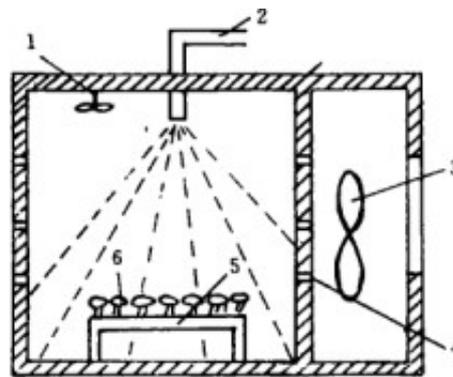


Principle of wood microwave drying

The heat of conventional heating and drying is transmitted by conduction. From the surface to the inside, the direction of heat transfer is opposite to the direction of water evaporation, so the heating speed is slow and the efficiency is low. Natural drying takes months to years; hot air drying takes days to tens of days; and microwave drying is the overall heat generation of wood itself, without thermal inertia and heat transfer loss, drying only 10 minutes or tens of minutes, drying speed faster than traditional heating method.

Due to the permeability of microwave drying, moisture in wood is discharged from inside to outside simultaneously during the drying process, so that the expansion and shrinkage coefficient of wood is basically the same, the heating is uniform, the moisture content gradient of internal stress is small, which can avoid the deformation and cracking of wood in the drying process to the greatest extent. At the same time, the microwave drying process can completely kill all kinds of insects and fungi, eliminate wood pests, thus improving the drying quality of wood and wood products. In addition, the wood surface of microwave drying can keep its original color.



Saving wood and increasing wood utilization

The biggest characteristic of [microwave drying equipment](#) is the semi-finished products that can dry wood products. Since ancient times, the process of making blockwood is to dry the wood first and then use it, and microwave can directly dry the formed wood, and maintain the original wood, no deformation, no cracking, no damage to the wood. Therefore, according to the structural needs of wood products, boards and squares can be made into various shapes and specifications of semi-finished products, and then microwave drying, so that the original defects in the wood no longer expand, so that the utilization rate of wood increased, saving a lot of wood and energy, economic benefits are very significant.

Because microwave drying of wood does not require soaking, cooking, spraying and other processes, drying equipment is easy to achieve automatic control. Generally, the drying time can be determined according to several parameters. When the drying time is set up, there is no need for people to wait. When the wood is dry, the machine will stop automatically, which is easy to operate and has no environmental pollution.

[Microwave drying wood](#) has selectivity. The part with high moisture content absorbs more

microwave energy and gets more heat, which is beneficial to the consistency of moisture content of wood.

Although wood microwave drying has many advantages, but its power consumption is large, equipment is more complex, the process is difficult to control, and the need for special protection. Therefore, in the application process, we need to constantly improve and improve.

Application of microwave drying

In the microwave electromagnetic field, because the medium loss makes the wood heated, the heat is not transferred from the outside of the wood, but generated directly from the inside.

Therefore, the structure and properties of the wood can be changed from the inside.

Improving wood permeability

Microwave can increase the vapor pressure in wood cells. Because the cell wall of wood ray cells is thin, the increase of internal pressure can lead to their rupture and the formation of liquid and steam through the radial channel. The increase of internal steam pressure can also form voids in the diameter section, and the quantity, size and distribution of voids can be controlled by the microwave power. These changes can increase the permeability of wood thousands of times. The results showed that the permeability of *P. radiata*, *P. fimbriata* and *Eucalyptus obliqua* was significantly improved after microwave treatment. Wood treated with microwave can be impregnated with preservatives or resins.

Microwave heating softening wood

Solid wood bending furniture is very popular because of its flexible curve shape and natural wood texture. But at present, the traditional processing method is generally used to bend the wood, that is, to soften the wood by cooking, bending and then drying. The method has the advantages of long production cycle, low production efficiency, uneven heating, easy to produce defects and waste products when bending, and greatly increases the cost. Using microwave heating to soften wood and bend processing, the production efficiency can be significantly improved.

The traditional cooking method of softening wood mainly uses water to swell cellulose, hemicellulose and lignin to provide free volume space for molecular vigorous movement. The wood is gradually heated by conduction from outside to inside, so that the molecules can get enough energy. However, the method is not uniform in internal and external heating, for thicker specimen heating time is longer, the softening effect is not ideal.

The mechanism of microwave heating to soften wood is the same as that of traditional methods, but the heating method is different. Microwave heating makes polar molecules under the action of microwave field.

(water and related functional groups) produce swinging, frictional heating, and achieve the purpose of heating inside and outside. This method can not easily produce moisture gradient, reduce stress concentration, reduce the waste rate of bending wood, and improve product quality.

Microwave bending drying of wood

Curved wood products give people a sense of elegance and elegance, widely used in furniture, musical instruments, sports equipment, toys and other manufacturing industries. In the bending process, microwave heating bending technology can meet the aesthetic and mechanical strength requirements. Microwave heating bending wood has formed industrial production

capacity in Japan, Europe and the United States and other developed countries because of its short time, high efficiency and excellent bending properties.

Microwave heating can stimulate the dielectric molecules in wood to produce polarization, vibration and friction heat, so that the water inside the wood moves outward in the state of hot water or steam. When lignin and hemicellulose absorb water, the glass transition temperature will be reduced to about 100°C. Because of the strong penetrating ability of microwave, bending wood can be dried and finalized by microwave drying technology after several minutes irradiation in microwave oven, which has high efficiency and good finalization quality. Japanese scholar Yuanjing invented a pressure device for processing curved wood in a microwave heating chamber, which can soften, bend and process wood.