

UV or Not to UV—A Small American Manufacturer Takes a Technological Leap

By Doug Hatch

When PB&H Moulding first started using UV coatings on wood mouldings in 1991, it was an insight on the “next new thing” in finishing and we intended to get a leg up on our competitors by adopting the technology early. In retrospect, it may have been the one thing that allowed us to continue manufacturing in the United States, when most of the competition closed their doors or began importing the majority of their product.

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education and assistance. UV inks and coatings had been used in the printing industry for years and were becoming standard in the automotive industry at the time we moved into the technology. Uses in the wood industry were generally limited to those of a flat line operation. A couple of constraints made our application and curing with UV coatings both difficult and advantageous.

Challenges

The difficulties included the variety of substrate shapes and the low volumes of our runs. Since we focus on

quality, our price point allows us to do many small orders instead of single item large runs. We needed a system that could handle profiles with a wide variation of surface angles. Getting light to them for curing posed a challenge. A system could be configured pretty easily for a single substrate shape, but we have to feed a wide variety of sizes, colors and quantities through the system. Some lots are as small as 300 lineal feet.

Benefits

The advantages were clear. Applying the coating with a vacuum coater allowed us to have virtually zero coating waste and we were able to change set-ups in a matter of minutes. The speed of cure for UV coatings enabled us to finish in ten minutes, what took one man a whole day to complete. However, the goal of running multiple profiles and finishes back-to-back did not happen overnight.

Manufacturing History

PB&H Moulding was founded in 1888 in Syracuse, NY, and has been making decorative moulding ever since. We specialize in a traditional hand finish that includes gold and silver metal leaf, colored lacquers and furniture quality wood stains. That given, you would think there wasn't a place for UV coatings in our process. However, we found that UV coating was an excellent substitute for one of our biggest bottlenecks. We built a

finish by hand polishing with shellac. The underside of the moulding was tacked to sharpened screws on a table and then wiped down with shellac-soaked cheesecloth. Depending on the quality of the finish, multiple coats could be applied.

In 1990, we knew we had to change our ways as labor costs were increasing and our ability to serve the emerging “just-in-time” economy was hampered by the polishing bottleneck. Then and now, the popular high-speed method to build a finish on moulding was by using gesso extrusion. Gesso has the advantage of a smooth-quality surface finish and a lower wood cost by using junk or finger-jointed wood for the substrate. Using this method also meant having to do large runs as the set-up time was greater. Multiple coats required the first of the batch to be dry and sanded before the next application. Space became valuable because of the need for multiple drying racks for the moulding. The durability of the final product could be a problem if the gesso coating was brittle and chipped or delaminated from the moulding. Additionally, at that time gesso coatings were all solvent-based and noxious. Due to short runs and relatively limited space, we knew gesso was not the answer for us. We had to find something better to fit within our production scheme.

Our UV Journey

Late in the summer of 1991, we met with consultant, Charlie Bates of Cedar Beach Inc., and gave him a sample of our most popular moulding. He returned with our stained Birds Eye Maple sample polished with a clear UV coating. We were impressed with the finish and unbelieving of his description of how fast this product could run on a UV-finishing line. We definitely wanted to see more and scheduled a trip to a UV-oven



PB&H Moulding makes decorative moulding with UV coatings.

manufacturer. We tried coating various profiles with and without stains and/or sealer basecoats. The process of a liquid coating turning into a solid fascinated us. Sold on the idea, we signed an agreement for the oven to be constructed and returned home with a confident feeling our polishing problems were solved. We now had that “leg up on the competition.”

Our vacuum coater and oven were delivered and installed in 1992. At this point we had invested more than \$100,000 in the project, which represented more than 5% of our gross sales. Unfortunately, it was not so easy a learning experience. It quickly became apparent that there was an awful flaw in the design of our UV oven.

The oven was originally sent to us with three 55" mercury vapor arc lamps mounted on top in parallel with the moulding and one 12" lamp mounted perpendicularly to travel on the bottom. Operating at 125, 200, or 300 watts per inch, there was entirely too much curing energy on top and not nearly enough on the bottom. Moulding would come out cured on the top and uncured on the bottom. If the line was slowed enough to cure the bottom, the heat from the 55" lamps would burn the top. It was also difficult to position the

lamps to get light to some intricate areas of the profile.

On a more serious note, the original conveyor was a steel chain that rode atop a herringbone support frame of 3/8" steel rods. The steel on steel would rub together and the small filings would make their way onto the surface of the glass UV bulbs where they would fuse to them at the high-operating temperatures.

Some changes to the oven were made including replacing the conveyor with one having steel rollers and a Kevlar belt, and turning the 12" lamp parallel inline with the travel of the moulding. Even after applying these remedies we could not achieve a functional cure so we sent the unit back to the manufacturer to make modifications.

While we waited, Robert Weithoffer Jr., of E&R System Technic (the distributor of the vacuum coater), built an oven using microwave-powered lamp technology to use while our original oven was being modified. It was a great machine with a much smaller footprint and significant savings in power consumption. For someone who ran the same shaped product all the time, it would have been ideal. The lamp units used much less electricity than the

standard arc lamps and ran at lower operating temperatures. However, because of the high intensity focus the UV lamps had to be carefully positioned for different size and shape parts, requiring a setup for each run of moulding. We used this oven for a couple of moulding runs, but eagerly awaited the return of our oven.

The unit was shipped back in January. Unfortunately, the trucking company failed to tarp the load. In Central New York and much of the Northeast, we use rock salt to keep the roads clear of ice. When our unit was delivered, a slushy, salty mess was plastered all over it. Two days were spent cleaning the dried road salt and grime from it.

The 12" lamp had been replaced with a 25" lamp mounted in parallel and more adaptable mounting clamps were made for the 55" lamps. The balance of energy was still not right, but some production was run through the unit.

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Covering all the angles was still a problem and one of the more difficult places was under the rabbet of the moulding. Stained moulding was run through the machine, but painted moulding had a problem with blistering. This was especially true with black painted moulding as it absorbed large amounts of the infrared energy thrown off by the lamps. A lot of money and time was invested in this operation and the directive came down to get it running...now!

At this point, we had given up dealing with the oven manufacturer and took modifications into our own hands. We contacted the manufacturer of the new bottom light, American Ultraviolet, to see what could be done

about replacing the other lamps. We could use the existing ballasts for the 55" lamps in the control cabinet with two 25" lamps wired in series. We now had the option of having seven light sources. We started with one pair mounted on either side of the first bottom lamp and this solved problems with getting cure around the bottom-back and rabbet sides of the moulding. Over the next couple of months, we bought four more lamp units and got rid of the remaining 55" lamps.

We now had a very versatile oven and, in most cases, we only need to adjust the power output of the lamps or the speed of the conveyor for different mouldings. Very rarely do we actually have to reposition the lamps to get cure in a difficult area. Our goal of having a versatile UV-finishing line had finally been achieved.

Other Concerns

With the curing issue out of the way, we could now focus on issues we had with the coatings. First, we were having problems with particulate matter that was contaminating the finish. We tried a smaller screen filter, but since it was on the in-feed side of



PB&H specializes in hand finishing, but a UV clearcoat was an excellent solution to a big bottleneck.

the pump, it would clog easily and the pump would run dry. A new bag filter unit was installed on the output side of the pump, enabling different micron-sized opening bag filters to achieve a balance between flow and filtering. One big cause of the clogging problem was the flattener used in the original coating. It would not stay suspended and had a tendency to rapidly coagulate, clogging the filter. For many years, a full-gloss coating was used, because any coating with flattener would suffer the same filtering problems.

While trying new coatings, we had a bad experience with a supplier whose coating applied and cured well, but when the moulding batch was taken to the next step of the finishing process (gilding) we ran into a huge problem. The oil size (that is applied to the moulding to make a tacky surface for the metal leaf to stick to), instead of flowing out into a thin film, beaded up like water on a waxed car. Some type of silicate had been used in the manufacture of the coating and was so

invasive that even when the bad coating was pumped out and replaced with the old coating that had been in the tank, the old coating became contaminated and exhibited the same properties as the bad coating. A full day was spent scrubbing the vacuum coater from top to bottom, removing all traces of foreign coating.

The original supplier of the coating decided to get out of the wood products division and our local paint supplier, Strathmore Paint, was interested in getting into the UV-coatings field. They made up a similar coating that worked very well and was priced nearly \$10 per gallon less than what we originally paid for the coating. Three years ago, Chemcraft started selling PB&H a satin coating that solved the clogging problem. Today, we are able to produce a stained moulding with a satin gloss in only three steps.

Another coating issue was wintertime storage. With the combination of cold coating and the UV oven using outside make up air, we would have a problem with orange peel because the coating would not flow out in time before it cured. This was solved by allowing the machine to use inside air in combination with outside air by shutting down the intake fan and putting a tank heater on the fluid reservoir to keep the coating warm.

The only drawback that remains with our system is the electrical consumption of the UV-light oven. The mercury vapor arc lamps are great for bathing the moulding in light so all areas can be cured without having to tweak the set-up, but they use a lot of power, (7 lamps x 25" per lamp x 300 watts per inch = 52.5 kw). This does a number on our electricity charges. In order to keep our overhead costs down, the UV-finishing operation

runs while our wood mill is down. But because the UV line is so fast, this usually doesn't end up being a big interruption. Set-up on the coating applicator is very quick and we feed at approximately 80 feet/minute. In an hour or two, we can process a good volume of product. During this time, the mill can grind knives, clean up and perform other regular maintenance tasks. As a result, this load shaving has saved us nearly \$1,500 per month in demand electricity charges.

Summary

In conclusion, without this technology, PB&H Moulding would have gone out of business long ago because of production speed and the cost of labor. RadTech is an invaluable organization for propagation of this technology and has helped U.S. wood product manufacturers adopt a

finishing technology that brings productivity to a competitive level. We still struggle to survive, but finishing technology such as this gives us an edge and a means to hang on. ▀

—Doug Hatch is vice president engineering at PB&H Moulding Company, Syracuse, N.Y.

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PRIME UV Systems
416 Mission Street
Carol Stream, IL 60188

Phone: 630.681.2100
Email: sales@primeuv.com
Web: www.primeuv.com