

Study on microwave processing of corn flakes

A large number of experiments on microwave processing of corn flakes have been carried out in this paper. With corn as raw material, the technological conditions of microwave cooking, rolling, [microwave drying machine](#), cooling and their continuous production process were studied, which provided scientific data for the industrial production of [Corn Flake drying equipment](#).

Corn flakes are a kind of low calorie, high dietary fiber cereal nutritional convenience food, rich in thiamine, riboflavin, carotene and other vitamins and magnesium minerals, essential amino acids in total protein content is higher than rice and flour. China's corn output ranks third in the world, up to 95 in 1992. Ten thousand tons of corn food has abundant resources. Steam cooking, hot air drying, flaking, baking and extrusion technology are widely used in the production of cornflakes in China. The production is intermittent, with low output, high labor intensity and poor environmental protection and hygiene conditions.

Some countries also use steam cooking technology to design corn chip production line. Microwave drying machine technology began to be used in food processing in the 1960s, and has been developed rapidly in the last decade. It is widely used in freezing food softening, food drying, cooking and sterilization. However, the research on cooking technology of cornflakes has not been reported yet. We have studied microwave steaming of cornflakes. A large number of experiments were carried out to study the cooking process. Meanwhile, the traditional cooling and drying equipment was changed into a vibrating multi-layer horizontal garden moving cooling and drying equipment, which made the microwave processing of cornflakes realize continuous industrial production.

1.

1 process flow

Microwave drying machine processing corn flakes with corn sandalwood as raw material, microwave cooking, drying, using vibrating screw feeding, horizontal garden running cooling device to form a continuous production process: corn plant washing, soaking, microwave cooking, cooling, rolling, microwave drying, cooling Packaging, finished products.

2 process flow

The key to obtain ideal flake shape is to control the moisture and temperature of the mill, and to make the moisture and temperature of the corn plant after microwave cooking reach the required value of the mill must be cooled and dried. The traditional processing method is natural cooling, and the cooling time is long. Belt cooling dryer is often used in industrial production. This process needs to run about H3 from crushing to cooling drying. The technology adopts screw vertical vibrating feeder and vibrating multi-layer horizontal circular motion cooling unit to form conveying, cooling and drying unit, which effectively improves drying efficiency. The running time of the unit is only 18 minutes.

3 thickness of rolled sheet

The thickness of corn strip is closely related to the diameter of the rolling machine. The existing mill for Corn Flake production has a diameter of 50 m, 60 m, 80 m, 100 m and so on. The pressure produced by the different diameter of the roll is different. The test mill must meet the requirements of $G+R \propto R Z$. In fact, the grain of Corn Flake is very small, and the gravity G can be ignored. Therefore, we must comply with the requirements of $R \propto R Z$, so we can see $C \propto a$

G : material gravity

F : friction between roller and corn

$R L$: the resultant force of two frictional forces

$R Z$: the resultant force of positive pressure is $L / Z R \propto F$, that is,

$R L = Z F C \propto a$.

M : contact point between corn planting and roller

In order to increase $R L$ value, Friction F should be increased and meshing angle A should be reduced. Friction is related to the roughness of sandalwood surface and roll surface. A is related to corn planting diameter, roll diameter and roll spacing. The smaller the corn ballast particle, the smaller the roll diameter is. The bigger the $C \propto a$ value and the greater the $R L$ value, the easier the roll feeding. Increasing the diameter of the roll is conducive to rolling, and the larger the roll diameter is, the greater the load is. Through the comparative test, the existing mill specifications are 50. Only $s \propto m m$, the shape of the tablets is good, and the quality of the corn flakes produced is up to the target.

4 microwave cooking dryer and steam cooking, hot air drying equipment performance test.

The conventional heating and drying methods of cornflake processing include electric heating, steam, hot air, etc. We have used steam cooking, CT-C N type hot air circulation oven and S K Z-C-45 linear vibrating fluidized bed dryer for experimental study, but these equipment are through convection, heat transfer, heat transfer. Quantity is transmitted from the surface of the object to the interior. It is not only slow in transmission, but also easy to occur the phenomenon that the surface of the material is gelatinized and the interior is intercalated. In this process, microwave technology is used to test the cooking and drying process of cornflakes.

5 characteristics of microwave processing.

(1) Fast speed, high thermal efficiency due to microwave energy penetrating inside the material, 9 smart M H Z microwave penetrating food raw material depth of 30 C M material itself is a heat source, heat is not transmitted from the surface to the internal heat transfer, so the drying speed is fast, generally only 10 1% of the time of conventional methods. The process of heating and

drying can be completed, and the heat of microwave heating comes from the inside of the material, and the heat is around

The heat loss in the surrounding air is less, and the thermal efficiency can be increased by 2.4 times compared with the conventional heating method. .

(2) The heating source of microwave medium is dispersed in the heated material. It is heated from the inside of the material and has automatic balance. Even if the shape of the material is complex, the heating and drying is uniform. Conventional heating is easy to produce the phenomenon of coke endogenesis. Microwave heating It also has bactericidal action, thus prolonging the shelf life of the product. .

(3) Instantaneous control, easy to continuous production of microwave heating less thermal inertia, immediately after starting the normal operation without heating process, microwave power transmission speed can be stepless speed regulation, responsive, can be instantaneous control, so that the production of cornflakes to achieve continuous. .

(4) Selective heating drying mentioned above is closely related to the properties of materials. Microwave drying is easy to be heated and dried for medium with high dielectric constant, especially for water, when $f < 3$. The dielectric constant of OH_2 and $t-25$ is 76.7. The water in the material can absorb microwave strongly. It absorbs more heat than the material. The moisture is easy to evaporate. The material itself absorbs less heat. It is not easy to cause overheating. The loss of nutrients is small and the color is good. Generally, water content of a few to a few dozen substances can be effectively heated by microwave heating.

Two.

Main technical parameters

Microwave working parameters: 915, 25 M H Z

Maximum power microwave: 20 K w

Incoming line apparent power: 35 K V A

Cooling water flow rate: 20 L / m in

Conveyor speed: 5. One s M / im n

Conveyor belt width: 600 m m

Material import and export height: 900 m m

Microwave leakage: in line with national safety standards

Three.

Conclusion and discussion

1. Microwave heating drying is selective and closely related to the properties of materials. It has a certain range of requirements for the moisture content of heated materials. The moisture content of corn balls is about 14%, which can effectively utilize microwave energy.

2. Controlling the moisture and temperature of corn balls after microwave cooking and drying to the required value of rolling is the key to obtain ideal flake shape.

3. Microwave heating has the characteristics of high speed, high thermal efficiency and even heating. The shape of cornflakes processed by this technology is smooth, the color and fragrance are attractive, the product quality is good, and the continuous production is realized. The microwave processing technology of corn flakes has provided scientific data for industrial production.

4 microwave production of corn flakes should strictly control the leakage of microwave in line with national standards.