbs output is not limited to UV radiation. A significant amount of IR radiation is also produced. The resultant heat often damages the printed substrate especially if it is a thin film used in the packaging industry. Packaging films are typically printed using Flexographic or Offset means and therefore a very thin ink layer is deposited on the substrate. This thin ink layer allows the ink to cure rapidly allowing high press speeds. The high press speeds kept the packaging film cool enough that it wasn't damaged. Unfortunately, the packaging industry wanted to down-gage the film and use less expensive BOPP films to reduce the cost of the packaging. To prevent heat from the lamps damaging the film, new heat (IR) management techniques were developed by the equipment suppliers. One technique the manufacturers used was to modify the UV reflectors to selectively reflect UV while absorbing the IR and dissipating the heat.

I had used Fusion UV systems for a while and I was familiar with their dichroic coated reflectors, which is the purple one in the picture below. The coating would absorb the IR and dissipate the heat using a blower system. The rest of the bulb's output would be reflected to the substrate below. In my case, I was formulating screen printing inks and these reflectors worked the same regardless of the lamp I was using (mercury vapor- H Bulb, Iron doped- D bulb, Gallium doped- V bulb).

Recently, I was troubleshooting a screen printing ink that was not curing completely on some equipment that I had never worked with before. I did some formula modifications that helped but didn't solve the problem. We had the printers verify that we were using the gallium and Iron doped bulbs (because the inks had a significant amount of white pigment). Still poor curing resulted. I told my client that I had to look "under the hood" of his lamps. What I found was what looked like a clear piece of glass where I would normally find a polished metal reflector. It was similar to the one pictured below. We were trying to cure the screen ink with a gallium doped bulb with peak outputs between 400-450nm. This "reflector" being completely clear to visible light was obviously passing most of the lamp's output instead of reflecting it (see the transmission spectra on the next page). Although this reflector would work great with the standard lamp and flexo printed (thin) inks, it did not properly cure our thick screen printing inks with a lot of UV



absorbing titanium dioxide (white pigment). Once we went back to the standard polished metal reflector the curing problem went away because we now gained back the lost 400-450 nm wavelengths that the clear



reflector allowed to pass. If you recall, this is the important part of the spectrum needed to completely through-cure the titanium dioxide screen printing inks.

If you have any questions concerning curing of UV screen printed inks and coatings, and equipment configurations, I can be reached at 413-363-0770.

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