Measuring UV;

Common terminology, definitions, and some misconceptions

UV PROCESS SUPPLY, INC.

Let's start with a short glossary – following is a list of the most common terms typically used to describe a UV Bulb's power or intensity.

Watts This is the total amount of energy the bulb will use at 100% power. Unfortunately it is not a useful indication for UV because UV lamps are extremely inefficient. Total watts include; White Light, Infra Red (IR) Heat, and a substantially low proportion of Ultra-Violet (UV) energy. *~92% waste energy and ~8% UV*

WPI "Watts per Inch"; this is the same as Watts but it is broken down into each linear inch of the UV Arc Lamp. An example would be as follows: You have a 10 inch arc lamp that operates at 300WPI. 10 inches of arc X 300 per inch = 3,000 Watts. *(In some parts of the world, W/cm = Watts per centimeter)*

W/cm^2 This is a value for energy intensity and if the correct UV Radiometer was used; it will accurately describe the peak output power of a UV Lamp. Intensity can be also expressed in lower levels as mW/cm^2 (milliwatts) or even lower as µW/cm^2 (micro-watts). The portion at the end (/cm^2) stands for per centimeter squared, or per square centimeter. It represents the detector size used within the radiometer. All radiometers calculate based on a square centimeter detector so that there is some uniformity within the industry.

J/cm^2 This is a value for energy dose and accurately describes the total accumulative exposure of UV received. It is W/cm^2 multiplied by time. Similar to W/cm^2, in lower doses it can be represented as mJ/cm^2 (millijoules) or even lower as µJ/cm^2 (micro-joules). *Note: 1 Joule = 1 W/cm^2/second*

O.K., now that we are all working from the same textbook, lets talk shop. We receive many inquiries from clients wanting to know what a good "number" is for their UV equipment when they are trying to cure specific Inks, Coatings, or Adhesives. Most are somewhat disappointed when we cannot give them an exact answer.

Typically, the best place to get that "number" should be the manufacturer of the Ink, Coating, or Adhesive. However, we find many times the answers our clients receive from them are vague at best. A good example is when the specification requires "*exposure using a typical 300WPI UV lamp to cure*". Just from the glossary above you already know that this is not helpful. Here are several additional bullet points as to exactly why.

- **What is a typical 300WPI UV Lamp?** Is it Mercury, or a metal halide type like Iron or Gallium? These are spectrally three very different lamps, but are all available in 300WPI.
- **What is the UV Lamp in?** Lamp housings have reflector chambers surrounding the bulb to redirect the lamps energy. These reflector chambers vary significantly, because they are designed for a specific purpose. The shape of the reflector, or ellipse, greatly affects the amount of UV ultimately received at the target and the intensity of that UV. You can put the exact same 300WPI mercury lamp in 6 different UV reflector housing styles and achieve 6 significantly different results.
- **How clean is the reflector and how new is the UV lamp?** A typical electrode type UV lamp in Mercury has a useful life of 1,000 operating hours, Metal Halide additive type are only about 500 hours. Reflector aluminum becomes foggy or hazy due to exposure to UV and ozone. It discolors from intense heat, and can become pitted from dirt being baked on while it is operating. The reflector is responsible for redirecting at least 50% or more of the UV energy emitted from the bulb back toward the target. So a dirty reflector instantly affects UV intensity, even with a new bulb installed.
- **When was the last time you checked the lamp housings alignment and distance to the substrate or the UV lamps focus within the reflector chamber?** Most lamp housings have a very shallow sweet spot for focus, and UV intensity also decreases exponentially over distance. Minor damage to the fixtures alignment or changes to the lamp holders positioning can have significant negative impacts on intensity.

So, what do you do now?

In most cases it is ultimately going to be up to you to determine what good cure is. Fortunately, we have available all the tools you will require to confidently achieve this. Need to clean or replace parts? We also carry reflectors and UV lamps, as well as reflector/lamp cleaning solutions. Please contact us for assistance: **sales@uvps.com.**