



UV Flat Line Finish

This is one of a series of bulletins to help our customers understand industry issues and what Diversified Woodcrafts does to address these issues. We hope this is useful and informative. The information comes from sources within the finishing community.

ENVIRONMENTAL STATEMENT

Diversified Woodcrafts considers itself a responsible steward of our environment. We live, work and play with our families in the Northwoods of Wisconsin. Our neighbors live here. *Of course we care about the environment.* We will always strive to ensure the materials we use come from sustainable sources, that we work in an environmentally-friendly manner and the products we provide our customers can be used without environmental or health concerns.

WHAT IS “FLAT LINE” FINISH?

Trick question! When discussing a “flat line” finish, most people mean one or both of two different components:

1. A UV (ultra-violet) light cured, organic resin finish
 - a. Can be applied by any typical technique: roller, spray, curtain, vacuum, etc.
 - b. It has two components, the actual organic resin and the energy from high intensity ultraviolet light.
2. A “flat line” roller coat application system
 - a. Typically used in high volume facilities
 - b. Results in very little material wastage
 - c. Finishes parts *before* assembly, rather than finishing complete products after assembly
 - d. Can be used with a variety of finish materials

When the term “flat line finish” is used in the scientific casework industry likely, *but not necessarily*, both of the above components are being referenced. This bulletin will explain why it is important to use both components to maximize the benefits to the owner of the final product.

Each component is addressed in turn below.

OKAY, WHAT IS THIS “UV ORGANIC RESIN” FINISH?

There are now three basic coating types for wood casework:

COATING TYPE	DRY SPEED	CHEMICAL RESISTANCE
Thermoplastic	Fast	Moderate
Thermoset	Slow	Excellent
UV-cured	Fast	Excellent



Thermoplastic coatings may be better known as “lacquers” or other names. While they dry fast (which factories like), their components provide only moderate chemical resistance. Owners of finished products –laboratories – pretty much require a better chemical resistance than thermoplastics provide.

Thermoset coatings take longer to dry because of the long reaction times required for their components. They may be known generally as “polyurethane” coatings. Tend to be more durable with longer wear characteristics than other coatings. Laboratory owners like the chemical resistance, but the factories don’t like the long drying cycle.

UV-cured coatings combine the strengths of the two conventional coatings. The organic resin is able to be chemically cross-linked, resulting in **excellent chemical resistance**. The UV curing enables very fast reaction and drying times. **UV-cured finishes also tend to be more moisture, solvent, stain and heat resistant.**

SO NOW EXPLAIN THIS FLAT LINE SYSTEM

The industry norm is to build a cabinet with unfinished wood. *After* assembly the cabinet is stained and finished. The problem is that many of the natural characteristics of the wood – which we humans often do not want to see – are not visible until *after* finishing. At this point the cabinet is taken off line – after a lot of labor cost has already been applied – and someone tries to make the “unwanted” natural characteristics go away. This adds more labor cost.

A flat line system finishes the parts *before* assembly, in their flat state. If unwanted characteristics are found after finishing an individual piece it is relatively easy to just cut and machine another piece and then finish it. This is much easier for the factory to manage than the conventional system.

I DON’T UNDERSTAND HOW THE FINISH IS APPLIED

Most people are familiar with spray finish systems. A person manually sprays the cabinet. (There are issues with this we will address shortly.) Think of the flat line system as doing pretty much what you are likely to do when you re-paint a room in your house. You use a roller for most of the surface, not a brush or spray. (1) The roller gives you control over where the finish is applied. The finish goes only where the roller goes. If the roller isn’t being applied to a wood surface then no finish is being applied. (2) It also ensures a nice, uniform coat over the surface. (3) The roller also applies pressure to ensure complete coverage of the surface.

HOW DOES FLAT LINE FINISH ELIMINATE THE ISSUES OF SPRAY FINISHING?

- 1 **WASTE ELIMINATED** – By its nature spraying is sort of a shot-gun approach to finishing. You spray and hope most of it lands on the wood. In reality much of the finish is wasted because it does not end up on the wood. Manual spray systems (as used by many companies in the wood science casework industry) have typical transfer efficiencies of as little as 30-40%. Some spray processes with overspray reclamation may reach 90% efficiency, but these systems are more likely used in the steel casework product segment. **Flat line roller systems are nearly 100% efficient.**
- 2 **EVEN, COMPLETE COATING** – Manual spraying depends upon the ability of the human sprayer to provide an even coat. Doesn’t happen. You will always have uneven spray application, and it isn’t good in either extreme. Ever see dried drips on a cabinet because too much finish was applied? Ever feel the grain of the wood on a “finished” cabinet because too little finish was applied? **The process controlled roller of a flat line finish system ensures a consistent, even, complete finish applied across the entire surface of the wood part.** Not too much, not too little but just right *on every cabinet.*
- 3 **ENERGY SAVINGS** – Manual spraying is done in a spray booth (basic safety and health requirement). A spray booth uses a fan to move the overspray out of the booth, through a filter and the excess air goes outside. Factories in the north must condition the make-up air that is brought into the building as a result, or at least condition during the cold winter months. In southern locations make-up air is likely not



conditioned as typically their doors are just left open. **Anyway, a flat line system doesn't require spray booths to filter and exhaust air or make-up air systems.**

SO, HELP ME UNDERSTAND THE VALUE OF THE UV LIGHT

In the typical manual spray systems, drying *at best* is accomplished by moving the finished product past a fan system, blowing air onto and past the product. In most factories the cabinets are on some sort of conveyor system which keeps the cabinets moving past the fans. If the conveyor speed is increased, say to get more product through the factory during the busy summer season, then there is less time spent in front of the fans. This means surfaces are likely still tacky to the touch, showing fingerprints, sawdust, etc. **The UV-cure happens immediately after leaving the finish application roller, curing the finish coating almost instantly.**

BUT AREN'T THERE HAZARDS WITH USING UV LIGHT?

Not really. The biological effects of exposure to ultraviolet light resemble the typical symptoms of sunburn. Simple shielding of the UV light mechanism protects production personnel.

ARE THERE ANY ENVIRONMENTAL BENEFITS TO A UV FLAT LINE FINISH?

Absolutely!

1. **Virtually zero VOC emissions.** Volatile Organic Compounds are not the type of thing you want off-gassing anywhere. VOCs are present in solvent-based finishes and to some extent even in water-based finishes. VOCs are virtually not present at all in UV flat line finish systems. **This is an extremely emission-friendly finish.**
2. **Virtually zero waste.** As noted earlier, a UV flat line system has a virtual 100% transfer efficiency while manual spray systems are closer to 30-40%.
3. **No hazards to production personnel or the community.**
 - a. UV flat line finishes as a class are not considered carcinogens
 - b. Are not fetal or reproductive toxins
 - c. Are not regulated as RDRA hazardous waste
 - d. Do not appear on any Community Right To Know list

ARE THERE ANY APPEARANCE ISSUES WITH A UV FLAT LINE FINISH?

No, just the opposite. A UV flat line finish will typically have a nice gloss to it. A water-based finish, on the other hand, tends to have less clarity, or a milky appearance, which becomes more noticeable over dark stains or veneers.

THE BIG QUESTION: DOES IT COST MORE?

Not to you it doesn't. Yes, the cost per gallon *to the manufacturer* is higher. Remember, though, a manual spray system uses a finish that is almost two-thirds solvent or water, which evaporates after the finish solids land on the wood being finished. A UV flat line system is almost 100% finish solids; no solvent or water to carry the finish to the wood is required. So, with less waste and more actual finish solids per gallon, the per square foot cost of a UV flat line finish is actually less than a manual spray finish. And that does not even take into account increased labor efficiencies in the factory, decreased energy costs and decreased costs from quality issues.



SO, BOTTOM LINE IS I GET A BETTER PRODUCT THAT IS GOOD FOR THE ENVIRONMENT AND IT DOESN'T COST MORE

I guess that about sums it up!

- Very chemical resistant finish (and resistant to moisture, solvents, stain and heat)
- Even, balanced, complete finish on all finished materials.
- Better appearance
- No VOC off-gassing or other hazards
- Virtually no waste
- Less expensive
- No quality issues as with manually sprayed finishes
- Energy savings

HOW DO I SPECIFY THIS FINISH?

Just make certain your finish specification for your wood science casework includes the following phrases:

- Finish is to be applied with a UV-cured, flat line roller finish system.
- Finish is to meet SEFA 8 finish performance requirements. (As an active member of the Scientific Equipment and Furniture Association we recommend the use of their customer-focused performance standards. This requirement ensures the finish being used is chemically resistant and appropriate for use in laboratory applications.)
- Finish is to meet AWI Section 1500 finish standards. (As an active member of the Architectural Woodwork Institute and its Quality Certification Program, we recommend the use of their Quality Standards Illustrated.)

LAST QUESTION: WHY DON'T ALL FACTORIES USE UV FLAT LINE FINISH SYSTEMS?

Well, I can't actually speak for them but I can hazard a guess. They likely don't want to spend the money to purchase and install the equipment. While the system is expensive, the fact is the return on investment is actually pretty good. Our company, though, always puts a priority on doing what is right for our customers, our employees and our community. With that standard, installing a UV flat line finish system was a no-brainer!

So, enjoy your wood science casework from Diversified Woodcrafts!

-o0o-