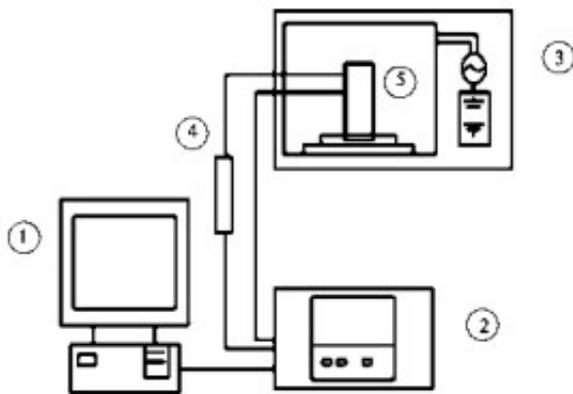


Microwave drying technology and application of wood

Microwave drying of wood takes wet wood as dielectric and is placed in microwave electromagnetic field. Under the action of frequent alternating electromagnetic field, the water molecule in wood is polarized, the polarized water molecule rotates rapidly, rubs with each other, and generates heat, thus heating and drying wood.

The higher the electric field intensity, the higher the current frequency, the higher the electrical power absorbed by the wood. This is because the stronger the electric field, the greater the oscillation amplitude of polarized water molecules, the more heat generated by friction. But the high electric field intensity, easy to make wood breakdown, which limits the maximum power density of microwave heating can be input. Therefore, the method of increasing frequency is usually used to improve the speed of heating wood. Because the higher the frequency, the more frequent the water molecules swing in the wood, and the more heat they generate.



The difference between [microwave drying equipment](#) and other drying methods is that heat is not transferred from the outside of the wood, but is generated directly from the inside of the dried wood. The heat penetration of wood along the whole thickness is not related to the thickness of wood, but to the electric field intensity, microwave frequency and dielectric properties of wood. Usually the higher the moisture content of wood, the higher the density, the greater the dielectric coefficient and loss angle tangent of wood, the faster the heating speed of wood.

When the wood is heated in microwave electromagnetic field, the temperature of the whole section will be the same if the surface of the wood is not cooled. However, because of the heat loss and moisture evaporation on the surface of wood, the temperature inside the wood is actually higher than the surface temperature, thus forming a temperature gradient on the different thickness of the wood. Therefore, moisture movement in wood depends not only on moisture gradient, but also on temperature gradient during microwave drying. Especially when the internal temperature of wood is higher than the boiling point of water, super-atmospheric water vapor pressure is generated in the wood, which makes the water move from inside to outside more quickly.

Therefore, the rate of microwave drying is much higher than that of convective drying. Because wood itself is a medium, wood contains water, water dielectric constant is very large, is a very

good material to absorb microwave. When the moisture content of wood is high, the temperature of 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.

Wood microwave drying system

The microwave drying system is mainly composed of microwave generator, microwave dryer, transmission system, dehumidification cooling device, control system and safety protection system.

Microwave generator is the key part of drying equipment, its heart part is the microwave tube - Microwave tube, its main role is to produce the microwave (energy) needed, and then microwave transmission through the waveguide device to the microwave dryer without loss. At present, the microwave tube used for wood heating and drying mainly uses magnetron. The normal operation of magnetron needs high voltage DC power supply, and uses air-cooled and water-cooled system to extend the service life and improve the efficiency of the tube.

Microwave dryer is the space to realize the interaction between material and microwave. The microwave energy is transformed into the internal energy of the dried material, and the moisture in the material is evaporated to achieve the purpose of drying. The microwave dryer suitable for wood use consists of a resonant cavity heater and a zigzag waveguide heater. The cavity heater is a rectangular hollow box made of aluminum plate. The top of the cavity is coupled with the waveguide to output microwave energy.

"%" wet cooling device

The function of dehumidification and cooling device is to discharge the vapour evaporated in the body and to cool the material. There are many drainage holes at one side and bottom of the heater box body, and an air duct outside the drainage holes at one side of the box body is connected with the suction port of a centrifugal fan to remove the water vapor in the box. drive system

The transmission speed and speed range of the transmission system should meet the technological requirements of the dried materials. They can be continuously sent to the microwave dryer for drying, and the dried materials can be conveyed to the next process. Materials conveyor belts are made of low consumption microwave medium materials, such as polytetrafluoroethylene fiberglass belt, polyethylene belt, etc. The transmission system is composed of conveyor belt, speed regulating motor, gearbox, chain wheel and roller, and the transmission speed is regulated by CVT control box.

Control system

The control system is used to adjust various operating parameters of the equipment to ensure that the output power, conveying speed, humidity cooling device of the equipment can be controlled and adjusted timely, conveniently and flexibly according to the requirements of the best process. The control system can not only be installed on the microwave generator, but also be separated from the main engine. The control system of some microwave drying equipment can be centralized on a general console to control the process parameters.

Characteristics of microwave drying

Microwave drying of wood is a new technology, which has a series of advantages, such as uniform heating, fast drying speed, good quality, and is conducive to continuous and automatic production. Compared with conventional drying methods, microwave drying has the following characteristics.

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

In the process of microwave heating and drying, the wood is in the microwave field, and the heating is carried out on the whole section. The wood is heated both inside and outside, and the temperature rises at the same time.

But because of the heat loss and water evaporation on the wood surface, the temperature inside the wood is actually higher than the surface temperature, especially when the temperature inside the wood is higher than the boiling point of water, the water vaporizes and produces steam pressure.