

Wood Manufacturer's Guide to Maximizing Quality



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Introduction

The wood manufacturing industry directly employs roughly 382,300 Americans (as stated by the [Bureau of Labor Statistics](#)) in a wide variety of jobs, and produces “wood and paper products valued at more than \$200 billion annually” ([Southeastern Lumber Manufacturer’s Association, Inc.](#)).

For the companies that take raw lumber and turn it into furniture, building materials, and countless other products large and small, every wood manufacturer stakes its reputation and livelihood on its ability to produce top-quality products quickly and consistently.

Quality Control and Wood Manufacturing

Wood manufacturers face many challenges in creating wood products for distribution across the U.S. and other markets, including quality control issues such as:

- Properly dried lumber
- Failed glue joints
- Defective finishes
- Warping, buckling, or cracking

These quality control issues can lead to production delays, recalls, and worse. Wood manufacturers simply cannot afford to halt production for an extended period of time, let alone actively reimburse clients for faulty products.

This is why maintaining strict quality control guidelines is vital for the survival of any business in the wood manufacturing industry.



Section I

Moisture Content and Wood Product Quality

One of the biggest factors in determining the quality of any wood product is the moisture content of the wood used for it. Improper moisture content can have an enormous impact on the overall quality of the final product.

Many of the defects listed previously occur when the [%MC of wood](#) is too high or too low. For example, high moisture content can keep adhesives from bonding properly to wood, weakening glue joints.

Because wood is a hygroscopic material, absorbing or losing moisture until it reaches equilibrium with its environment, monitoring and controlling moisture are key for ensuring a top-quality wood product.



Monitoring Wood's Moisture Content

Wood moisture meters are a key tool for wood manufacturers to monitor the %MC of the wood they're working with.

Whether you're a distributor who sends seasoned lumber to other businesses or a manufacturer that takes lumber and turns it into a finished product, moisture meters are an indispensable tool of the trade for those looking to create high-quality products.

By taking precise readings of the moisture in wood products, manufacturers can quickly determine whether their wood is at risk of developing severe moisture-related problems such as: shrinkage, swelling, cracking, etc.

This makes moisture meters a critical tool for maximizing quality in wood products.



Using Moisture Meters to Maximize Quality

Wood moisture meters are critical for improving the overall quality of woods products. There are essentially two kinds of moisture meters that wood manufacturers can use to measure moisture in wood:



- ❑ **Pin Moisture Meters** – These devices use the principle of electrical resistance to measure moisture in wood. There is a direct correlation between the resistance and moisture content. An electrical current is passed from one electrode or pin embedded in the wood to another. Since wood is an insulator and water is a conductor, less resistance means more moisture; higher resistance means less moisture.



- ❑ **Pinless Moisture Meters** – These devices use an electromagnetic radio frequency to scan wood for the presence of moisture. The meter uses distortions in the radio waves to evaluate the average %MC of the wood being tested.

Both pin and pinless moisture meters are typically handheld, and each one has its place in the various phases of lumber production, which is an area we will talk more about later.

The first step to help ensure the quality of wood at each phase of the production process is to kiln-dry the lumber, either from the green condition or after air drying; this will bring the initial moisture level down before the wood goes into the kiln. During the drying process, it is especially important to monitor wood moisture content. Here, a kiln operator typically uses a pin-type moisture meter with insulated contact pins to check both surface and core moisture levels to make sure the boards are being dried uniformly. Some companies offer in-kiln moisture-monitoring systems that reduce the need for the kiln operator to enter the kiln.

Tips for Maximizing Quality

Tip #1: Monitoring Both Shell and Core Moisture in the Kiln

As noted above, proper drying of the lumber is the first essential step in ensuring the quality of a finished wood product. When measuring wood moisture content in the kiln, it's important to monitor both the shell and core moisture values of drying wood.

This involves using an electrode with insulated contact pins, where only the tip of the pin is exposed, allowing the operator to drive the pins to different depths in the wood, noting the readings at each depth.

Knowing the difference between shell and core moisture in a load of lumber helps the operator make more-informed drying decisions. For example, if the %MC difference between the shell and core is less than 1%, then the wood is most likely near its equilibrium moisture content (EMC) value or fully dried.

If there is a significant difference between the shell and core moisture content values, then the operator can adjust the kiln settings as necessary to keep the outer layer from becoming overdried while waiting for moisture to leave the core layer.



Section II

Tip #2: Check All Incoming Lumber

Even after proper kiln-drying, it is possible for wood to reabsorb or lose moisture content for various reasons. These include:

- Where the lumber came from
- Weather conditions during transit
- Storage conditions

Because of wood's ability to take on or lose moisture, it is crucial to spot-check lumber at every step of the process. For example, if a load of kiln-dried lumber is being delivered to a furniture manufacturer, the manufacturer must test the incoming delivery to verify the documented %MC of the wood after it has been dried. Checking the delivery gives manufacturers the ability to either take remedial measures or reject the shipment as necessary.

Tip #3: Acclimate Wood for Distribution to Different Markets

Different regions of the United States have different ambient moisture conditions. This, in turn, will affect the specific EMC of wood.

For example, many coastal areas in the southeastern part of the U.S. have a relative humidity (RH) of about 58%-63%. In these regions, wood will reach EMC at approximately 11% moisture content. Most of the rest of the U.S. has an RH value between 40%- 45%. Here, wood will reach equilibrium closer to 8% MC.

Wood that is not acclimated to the right %MC before shipping to a given region will begin to absorb or lose moisture once it's exposed to those conditions. This can lead to dimensional change, cracking, warping, buckling, and other defects.

By drying a shipment of wood to the EMC that is appropriate for where it is being delivered, wood manufacturers can prevent significant defects in their wood. Ideally, the transportation method used for shipping the wood should also prevent weather in transit from affecting the wood, as well.

Section II

Tip #4: Maintaining Moisture Meters for Peak Accuracy

Moisture meters are precision instruments. Proper maintenance and handling are key to ensuring accuracy of readings and prolonging their useful life.

Some basic maintenance suggestions for moisture meters include:

- ❑ **Regularly Checking Meter Calibration** – Over time, moisture meters may lose accuracy. To ensure accurate readings, moisture meter calibration should be tested at least once a month. The most common test method is to use a moisture content standard, but some advanced moisture meters have a built-in calibration check that simply requires the press of a button.
- ❑ **Inspecting Pins, Scanning Surfaces and Electrode Cables** – Whether you use a pin, pinless, or in-kiln monitoring system, it's important to routinely verify the condition of the meter and its components. With pin-type meters, broken pins and worn-off insulation can affect measurement accuracy. Damage to a pinless meter's scanning plate prevents proper contact with the surface of wood, negatively impacting accuracy. In addition, check for any damage to electrode cables that might cause erroneous readings.
- ❑ **Storing Moisture Meters When Not in Use** – To protect moisture meters from potential damage, it's best to keep them in their carrying cases when they are not in use. Meters should be stored in a cool, dry area when possible. Optional components such as extra probes should be stored in a similar fashion. This reduces the wear and tear on the meters when they're not in use, prolonging their useful life.



Following these basic care steps can do a lot to ensure the accuracy and longer useful life for your woodworking moisture meters.

Picking the Right Moisture Meter

One of the biggest challenges in using moisture meters for wood manufacturing is picking the right moisture meter for the job.

Both types of moisture meters have unique benefits that might make one more or less suited to your particular application.

Below are some guidelines to follow when choosing the right moisture meter:

Pin-Type Meters:

- During kiln drying, to determine distribution of moisture in boards (moisture gradient)
- Ideal for wood with irregular surfaces, such as rough surfaced lumber and cupped board
- Flexibility to interface with specialized electrodes
- In hardwood flooring, particularly to check subfloor %MC during and after installation

Pinless Meters:

- As an aid in sorting lumber.
- For quick checks of large loads or areas.
- Ideal for identifying wet pockets.
- On finished product when only non-destructive testing is required.

In general, pin moisture meters are recommended for testing wood that is being dried, or when there is doubt regarding whether boards are uniformly dried. Pinless meters are great for testing large areas quickly. For in-kiln monitoring, insulated pin-type moisture meters are a must to determine moisture gradient.

Many wood manufacturers own both pin and pinless meters to take advantage of their unique attributes for different operations. **If you have to choose one or the other, a pin meter is usually the better option because of its overall utility and accuracy.**