



Wood Finishing 101

Wood finishing is one of the last processes in the manufacture of furniture or cabinets and the first thing seen on the retail floor. The wood finish emphasizes the mission of the furniture, cabinets and case goods with respect to their look and feel. A pleasing finish can do much to offset a mediocre design, while in contrast, a mediocre finish will detract from well-designed and constructed products.

Up to 90 percent of the entire costs associated with the manufacture of furniture or cabinets apply to the white room, and only 10 percent to wood finishing and its components.

Tips & Lighting Issues

Some basics for *white room wood preparation* include:

The moisture content of the wood coming from the white room must be consistent. This allows the wood substrate and the finish to “breathe” together.

The sanding procedures are primarily dictated by the porosity of the wood pieces. Soft, porous woods, such as pine, requires aggressive sanding and a coarser paper grit.

Overly aggressive sanding (burnishing the wood) on harder woods such as oak, cherry, maple, birch, and alder prohibits proper finish adhesion. The wood finish may flake off in its entirety on woods with little pore definition. When manufacturers are using aggressive sanding procedures on harder wood, we recommend a fine mist of water or alcohol to open up the wood to better accept the finish, and the wood finish adhesion will be improved.

Using too fine sandpaper in final sanding prior to finishing will cause colors to be lighter in comparison to the standard. Worn out sandpaper and/or varying grits of sandpaper change the color absorption of the wood, and cause adhesion issues.

Dark colors are especially susceptible to sanding and adhesion problems and the overall integrity of the wood finish. Whites are also susceptible to adhesion problems as high concentration of pigments (high PVC) are often used to obtain the look wanted. If the pigment concentration is too high and goes above the CPVC (the point at which there is just sufficient binder to cover the pigment surface as well as all the interstitial spaces between the pigment particles in a close-packed system), adhesion becomes an issue or in more simple terms: basically too much pigment causing adhesion issues.

Note: Always check with your professional sales representative for questions on specific coatings. The above illustrations and observations are meant for educational purposes only and do not imply warranties of any kind.

With That in Mind

Here are some **execution** variables and recommendations:

- Proper maintenance of equipment for finish consistency cannot be overemphasized. The spray equipment must be kept clean and in good shape. Spray gun tips (orifice) will wear and as they become larger, inconsistent finishing will result.
- All excess stain should be wiped off uniformly to prevent adhesion problems and color inconsistencies.
- Heavy-bodied stains must be dried properly before the next coat is applied in order to reduce the threat of bubbles and blisters.
- After wiping and drying, the stains should be brushed or blown off to remove any excess rag fibers, lint, or dust.
- All clear coats, wash coats, sealers, and topcoats should be applied at wet film levels, to obtain the best finish appearance. As a rule, we recommended 3 to 4 wet mils for low-volume solids.
- It is recommended the sealer application be kept closer to 4 wet mils and topcoats closer to 3 wet mils. In faster manufacturing situations, this helps to prevent blisters, when the finish is exposed to heat. Millage control of the sealer and topcoat application as recommended by a finishing supplier should be monitored carefully.
- It is recommended that pieces should be examined for wood finishing defects as early as possible, but no later than the sealer application stage, and prior to topcoat applications. It is easier to adjust sealers than rectifying poor build or poor color in the topcoat step. Sealers can be tinted and - depending on their formulation - sanded in preparation for the final topcoat. Therefore, catching finishing problems before the topcoat application is a rule that would be good to follow.
- It is recommended that finishing materials be properly warmed before application, especially in cold climates. Checking for flow properties is important for all wood finishing products, especially clear coats. If the materials are cold, the viscosity will be high and the quality of the finish will be compromised; if the finish is too warm, flooding of the finish (leaving puddles during application may occur).

Finish Inconsistencies:

The following are some of the appearance inconsistencies that can relate to improper product and or execution controls:

Bleed-Through: Alcohol-based dye stains can react with catalyzed sealers and topcoats causing a bleed-through that is readily apparent in the finish - usually red or green.

Drying issues: The process must allow the finish to dry and cure from the substrate up rather than from the topcoat down. This quality check cannot be overstated. In addition to having good air make-up in the room, the air in the ovens must be kept clean or the finish may be affected.

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Ovens overloaded with solvent vapors can cause the finish to cure with a greenish-yellowish cast due to the high acidity of the atmosphere in the ovens and cooling systems. This makes it necessary to wash off and re-finish the pieces.

Improper cure also can create blisters, and bubbles in the finish, leading to poor finish adhesion, and results in a rough feel to the final piece.

Additionally, improper formulation of the topcoat can result in a “wavy cold gravy” appearance. The solvents may be flashing off and drying too quickly. The solution to this problem is to correct the solvent blend and/or add more flow agents. If the topcoat cures topside down rather than substrate up, this is another reason the wavy, cold gravy appearance will also appear. Makeup air and oven temperatures should be addressed for correction.

Blushing of the Wood Finish: This occurs mostly in multiple-step furniture finish applications and is caused by moisture-laden air, usually from high humidity, causing a “white blush” appearance on the wood finish. The appearance generally comes from the topcoat causing the stains and glazes to “blush up” through the topcoat.

Blushing can be corrected in many ways, Reduction of air flowing through the finishing spray guns is recommended, along with the use of a slower solvent to allow the finish to dry from the bottom up, not topcoat down, Again, keeping the finishing room dry without excessive humidity is an important aspect of controlling this execution step.

Lifting of the Finish: In catalyzed wood finishes, if the catalyzed sealer is not cured properly in conjunction with the curing of the catalyzed topcoat, lifting of the wood finish occurs. This lift gives the finish an alligator-skin-like appearance, ruining the pieces and requiring costly clean-up and re-finishing.

Wood Finish Checking: A wood finish will check if the finish sets up quickly and drying is too fast. This happens in the topcoat step with both nitrocellulose lacquers and conversion topcoats. A finish will fail the ASTM cold check test if the topcoat is too hard and lacks flexibility, or if the operator is putting too much material on the pieces (in excess of 3-4 wet mils per topcoat application.)

Veneer Checks: Veneer and finishing checks are sometimes confused. The visible difference is the consistency of the checking pattern throughout the veneer. A finishing check is much more random in appearance.

Trapping Bad Air/Poor Drying: As parts move from finishing station to finishing station solvent- laden air may get trapped in the finish. This will impede the cure and if the solvent-laden air is not replenished, the pieces will become “gummy”, causing sand-throughs, poor adhesion and rub-throughs.

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Pore Bleed Back: Wiping stains, fillers and heavy glazes may bleed back through the pores of the more porous woods such as oak due to improper air. This finishing problem usually results in a costly refinishing process drying and lack of clean make-up.

Fish-Eyes/Craters: The cause of the defect comes from two areas:

- **External:** Lubricants and grease used for equipment maintenance often contain silicone, which can contaminate the finish causing the fish-eye/moon crater problem. The silicone can also come from hand creams, soaps, and deodorants used by employees.
- **Internal:** Many clear wood finishes are formulated with some silicone (very small additive weight) to enhance the slip or feel of the finish. If the wood finish is formulated with too much silicone, or if the manufacturing process too much silicone is added, the fish-eye moon crater problem appears.

Strange as it may seem to many, one way to remedy this problem is to use what we call a *fish-eye/moon crater corrective additive* which has as its basic formula some solvent and silicone – yes silicone (slip agent) – the very product that contributes to the problem. However, this additive is made under controlled conditions and is different in its mixtures from the silicones found in other products.

Finally, we would like to address those same common issues along with additional variances with finish application in an easy to understand and problem/solution approach we'll call *Troubleshooting*. As always, please consult your Nanochem sales professional with questions.

Troubleshooting:

Issue:

Hiding: Poor coverage and the appearance of dark lines at the edges of profiles.

Potential Treatments: The potential treatments are reducing the amount of thinner in the material, mixing it thoroughly before use, ensuring the right film build, sanding sharp corners of profiles, and increasing the speed of the solvent balance.

Issue:

Blushing/Blooming: This refers to the hazy deposits and possibly oily or wax-like substances that appear on a film, causing a reduction in gloss, and resulting in non-uniform surfaces.

Potential Treatments: Try adjusting the catalyst level: over-catalyze an acceptable amount and in consultation with recommended product data sheets or sales consultants; do not use steared materials such as lacquers and certain polyesters under acid-catalyzed coatings; check the formula for incompatibility; check the substrate for contamination.

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Issue:

Dark (Brown) Spots in the Film.

Potential Treatments: This is likely due to contamination. Clean the air lines or repair the oil separator to remove oil contamination.

Issue:

Flooding: Flooding is a process that causes uniform color change and surface enrichment of one or more pigments. The color on the disturbed surface or rub-up may be different from the original surface color.

Potential Treatments: Reduce the film thickness, the coating viscosity be raised, and the drying process sped up.

Issue:

Gray Pores: Gray pores are when there are gray areas deep inside pores. This happens when sanding dust is not cleaned properly or when the pores are not wetted well.

Potential Treatments: To improve the appearance of sanded panels, potential treatments include blowing out any sanding dust from the pores, decreasing the thickness of the sealer, adding silicone to improve the sealer's ability to spread evenly and not be contaminated, changing to a different type of sealer, and switching to a urethane sealer.

Issue:

Discoloration: Changes in the color of the finished parts; yellowing of film.

Potential Treatments: To treat coating issues, first check the age of the coating and for contamination from the drum liner or equipment used. Look out for foreign vapors and ensure the presence of UVA if required. Also, avoid storing the material in excessive heat and check for tannin bleed.

Issue:

Gloss Variation: This refers to issues with the appearance of the Shine or glossiness of a surface, including parts that are uneven, incorrect, unexpected, flat, or too glossy.

Potential Treatments: To prevent exudation of resins from wood, potential treatments include ensuring correct drying or oven temperatures, correct film build, applying a seal coat to eliminate absorbent areas on the substrate, reducing solvent strength, ensuring a clean substrate, and adding a silicone flow agent.

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Issue:

White Spots or Contamination in Film.

Potential Treatments: Please ensure the flattening agent is completely mixed in before your application. Additionally you may also try filtering the material before use and/or checking the water separator.

Issue:

Silking: Silking is a finish defect that appears as parallel lines of irregularities. It may be caused by floating problems, phase separation, specialized Bénard cells, or incompatibility.

Potential Treatments: To improve treatment, options include adding a dispersant, using a silicone additive, increasing viscosity, or adding a thickener.

Issue:

Haze: The surface appears dull and has exudation and small defects called microvoids, fine solvent pops, and fine thermal/convection cells.

Potential Treatments: Potential treatments for achieving a better coating include using the right thinner, checking the current catalyzation, ensuring the previous coat is completely dry, stirring the material for even distribution, and using a retarder solvent

Issue:

Cratering: Hollows/dents in the finish including with raised edges and/or material at the center.

Potential Treatments: To prevent cratering in coatings, clean your equipment and substrate beforehand. You can also filter your material and check/clean your air system and ventilation control. Adding a silicone flow agent may also help.

Issue:

Mud Cracking: Mud cracking refers to small cracks that appear on the surface of a water-based finish.

Potential Treatments: Ways to potentially treat the issue include raising the temperature of the affected area or drying, using a coalescing solvent with agitation, and increasing the temperature of the substrate.

Issue:

Bumps and Sinks: Uneven surface appearances-depth of image on low side.

Potential Treatments: Adding a silicone-based flow additive or thixotropic additives in the recommended quantity suggested by a sales consultant can be effective.

Issue:

Solvent Popping/Pin-Holing: Solvent popping or pin holing is when holes, craters, dimples, bumps and a seed-like visual appearance occur, leading to a low gloss.

Potential Treatments: Some potential treatments for a painting issue could be to increase the flash time, use a retarder solvent, or use a slower solvent blend.

Issue:

Solvent Trap: The finish of a solvent trap may crack or become glossy or flat after unpacking and stacking.

Potential Treatments: To ensure proper film application, air movement, and dry times, avoid storing in a cold environment before complete cure, increase cure time before stacking or packing, and ensure correct catalyzation.

Issue:

Crawling: When a surface is not able to be wetted properly, it can cause small formations such as beads (also line/ribbon) craters or pinholes.

Potential Treatments: We recommend you always clean the substrate before application. Additionally, ensure proper sanding before application. You may also try the addition of a silicone flow agent.

Issue:

Cracking: Cracks and checks in film.

Potential Treatments: Check the thickness during application (use a wet mil thickness gage), reduce moisture, check mixing ratios, make sure the surface was prepared properly, and check drying and storage conditions.