THE CHANGING FACE OF FLOOR FINISHES

By Bill Price

EPA regulations and new technologies are changing the way we finish wood floors

Many species and patterns of wood flooring have been used for hundreds of years. But no matter what type of wood floor or where it is used-whether kitchen or bedroom, residential or commercial—they all have one thing in common. They all need finishes to protect them from moisture and wear. While the flooring itself has changed little over the years, the finishes have gone through drastic changes in the last 35 years.

Shellac, varnish, penetrating seals, and waxes were commonly used prior to the early 1950s and are still used today in some regions. But the predominant finishes today are oil-modified polyurethane, moisture-cured polyurethane, Swedish finishes, and water-based finishes. Different parts of the country see varying amounts of each type.

One major change now occurring in the floor finish industry stems from the Environmental Protection Agency's (EPA's) Clean Air Act, which regulates the amount of solvents that can be released into the atmosphere. Although the law was passed in the 1970s, many extensions were granted. Recently, however, enforcement was stepped up in San Francisco, Los Angeles, and San Diego, virtually eliminating the use of most solvent-based coatings there. Similar restrictions are scheduled to take effect in New York City in January 1989 and Dallas, Fort Worth, Phoenix and maybe Denver over the following two years. Although a few solvent-based products can comply with the clean-air regulations, as broader national enforcement takes effect in the early 90s, many contractors will have to adjust to water-based coatings.

Stains

The stains sometimes used to color wood flooring come in several types. All use either pigments or dyes. Oil-based stains, which are still the most commonly used, contain mostly linseed oil and are thinned with paint thinner. But lacquer- and alcohol-based stains are finding limited use as well. Lacquer and alcohol stains are very fast drying, but are difficult to apply uniformly. The average floor mechanic will not attempt to use these, and the people who make them work have usually learned by trial and error. Water-based stains are also beginning to see use on flooring. These stains dry in one to three hours—not as fast as lacquer or alcohol but much faster than most oil stains. They are also slightly more expensive.

Using a special foam-backed mohair applicator, a floor finisher applies a coat of water-based urethane. The applicator is designed to apply a thin, uniform coat, which this type of finish requires. Between coats, the floor is lightly screened (bottom) to smooth the raised grain.

All stains of a given type, regardless of color, will work in the same way. But many floor contractors get into trouble with white and pastel colors. This is largely due to the expectations of the customers. Many designers and homeowners think that a white or pastel stain on a floor should be dense enough to hide the grain and match the kitchen cabinets or wall paint. However, penetrating stains, no matter what color, are made to be wiped on and wiped off the floor. The color and intensity depend on how much stain penetrates the wood fibers. The trouble comes when we expect a floor to be white, pink, or blue, like paint. When stains are applied that heavily, they are likely to peel or chip. We sometimes hear, "My painter stained the cabinets that color. Maybe I should have him stain the floors." The difference is that no one walks on the cabinets.

The way a floor is sanded and the type and grade of the wood has as much or more to do with the final color as the stain itself. For example, don't expect uniform color from any stain used on lower flooring grades, such on #l or #2 Common, popular in some parts of the country.

Also, the smoother a floor is sanded or screened (smoothed with a screen-type abrasive) the less color will be accepted by the wood. Sanding with finer than 80 or 100 grit, or fine screening, will produce a floor where the soft, open grain of the wood will accept stain but the hard grain will remain almost natural. The solution is not to put on more stain or wipe off less. Rather, you should leave the wood grain open by not screening, or by "popping the grain" of the wood by wiping the floor lightly with water and allowing it to dry before staining. More uniform colors will result.

Polyurethane

Oil-modified polyurethanes are the most commonly used floor finishes today. They range from inexpensive to moderate in price depending on the quality and quantity of the resin used. These products will range from satin to high-gloss finish and most manufacturers claim that waxing is not necessary. The high-gloss finish will definitely be more durable but because of the brittleness, fine scratching will show. Polyurethanes are commonly applied in two or three coats using slightly thinned material as a first coat. Three

coats will always give better appearance and durability.

Oil-modified urethanes tend to dry very slowly, usually overnight, and are slowed down further by dampness or high humidity. Because of the slow drying time, oil-modified urethane is easy to apply using almost any method: brush, roller, or lambswool applicator. The finish has an amber cast and does tend to yellow, so it is not recommended for white or pastel floors. Recoating is not difficult, as long as the floor has not been waxed and does not have chips or deep scratches. But touch-up and spot repairs are difficult to blend in.

The mineral-spirits solvent gives this product low flammability and a moderate odor. Although the vapors of this and other mineral-spirit based finishes (penetrating seal, oil-based stains) may not smell objectionable, in a closed space they are considered toxic. Applicators who work with these products daily should wear protection.

Moisture-Cured Urethane

Moisture-cured urethane (MCU) has had the reputation for many years of having outstanding durability. But these products emit a strong odor during application, and are difficult to apply. MCU is tricky because of the fast dry, particularly in hot, humid weather. On the other hand, it is used little in arid areas because it dries too slowly there. Application is best left to professionals who have experience with MCU.

Recoating moisture-cured urethane must be done with care because of the hard surface that the film achieves. Ninety percent of the surface should be dulled by sanding but not cut through. Like oil-based urethane, MCU is also difficult to touch up without it showing.

MCU comes in two types. *Aliphatic,* the more expensive type, is non-yellowing while *aromatic* has a tendency to yellow in time. Both types are water-clear when applied—usually in two to three coats. For many years it was only available in a high-gloss finish, but in recent years a semi-gloss finish has become available.

The strong smell of MCU comes from the xylol solvent which represents about 50 percent of the ingredients. This makes a respirator necessary during application, but it does not represent a fire hazard.

Swedish Finishes

Swedish finishes come in two types. One is a two-component alkyd-type finish, in which an acid hardener is added to the base prior to application. This dries by a chemical reaction and by evaporation of the solvents xylol and alcohol. The more widely known type of Swedish finish uses this alkyd-type material as a base coat, topped off with a precatalyzed finish coat, which is 80-percent alcohol. This is also acid-curing and is sometimes referred to as a conversion varnish, although it is not actually a varnish at all.

These finishes are more durable than oil-modified urethane but not as tough as moisture-cured. They range from satin to a medium gloss and the color of the coatings ranges from water clear for the precatalyzed type to a slightly yellow in the two-component type. Because these finishes tend to yellow far less than oil-modified urethane, they have been used for many years for white and light-colored floors. The cost ranges from moderate to expensive.

Both types of Swedish finish are very difficult to apply and are not recommended for the occasional user. They can be applied by roller or applicator, but a wide pure bristle brush gives the best results. Two to three coats are usually recommended.. The coats dry fast, have a very strong, objectionable odor, and always require a cartridge-type respirator. Because of the alcohol solvent used in Swedish finish, the potential for flammability is higher than with oil-modified but not as dangerous as with lacquers. Recoating and touch up are tricky when attempted by someone unfamiliar with the finishes.

Penetrating Seal

Seal and wax have been used longer than any of the other products listed. It is the choice of many people for many reasons. It is inexpensive, very easy to apply, and fairly easy to maintain and touch up. Floor seals are essentially urethane or varnish-type materials thinned down with mineral spirits, spread on the floor, and allowed to penetrate. The excess is removed with rags or buffed in with steel wool. The dry time is slow and the finish has an amber color. The finish penetrates deeply into the grain of the wood and none is left on the surface; hence the name penetrating seal.

For surface protection, paste wax is then spread in thin coats and buffed. The wax takes the wear and tear. When the floor looks bad, the wax can be removed, more sealer applied, and the wax reapplied.

The main advantage of seal and wax is that touch ups and repairs are almost undetectable, something that most surface coatings can not claim. The smell of the seal is moderate and the flammability is low. Durability is good as long as the wax is kept intact. The appearance is a very pleasant wax luster.

The major disadvantage is that the wax will turn white and spot easily from water—a problem in kitchens and other potentially wet areas. Also the owner. must either have a buffer to maintain the floors or hire someone to maintain them. This process has lost popularity over the years, however, to "no-wax" surface coatings.

Water-Based Coatings

Water-based wood floor finishes are new, yet not so new. They were first introduced to our industry about ten years ago in the form of a 100-percent acrylic coating, which did not experience great success. Three major reasons it was not accepted were: (1) It was not durable enough. Acrylic coatings alone are very similar to the dressings sold in supermarkets (such as Clear or Future) for use by homeowners on vinyl floors. Water-based coatings need some urethane for durability. (2) At that time, floor finishers would not accept the grain-raising or other application techniques that differed from what they were used to. Also, it required extra sanding between coats. (3) People were not as aware as they are today about the hazards of breathing solvents without a respirator.

Some of the resistance to wood coatings stems from the old notion that "Wood and water don't mix." While it's true that water can make wood swell, move, and act strange, we don't have these problems with water-based coatings if they are used correctly. The key is to apply these products so they dry quickly (in many cases a set up time of 15 minutes is recommended). They will be dry enough to recoat in one to three hours as long as they are applied with adequate ventilation, such as open windows or fans to move the air in the room (not the floor). Water-based coatings will not have as high a shine as solvent-based urethanes, but a pleasing lower-gloss appearance.

The different types of water-based coatings available can create some confusion. The early acrylic-type coatings were developed from water-based floor waxes. Although additives (cross-linkers) gave them greater chemical and abrasion resistance than waxes, the acrylics still lacked durability. But they were inexpensive, very easy to apply, and went on in thick coats that gave the build-up of finish we were all used to.

On the other side of the coin, we had water urethanes which were developed from the moisture-cured and two-part urethane technology. These also have a cross-linker for greater chemical and abrasion resistance and are very durable, some as durable as moisture-cured urethane. The "but" that goes with water urethanes is that they were expensive, difficult to apply, and had to be applied in several thin coats, using a sealer.

Rating Floor Finishes

Product	Cost	Number of Coats	Drying Time	Color	Sheen	Odor	Ease of Application	Flammability	Durability	Repair or Recoat	Solvent	Respirator Suggested	Remarks
Oil-Modified Urethane	Inexpensive to Moderate	2-3	Slow	Amber	Satin to Gloss	Moderate	Easy	Low	Fair-Satin; Good-Gloss	Repair Difficult; Easy Recoat	Mineral Spirits	Yes	
Moisture-Cured Urethane (MCU)	Moderate to Expensive	2-3	Fast	Clear	Semi to Gloss	Strong	Difficult	Low	Excellent	Difficult	Xylol	Yes	Professional Application
Swedish Finish	Moderate to Expensive	2-3	Fast	Slight Yellow to Clear	Satin to Gloss	Object-ionable	Difficult	Moderate	Very Good	Touchy	Alcohol Xylol	Yes	Two Component and Pre-Catalyzed
Seal and Wax	Inexpensive	1-2	Slow	Amber	Wax Luster	Moderate	Easy	Low	Good	Easy	Mineral Spirits	Yes	Requires Buffing and Rewaxing
Water Based: High Acrylic Blend	Moderate to Expensive	3	Fast	Milky Clear	Satin to Low Gloss	Mild	Easy	None	Fair to Good	Easy	Water	No	Respirator Suggested in confined areas; additive in most types; no steel wool
High Urethane Blend	Expensive	4	Fast	Clear	Satin to Low Gloss	Mild	Touchy	None	Good to Excellent	Moderate	Water	No	
Lacquer Sanding Sealers	Inexpensive	1	Very Fast	Clear		Object-ionable	Easy	Very High			Lacquer Thinner	Yes	Seal coat only; reduces durability; dangerous

The industry's answer was to blend the two. Urethane/acrylic blends represent most of the water coatings we now see on the market. These blends cover the spectrum from all urethane to all acrylic and everything in between.

To simplify the matter, we will deal with what I call high-acrylic and high-urethane blends. Both have water as the solvent, both dry fast (one to three hours under most conditions), have a very mild odor, and are not flammable.

High-acrylic blends are moderate to expensive in price and are generally applied in three coats (400 to 600 square feet per gallon). They are easy to apply using most accepted application procedures and they are easy to repair and recoat. These have a heavy, milky white color but dry to a clear film. The sheen will range from satin to gloss and the durability of most is fair to good depending on the amount of urethane added to the acrylic.

High-urethane blends are a little more difficult to apply, repair, and recoat. The increased urethane adds cost, but it also brings good to excellent durability. In some cases, it's as durable as moisture-cured polyurethane, but goes on in thinner coats. Four thin coats are usually applied, two seal coats of acrylic followed by two top coats at 800 to 1,200 square feet per gallon. Because of the need for thin coats, some manufacturers have special applicators that allow two workers to apply up to 7,000 to 8,000 square feet per hour. High-urethane blends also dry clear and range from satin to a not-so-high gloss.

When used with ventilation, respirators are not necessary, but most water-based manufacturers recommend wearing a respirator in confined areas (smell is similar to latex paint). Also some formulas have the additive aziridine, which is a strong skin irritant. This is the cross-linker that gives these products their chemical and abrasion resistance.

Caution: Steel wool should never be used with any water finish as any fibers left on the floor or in cracks will rust and show. Fine sandpaper, screens, or abrasive pads are recommended between coats, and this work will be minimal if ventilation is provided. The longer the water takes to evaporate, the rougher the wood will become. These coatings have proven themselves on gym floors and racquetball courts. They offer fast application and less down time. Most floors can be used the next day.

Lacquer

Many manufacturers recommend against using lacquer sanding sealers under their products. But because these products dry in 15 minutes, lacquer sanding sealers are sometimes used as a fast, inexpensive way out of a job. In many cases, these sealers are topped with just one coat of a urethane or Swedish-type of floor finish and that's it. Unfortunately, most people who buy houses with this type of finish will be refinishing much sooner than they expected.

These thin nitrocellulose grain sealers smell terrible because of all the lacquer thinner, and are very flammable. They are responsible for most of the fires and explosions associated with floor finishing. I believe they offer nothing to the consumer.

In some cases, however, this approach is necessary because the construction schedule does not allow time for a quality job. Other times the customer doesn't want to pay for a quality job. In these cases, the flooring contractor should explain to the customer the limitations of the finish.

Maintenance

Today's wood finishes don't require a lot of maintenance, but they still require some. Much is common sense—for example, put an area rug in high-traffic areas such as entries, in front of the sink, or under tables.

Recoating surface finishes on flooring will always be necessary hut it can be kept to a minimum by keeping grit off of the finish. This requires vacuuming, since a dust mop will not pick up sand. This same grit or sand is what wears out carpeting. Tell your customers that walking on sand or grit is like walking around with sandpaper on the bottom of their shoes.

As for waxing, this is a personal decision of the homeowner. Waxing can help a finish last longer if it is regularly applied and kept in good shape. But if recoating is needed due to scratches or damage, the floor will usually have to be resanded, due to traces of wax (except with penetrating seal).

Bear in mind that no matter what finish is used, a wood floor will dent if struck hard enough. Many people believe that deep penetration or heavy build-up of a finish will prevent denting, but it won't because of wood's natural honeycomb-type structure.

Another misconception regards yellowing. Yellowing is often blamed on the finish, and in some cases the finish is at fault. But wood also changes color naturally when exposed to sunlight. Cover half of an unfinished piece of oak or maple and expose it to a south-facing window for two to three months and you can see the difference.

A wood floor installed today should provide beauty and pleasure for the life of the house in which it resides. The key is selecting the right type of finish, applying it properly, and keeping it maintained. ■

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Swedish-type finish: Vacuuming removes all dust (left). Next, two coats of Glitsa's two-part sealer are applied (center) with a 12-inch china-bristle brush, as shown, or a lambswool applicator. A light screening (right) precedes the finish coat.