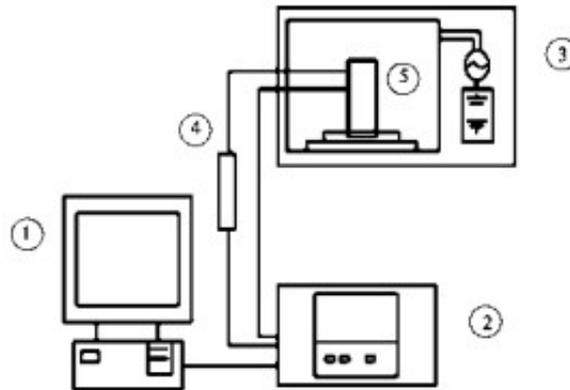


Wood microwave drying technology

Scholars in the United States, Japan, Canada, Germany and other countries are Microwave drying of wood has been studied since the early 1960s. It is considered that microwave drying is the most effective and rapid drying method. In the early 70s, the research and application of [microwave drying equipment](#) were carried out in China, and some



achievements were achieved.

1 principle of [microwave drying wood](#)

Microwave is an electromagnetic wave with wavelengths ranging from 1 m to 1 mm. Microwave itself contains a certain amount of energy called microwave energy. When the dielectric material is in the microwave field, it will absorb microwave energy and convert it into the heat energy of the medium itself. The amount of microwave energy absorbed by different media in the microwave field is different. Generally speaking, the bigger the dielectric constant, the bigger the loss angle, the more microwave energy absorbed into heat energy. Wood itself is a medium, wood contains water, water dielectric constant is very large, is a good absorption of microwave materials. When the moisture content of wood is high, the temperature rise by microwave heating is also high. In addition, the dielectric constant of wood increases with the increase of temperature, so it can keep high efficiency in the whole process of heating and drying.

2 characteristics of microwave heating and drying

Compared with conventional heating drying methods (such as steam drying), microwave heating drying method has the following characteristics:

2.1 the heating time is short and the drying speed is fast.

In the process of microwave heating and drying, wood is in the microwave field, heating is carried out on the whole section, that is, microwave heating has permeability, so that both inside and outside the wood can be heated at the same time, and the temperature rises at the same time. The moisture inside the wood rapidly vaporizes, forming the pressure of outward diffusion. However, due to the heat loss and evaporation of wood, the temperature inside the wood is higher.

Surface temperature. When the internal temperature of wood is higher than 100 ~C, water vaporizes and produces vapor pressure, which accelerates the diffusion of water to the surface. The drying speed is fast and the drying efficiency is high. Compared with conventional heating drying, the heat of conventional heating 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. By contrast, natural drying takes months to years, hot air drying takes days to tens of days, and microwave drying takes only minutes to tens of minutes. The speed of microwave drying and the thermal conductivity of wood are not. Off depends on the intensity of the microwave field, which depends on the size of the microwave power. The depth of microwave heating is related to the frequency of microwave. For the same frequency of electromagnetic wave, the heating depth is related to the moisture content and material quality of wood.

2.2 good drying quality.

Because of the permeability of microwave drying and uniform heating during drying, cracking and deformation are small. As long as the power of microwave treatment, drying time (relative to the transmission speed) and ventilation are well controlled, the quality of microwave drying is easier to be guaranteed than that of hot air convection drying, and there will be no wet core, even drying and less residual stress. In addition, the surface of wood dried by microwave can keep its natural color.

2.3 save wood

Microwave drying reduced wood deformation, cracking and mildew, which made wood utilization rate increase by at least 5%.

3WX40L series microwave dryer

WX 40L series microwave dryer is a new type of wood microwave drying equipment developed by the Research Institute of microwave energy popularization and application in Nanjing No. 772 Plant.

3.2 structure of equipment

WX 40L series microwave dryer is composed of microwave source, microwave drying box, dehumidification system, microwave suppressor, frame and transmission mechanism as shown in the drawings. The wood was sent by conveyor belt into drying box for heating and drying. Three drying boxes were connected with each other by flanges. Two 915 M Hz 20 kW microwave sources were fed into the box by waveguide pipes from the back wall of the drying box for heating and drying. The drying box is equipped with a supporting rod to support the wood to ensure smooth operation. The top of the drying box is equipped with a drainage hood, which is connected by a wind pipe and a centrifugal fan.

Size, speed of conveyor belt and volume of humidifying air.

Drying process to achieve the best drying effect. Practice shows that

When the moisture content of wood is between 15% and 20%, the deformation is minimum.

Two problems must be paid attention to. One is that when the microwave power density is too high, the vaporization pressure inside the wood exceeds the allowable limit of the wood fiber, the wood will burst. Secondly, when the moisture content of wood drops to a certain value, the internal temperature is high, such as continuous drying, there will be internal carbonization phenomenon. Therefore, we must master the drying process correctly.

4 application prospect of wood microwave drying

Our country began to study the application of microwave energy in 1973. The wood microwave dryer was developed in 1977 by the microwave Office of No. 772 Factory. It was first used in

No. 2 Furniture Factory of Wuxi. On this basis, the equipment has been continuously improved and improved, and has been successfully applied in dozens of wood processing plants in Beijing, Shanghai, Ningbo, Dunhua and Jiangdu. Now it is also extended to the drying of fire-retardant wood structure in high-rise buildings. In addition, microwave drying can also be used for drying semi-finished products such as veneers and shavings.