Heraeus

A Useful Language for 3-D UV Systems

Life was easier when UV lamps stretched across a web or flat conveyor, and all we had to worry about was *width* and number of *rows*. But, as we moved into 3-D processing, we find lamps located all over the curing zone. In fixed-lamp 3-D configurations, each lamp has its own optimized position. Setting lamps in a large 3-D installation falls somewhere between science and art.

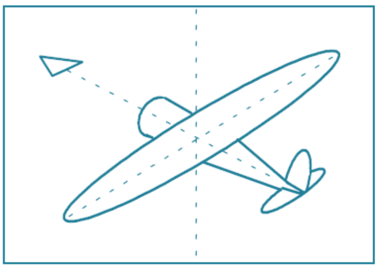
Have you ever tried to describe the orientation of a UV lamp – or several lamps – in a 3-D configuration? Have you watched an otherwise conservative engineer waving his hands and arms, often with the assistance of pens (to represent bulbs) and file cards (curved, to represent reflectors), trying to communicate the orientation of a lamp in space? What about changing the position of a lamp? Does it drive you nuts to hear the description of "Just rotate the lamp a little." "*Rotate? - What does THAT mean?*" "You know – *tilt* it."

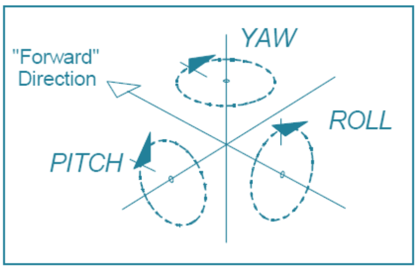
This isn't a new problem – how to orient something in space. There *is* a language that is clear and one that we can adapt easily to 3-D UV lamp orientation. It's used all the time in flight and aerospace situations. There are two parts: *attitude* and *position.*

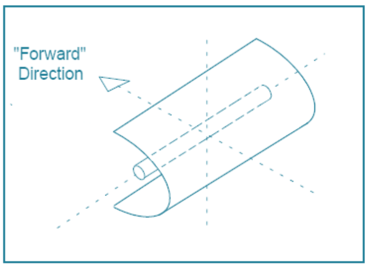
Attitude

Think airplane. We begin with *pitch*, *yaw*, and *roll*. For the pilot of an airplane, *pitch* is the angle relative to a plane, for example, the horizon – nose up, nose down or level. *Yaw* is turning right or left. *Roll* is raising one wing and lowering the other. These three axes will completely describe the *attitude* of the aircraft.

Think of the axis of the UV bulb aligned with the wingspan of the aircraft, and you get the picture.

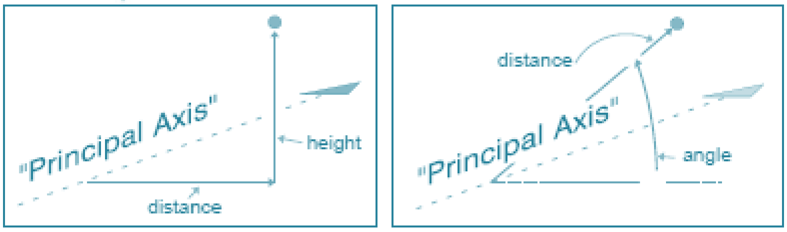






Position

This is a little trickier, because there are several ways to locate a point in space. First, the *principal axis* is along the direction of travel of the production line. The principal axis can be located anywhere parallel to the travel. The centerline of the conveyor and the floor, for example, are convenient reference points for locating the principal axis.



Imagine a horizontal plane through this principal axis. This is like the horizon. A point can be located by its height (altitude) from the plane and its horizontal distance from the centerline (these are its Cartesian coordinates). Another way to locate the point is to use its angle of elevation from the “horizon” plane and the distance to the principal axis. Pick one of these ways and stick with it.

By locating the *position* of a point in space and describing the *attitude* of the object at that point, its precise orientation can be described and communicated – or drawn – consistently. And, all of this is independent of the complexities of the shapes of objects and surfaces to be cured. (*How many* and *where* to locate lamps for maximum effectiveness is a topic for another day.)

Now, if the geometry is too much, just get some pencils and some file cards.

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*This article was originally written by R. W. Stowe, Technical Director, Fusion UV Systems, Inc. and published in the Nov-Dec, 2002, **RadTech Report**. More recently, when he was UV Applications Engineering Consultant, Heraeus Noblelight America LLC, the article was published in the UV+EB Technology, Issue 1, 2017.*

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