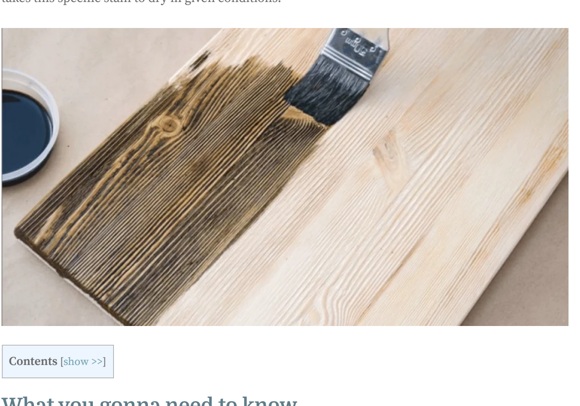
How long does stain take to dry and why? Complete 2022 guide and FAQ

by Alex Mashinsky

Let's say you prepared the surface of your next woodworking project and are eager to carry on with it by moving to the next stage. But you're a well-organized person and want to know how long does stain take to dry to plan all the next stages accordingly.

The simplest and most straightforward answer is on the packaging of your stain. In reality, there's a little bit more to that. If you want to avoid staining wood and end up with a sticky surface after three days of waiting for the stain to dry, then all the following text is exactly for you.

Pro-tip: Always pay attention to the instructions on the packaging. The information provided by the manufacturer of your stain is the base that will give you some orientation in terms of how long it takes this specific stain to dry in given conditions.



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What you gonna need to know

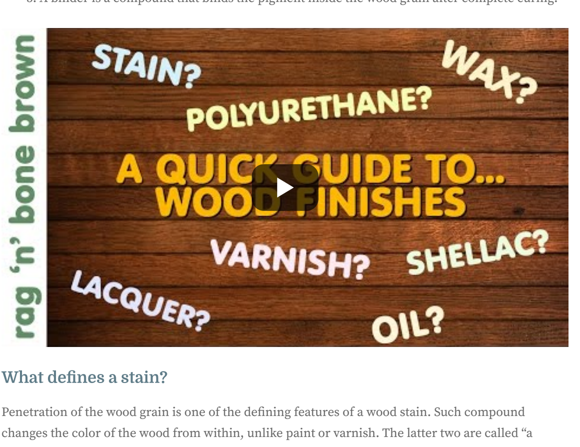
We'll take a look at different types of wood stains, the inside of the drying process, as well as a variety of factors that may or may not influence it.

There are a couple of things that need clarification before diving deeper into the nits and grits of the process of wood stain drying. First of all, let's determine what kind of products are considered wood stains, and shed some light on the situation with brands.

What is a wood stain?

Wood stain is a compound of a pigment, a vehicle, and a binder.

1. A pigment is essentially a coloring agent. It can come in a form of fine particles, suspended in the solution of a vehicle and a binder. Alternatively, it is a dye, dissolved in the solution.
2. A vehicle is a liquid that travels inside the wood grain, taking the pigment and the binder with it.
3. A binder is a compound that binds the pigment inside the wood grain after complete curing.



What defines a stain?

Penetration of the wood grain is one of the defining features of a wood stain. Such compound changes the color of the wood from within, unlike paint or varnish. The latter two are called "a topcoat" for a reason. The table below illustrates the main differences between a stain, a dye, paint, and varnish.

Table of compared features of stain, dye, paint, and varnish

	Stain	Dye	Paint	Varnish
Vehicle/ Pigment/ Binder ratio	More vehicle, less pigment (usually suspended, not dissolved), a small amount of binder	Proportions are similar to a stain, but the pigment is dissolved in a vehicle	More pigment, more binder, and almost no vehicle	Plenty of binders, almost no pigment, and vehicle
Absorption	Travels the deepest inside the wood grain	Travels inside the grain	Stays on top to form an opaque colored coat	Stays on top to form a somewhat transparent protective coat
Features of a dry layer	Transparent, deep, almost no protection, partial sealing	More vibrant color, deep, almost no protection, partial sealing	Opaque, firm protective layer	Transparent firm protective layer. Some yellowing occurs with time

The actual formula for every wood stain out there is different. It may include additional components that make drying faster, improve binding, or provide any other additional features to the product.

Combined staining products

There are many other nuances. Some manufacturers alter the compound to make a wood stain lacquer, for instance. It is a typical lacquer with increased content of the vehicle and some more pigment. And the industry is always progressing, putting something new on the shelves.

So keep an eye on what's going on in the market and never hesitate to try something new. Hands-on experience is the best way to become a pro.

A bit on brands

There are a lot of speculations on what brand of wood stain is the best. However, the features of the specific product depend on its content, quality of ingredients, and production conditions. There's definitely a difference across the variety of brands, but it is almost impossible to determine the most suitable brand for a specific project.

Personal preferences, budget, available colors as well as the type of wood, and a hundred other factors should be considered before picking out the best brand.

Pro-tip: Make a sampling board (or even a couple of them made of different types of wood) and cover sections of it with all the stains you happen to have. A respectively marked sample will save a lot of time and prevent some surprises.

How to pick a stain brand for beginner?

There's always a sweet spot where a manufacturer is strong enough to invest in the quality of the product, but not famous enough to ask for additional money just for the name. Hence, the priciest is not always the best, but the cheapest is always the worst.

The dynamic of drying

Similar to the rest of the known Universe, the drying process of the wood stain follows the laws of physics. And you don't need a degree to understand the basics of it.

On the other hand, such information will help to predict the speed of stain drying and how surrounding conditions may affect it.

Three stages of a drying process

The wood stain passes three main stages on its way to form a surface ready for further work:

1. Penetration.
2. Drying or evaporation.
3. Curing.

Usually, the first layer is ready for the second coat of the stain after complete evaporation, but before curing. Technically, it is possible to put down a second coat even after the complete curing of the first coat, but the results may be unpredictable.

Pro-tip: Make sure to thoroughly wipe the excess stain from all the surfaces after sanding. Lint-free cloth, tack cloth, or vacs brush nozzle will do the trick. Or else, leftover sawdust will ruin the stain and its drying time.

Penetration stage

During the **penetration** stage, the vehicle (water, oil, gel, etc.) takes the binder with pigment inside the pores of the wood. There's only so much of the stain that can penetrate the grain of the wood of a given type over a given period of time.

The more time the compound sits on the surface of the wood, the more saturated will be the stain. Usually, it takes up to half an hour to completely saturate the structure of the wood.

How to improve penetration and coverage?

Application of some pre-stain conditioner will improve the penetration and negate some tone variations due to grain variations across the piece.

Evaporation or drying stage

During the **evaporation** stage, the vehicle leaves the pores of the wood. Since after evaporation of the water or oil, the binding component of the stain is still in the grain, the surface may still be a bit sticky.

It is not recommended to put on the sealing or protective layers on top of a stain that hadn't cured properly. The reaction between components of paint or polyurethane is unpredictable and can ruin the piece. Also, excess stain hinders drying.

Curing stage

The **curing** stage is when the binder hardens, thus sealing the pigment inside the pores of the wood. Usually, it is the longest of stages. Completely cured wood stain is suitable for sanding, painting, and other operations. Hardened binder with pigment won't leave the pores.

Most of the binders of the wood stains are unable to dry properly outside the pores. Similar to the thread-locking compounds, they only harden inside the microscopic spaces or without access to oxygen (different types of binders).

Actual curing times

According to manufacturers of wood stains, time of complete curing varies from 12 to 72 hours, and even more for some exterior stains. But the information provided on the label of your stain was gathered in laboratories with near-perfect conditions.

Your workshop is a laboratory only in a metaphoric way. So let's take a look at how long does stain take to dry, depending on a wide variety of factors. Don't leave a wood stain to dry there without assessing the conditions.

How long does stain take to dry depending on its type?

Wood stains are predominantly differentiated by the type of their vehicle or any other component. There are three main types:

1. Water-based wood stains.
2. Oil-based stains.
3. Gel-based wood stains.

The name of each type is pretty self-explanatory. Drying times of each type depend on the properties of it, whereas curing times are due to the properties of its binder.

Water evaporates faster than oil. Except when there are additives in the compound that promote the speed of drying. Usually, such stains are branded as fast drying.

Oil-based wood stains

Oil-based stains often have some petroleum distillates that improve penetration and drying times. Along with it, petroleum fumes are hazardous. Oil is mostly binder. Natural polymerization of, let's say, linseed oil traps particles inside the pores of the wood.

Pro-tip: Read the safety instructions for your oil-based stains carefully. Components of some products may flammable or volatile. Safety is important if you want to carry on with your woodworking with no harm.

Drying and curing times of oil-based stains vary between brands. But generally, it is recommended to wait at least 8 hours before the second coat of stain and at least overnight before you will apply polyurethane.

Water-based wood stains

Water-based stains use water as a vehicle. On average, it is the fastest drying stain. On the other hand, they are the most sensitive to high humidity. If it will be too high, the stain won't dry at all. In addition, faster drying requires a faster application or the coat will be blotchy.

Such features result in 3 to 4 hours of drying before the second coat. However, curing usually takes as much time as stains of other types. Water as a vehicle is safer than petroleum, so stains of this type are safer in general.

Pro-tip: Always use a solvent to dilute the oil-based stain and some water (preferably distilled) to dilute water-based stains. Using the wrong liquid will just ruin the whole batch.

Other features of water-based stains

Also, faster drying comes with lower penetration. Water-based stains don't take the pigment as deep as oil-based stains. It means a lighter tone on wood with a dense structure (hardwood). The second coat might help make the tone deeper. And a combination of stains with different colors can create nice tone variations.

Gel stains

Gel stains have a thick consistency. They tend to dry longer than the other types. Increased viscosity allows more time to evenly spread it across the surface. Gel stains also prevent splotching and splatter.

Gel-based stains are the longest-drying. The drying stage may require 12 hours, whilst curing timed are considerably similar to the rest of the stain types.

Gel stain is perfect for softwood or for covering big areas, however, you'll need more gel-based wood stains than water-based stains, or oil-based stains to cover the same area.

Interior stains and exterior wood stains

Interior and exterior stains have a lot in common. But there are differences too. Interior stains are designed to use for pieces of furniture or other things meant to be used and fabricated (at least drying) indoors. Exterior stain is designed for decks, fences, and other outdoor structures of a similar sort.

In general, oil-based stains and other stains for outdoor use dry longer than the interior stains. Mostly because of additives in the compound of interior and exterior stains for:

- weather protection;
- protection against insects infestations;
- mildew and rotting protection.

What is the difference between exterior and interior stains

Consistency and contents of stains for outdoor use are also adapted for covering big areas and drying with not the most suitable conditions. The rest of the features are applicable to exterior stains. For instance, water-based stains for outdoor use do dry faster than oil-based stains.

Pro-tip: Try to pick at least a couple of bright and warm days for stain to dry on a freshly covered deck. Divide the task into a couple of takes if weather conditions are not allowing you to do everything in one go.

Among a wide variety of outdoor wood stains, there is a special kind designated for pressure-treated wood. But before using it, you need to make sure that the wood has an acceptable humidity level.

Multipurpose products

Due to similarities in components, some manufacturers combine topcoats with stains. Stain lacquer or stain varnish will provide both protection and some coloring to the piece. It can significantly cut the time needed to complete your project, but the drying times of such products are different from regular oil-based stains or any other kind of stains.

The drying time of multipurpose products is also altered with surrounding conditions and type of wood, but it is better to dedicate whole another article to cover it.

How long does stain take to dry, depending on conditions?

Understanding the basics of physics behind wood stain drying is useful for outlining the influence of different conditions. The interaction of the stain with wood and the environment is the main factor that changes the drying time.

The structure of the wood itself, its humidity as well as humidity of the air, and its temperature are all factors that can make stain dry longer or faster. Let's dive a bit deeper into this.

Features of the wood

Structure, density, and the way it was sawed out, of a certain piece of wood, form its grain pattern. Hardwood (alder, oak, ash, birch, etc.) have dense longitudinal cells and pores while softwoods (pine, fir, cedar) have bigger and less dense. It occurs because softwood trees grow faster.

General features of structure of wood

Variety of structure across a given piece of wood produces variations of depth of stain penetration, hence difference in tone. But on top of it influences the speed of drying. The deeper the product travels in the grain, the longer it takes the stain to dry.

Info-piece: Up to 95% of cells in softwood are longitudinal cells. They form a long transportation network of a tree and form the majority of lumber's structure.

Type of wood

In terms of structure-dependent features of stain penetration, three main types of wood:

1. Softwood.
2. Hardwood.
3. Pressure-treated wood.

Most of the structure of any wood consists of remains of dead cells that have no other function except the structural support of a tree. These cells are shaped somewhat like tubes.

In addition, there are pores in hardwood and resin canals in softwood. To picture it, try to imagine a bunch of straws of various diameters squeezed together by a zip-tie.

Softwood

Cell-structure of softwood is less dense. Its cells are long and broad, compared to hardwood. Such configuration promotes faster drying on one hand, but makes the result of staining quite unpredictable. The significant variety of wood consistency across the piece tends to cause blotches.

Penetration and evaporation of wood stain

In general, the penetration and evaporation stages in softwood are faster than in hardwood, but curing may take more time if the binder of the stain is designed to work in the opening of the smallest scale.

Hardwood

Hardwood has a dense structure because it grows longer than hardwood. Its cells form thinner canals for the stain to flow in and for the vehicle to evaporate. So it makes the stain dry a bit longer. Especially when the surrounding conditions are off.

On the other hand, such structure promotes even staining, and beautiful ornament formed by its pores. Oil-based stain, water-based stain, or even a gel stain will look great with proper application.

Pressure-treated wood

Staining pressure-treated wood and its drying times have much less to do with the actual structure of the wood. It is rather concerning moisture. During pressure treatment, a lot of special compounds are getting inside the grain.

It's not uncommon for distributors to put wet wood on the market. Some batches are sold still dripping. Staining wood of this quality and using it is not the best decision.

How to stain pressure-treated wood properly

It is always better to wait for the lumber to reach acceptable humidity and use designated wood staining products. But pressure-treated wood will dry a lot longer than any other kind.

Surface preparation

The quality of surface preparation of the piece influences the drying time along with the features of the wood itself. A properly sanded surface will absorb the needed amount of stain evenly. It will dry uniformly and form a great pattern.

Stain conditioning products will also improve drying time as they fill part of the volume inside the grain. Less stain means a slightly lighter tone, but also faster drying and curing.

Humidity of wood

Only properly dried wood pieces are good for stain. Excessive won't let the stain dry for ages and will block the grain from absorbing the needed amount of stain. If the piece is too dry, it will absorb too much. Either way, the stain will be ugly, and the drying time will be off.

Testing humidity of a piece of wood

If you doubt your wood humidity, try to put a test drop of water onto a scrap piece of wood. "Thirsty" wood will absorb it in a matter of minutes. If the piece is still too wet, the drop will stay on the surface longer.

Ambient conditions

The sweet spot for drying of a stained wood is at **70 °F** (21 °C) and **50%** of humidity with some significant airflow. Those are optimal conditions for the majority of products out there. Variations of **20 °F** (10 °C) and **20%** of humidity are within specs, too.

Airflow

Good airflow is as important as suitable temperature. It drives away evaporated fractions of vehicle and binder, promoting both drying and curing. Installing a fan or providing good ventilation in the workshop will make the stain dry a lot faster.

Temperature

Temperature is one of the key parameters of the environment for proper stain drying. The higher it is, the higher the rate of evaporation of respective components of a stain product. It affects both water-based stains and oil-based stains.

But it is important to not go overboard with trying to speed up the drying by heating up the oil-based stain (or any other kind).

How to heat the drying stain

Excessive heat may harm the wood. If the rate of evaporation will be too high, the wood may crack. And if the workshop is too cold, it will take ages for the stain to dry and cure.

Humidity

Air humidity defines how many more vapors it can take. If it's higher than 70% drying time will extend in underwhelming proportions. Putting down a humidifier set to 50% will make the process buttery smooth and within the expected time frame.

Oil-based stains are less sensitive to humidity. Especially during the curing stage. The vapors of oil binder interact with air in a slightly different way if compared to water.

Other conditions

Other ambient conditions include sunlight and precipitation when it comes to staining wood of outdoor structures. Rain can ruin the fresh stain layer and extend drying into infinity. As well as excessive sunlight and heat will make the stain dry too fast, resulting in cracking.

How to prevent cracking

The best available way to negate such effects is to follow the weather forecast or protect the stained deck or fence with a tarp or other protection.

With some air conditioning features inside the workshop, even tacky stain eventually dry completely.

Q&A bit

It takes a lot of experience to predict how long a stain takes to dry with regarding all of the possible influences. It is a path of trial and error, but the following questions might assist in making it easier.

How long should wood stain dry?

The best reference is the respective information in the instructions on the packaging. If something is going wrong and your stain is not drying within the provided time frame, then something is wrong.

Refer to the respective parts of the article to try and to find out what is wrong and why won't your tacky stain eventually dry.

How long does it take oil-based stains to dry?

The drying of oil-based stains is usually longer than the drying of water-based stains. But in general, it takes 8 to 12 hours to dry and up to 72 hours to completely cure.

How long does it take for stain to dry outside?

Stain drying outside is usually longer. Mainly because of daily changes in weather conditions. Nights are colder and mornings are humid, so the drying process is slower. During sunny and dry afternoons, drying speeds up a bit. General recommendations state **at least 48 hours for the stain to dry outside.**

How to fix mistakes made while trying to stain wood?

Sanding down the stained layer will be problematic because it penetrates deep enough. But there are some workarounds.

First of all, it is the combination of slight sanding and re-staining. The second coat will likely cover the majority of mistakes. Small mistakes can be camouflaged by hand-painting fake grain over them.

Will wood stain fumes kill me?

With long-enough exposure, some of the hazardous components of some stains can harm seriously harm your health. Never underestimate safety precautions as someone put their lives of health for it.

Final words

As you can see, there is no specific way to predict how long does it take a stain to dry before the next coat or cure completely. There are too many variables. But as long as you keep going in woodworking, you keep accumulating precious experience that allows you to precisely define the time of stain drying depending on the type of wood and ambient conditions.

Alex Mashinsky

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