TROUBLESHOOTING UV CURING

UV CURING ISSUES

Curing related issues are typically caused by an incompatibility between the curing system, the ink or coating, and/or the anilox selection (in flexo applications). These incompatibilities can stem from several variables, but it is always good practice to inspect the curing system for proper maintenance and performance.

Proper maintenance requires a physical inspection of the bulb and reflectors and should be performed on a regular basis. Pressroom conditions and production processes should dictate how often a physical inspection should occur.

Keeping a UV system maintenance log is highly recommended. A maintenance log for each press can easily be set up on an Excel spreadsheet and should include information in regards to each inspection. A basic log for UV lamp maintenance should have columns with rows consisting of; date of inspection, hours on the lamp, visual inspection of bulb, visual inspection of reflectors, visual inspection of quartz filter, physical inspection of reflector, physical inspection of quartz filter and an area for notes. Please contact the manufacturer for a maintenance schedule.

EXAMPLE UV SYSTEM MAINTENANCE LOG

DATE OF INSPECTION	1/25/23	6/27/23
HOURS ON THE LAMP		
VISUAL INSPECTION (BULB)		
VISUAL INSPECTION (REFLECTORS)		
VISUAL INSPECTION (QUARTZ FILTER)		
PHYSICAL INSPECTION (REFLECTORS)		
PHYSICAL INSPECTION (QUARTZ FILTER)		
NOTES		

CHILL DRUM TEMPERATURE

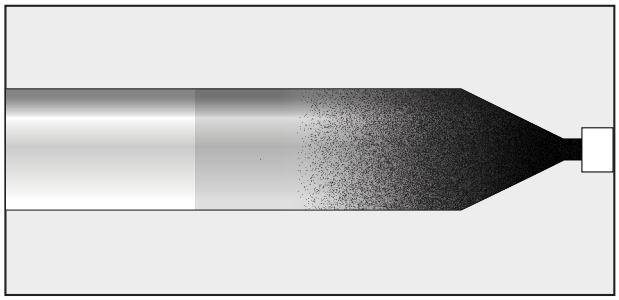
Temperature plays a major role in cure speeds. Most new presses have chilling systems that help to regulate the temperature of the substrate on a press, which is especially relevant when running thin shrink films on a narrow-web press for example.

While the temperature of the substrate is critical in web-fed presses, it is important to remember that UV inks and coatings cure through a chain reaction and when the temperature is low, the chain reaction will not travel as far through the ink film and may result in a shallow cure. This means a layer of cured ink is sitting on top of uncured ink, which leads to adhesion issues, even though the ink film appears properly cured. A good understanding of how temperature effects cure will prove valuable in achieving faster cure speeds, realizing energy savings, or simply saving a job from getting rejected due to improper curing.

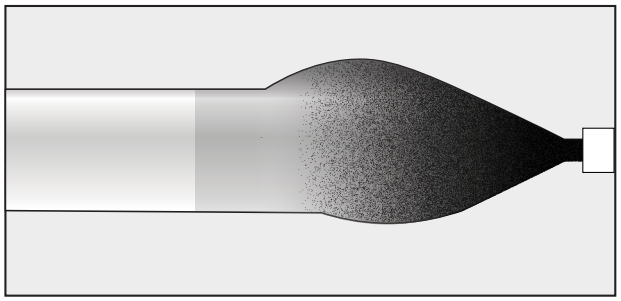
UV BULBS

Standard UV bulbs are typically guaranteed for 1,000 hours of operation. Most companies do not change the bulbs out at 1,000 hours of operation. **It is more common to see companies changing the bulbs out when there are cure problems.** The most common signs of a curing problem related to a UV bulb are seen when the materials inside the bulb deteriorate and less cure is seen. The ends of the bulb will show a decrease in cure before the center of the bulb will. Often times a visual inspection of a bulb with many hours on it will show up in the form of bubbling of the glass on the ends of a bulb along with a darkened area at the ends of the bulb instead of the clear bulb. The bubbling and dark areas are a direct effect from the "start up" process.

BLACK ENDS



BUBBLING/BOWING



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All curing systems need to incorporate some type of cooling mechanism in order for the bulbs to perform properly. If a system is too cold, the UV energy creating material inside the bulb will be unable to generate enough energy for the UV emitting material to do it's job. If the bulb is too hot the IR energy overloads the UV energy providing too much IR and not enough UV. The most common curing systems seen in narrow web printing utilize air to cool the bulbs to the required temperature allowing for effective cure.

Running Too Cold = Reduced Curing Speed

Running Too Hot = Overheating IR Lamps

The air cooled systems draw the air from the pressroom through the lamp housing from an exhaust fan. The air that gets pulled through the housing often times gets drawn into the housing of the lamp directly through the opening of the where the shutters block the light from the substrate when not in print mode. This means that the air is coming into the lamp where the bulb and reflectors are located. This type of design allows for a great deal of pressroom air to get drawn into the lamp and dust or dirt particles can and will get stuck on the bulb and reflectors. If there is enough of this build up on the bulb, the cure can drop quite a bit.

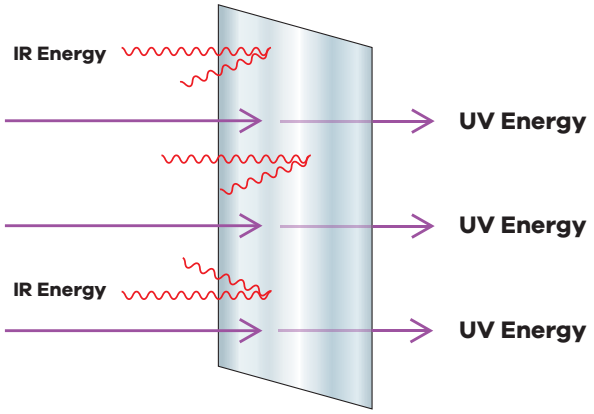
A regular cleaning of the bulbs are recommended using IPA only (IPA leaves no residue) along with clean disposable gloves. Touching the bulbs with bare fingers can cause the bulb to develop a "hot spot" which will draw the UV energy to the spot that was touched causing inconsistent energy output across the bulb.

QUARTZ GLASS/FILTER

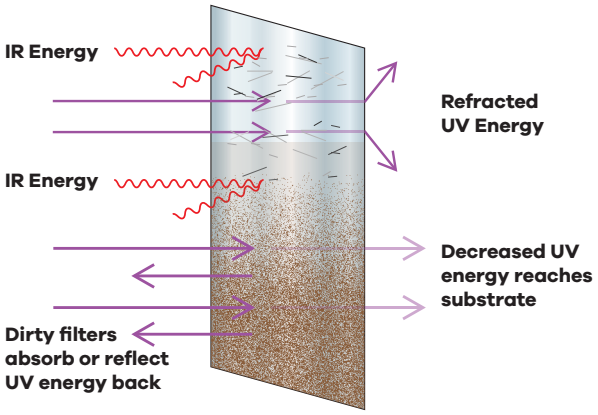
Quartz glass or "filters" allow for the UV energy to pass through the glass while the IR energy gets reflected back towards the bulb. This allows for a decrease in the temperature that reaches the substrate, typically around six to eight degrees depending on the system. If the glass is dirty or scratched, there will be a decrease in the amount of UV energy to the substrate. A dirty glass will absorb or reflect the UV energy while a quartz filter that has been scratched will refract the UV energy in a different direction minimizing or redirecting the focus of the energy in the scratched area.

A dirty quartz filter can decrease cure enough that only about twenty percent of the UV energy being generated actually reaches the substrate. Often times the quartz filter can be taken off the lamp for additional cure purposes as the temperature increase assists the chain reaction of the ink. You must check with the manufacturer of the curing system to determine if removing the filter will have any adverse affect on the system.

CLEAN QUARTZ GLASS/FILTER



SCRATCHED & DIRTY QUARTZ GLASS/FILTER



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REFLECTORS

The reflectors that are found on most presses have been designed to allow for the UV energy being emitted from the bulb to be directed into a "focused" area. **In other words the UV energy that bounces off of the reflectors will basically come together in a focused point.** The principals behind the design of focused reflectors are based upon the fact that light travels in a straight line and if the light is directed to one point we can bring the a majority of that energy to one point and therefor provide a majority of the energy to one point. If the reflectors have any type of debris on them, the light that hits the debris will be reflected in a different direction therefor decreasing the energy that is directed to the focused point. It is therefor important to keep the reflectors to maintain their efficiency.

We typically see two types of reflectors on presses. **The most common are "dichroic" reflectors. The other type is a highly polished aluminum either as an insert or an extruded aluminum.** The dichroic reflectors work opposite of the quartz filter in which the dichroic allows for the UV energy to reflect off of them and the IR passes through the reflector. This design allows for a lower temperature coming off of the reflector specially suited for temperature sensitive films.

Care must be taken when cleaning the dichroic reflectors as the dichroic coating can get damaged causing decreased curing. Consult the curing system manufacturer on their recommended procedures and scheduled maintenance of the reflectors.