

# Optimization of French fries vacuum frying process by response surface methodology

Taking commercially available potatoes as raw materials, taking the frying temperature, frying time and vacuum as the influencing factors, the comprehensive score based on the oil content, brittleness and acrylamide content of the French fries is used as the process index of the product, and the response surface is adopted. The method optimizes the frying process of French fries.

[Microwave drying machine](#)



[Vacuum frying fries technology](#) was developed in the late 1960s and early 1970s, and the technology developed rapidly after the 1980s. At the beginning, people used vacuum frying technology to obtain products with better quality than the traditional frying process, and later used it to dry the fruit pieces. The principle of vacuum frying technology is to use fresh fruits and vegetables as the main raw materials and edible oil as the heat medium. Under vacuum conditions, that is, 0.001~0.01MPa vacuum, it can be quickly dehydrated and dried in a very short time. Fruit and vegetable foods with low water content, low oil content, and brittle but not greasy.

This technology not only preserves the original shape, color, aroma and taste of fruits and vegetables, but also enriches various nutrients such as vitamins, minerals and fibers, and has the characteristics of low sugar, low salt, low fat and low heat. Therefore, using vacuum frying technology, fried foods can also be healthy, natural and safe.

In this experiment, the fresh potato was used as the main raw material, and the vacuum frying process was optimized by the response surface method. The comprehensive score based on the oil content, brittleness and acrylamide content of the French fries was used to determine the optimal vacuum frying process parameters. , providing reference data for the market application of French fries.

#### Effect of vacuum on the comprehensive score of French fries

Under the condition of frying temperature of 110 °C and frying time of 100 s, the change trend of oil content, brittleness, acrylamide content and comprehensive score of French fries under 0.01~0.09 MPa was investigated. The effect of vacuum on the oil content, brittleness and acrylamide content of the French fries was not significant. By changing the degree of vacuum, there is almost no significant difference in the oil content and brittleness of the French fries.

However, the content of acrylamide first decreased and then increased, and the acrylamide content was the lowest when the degree of vacuum was 0.05 MPa. In addition, under low vacuum, the obtained product has light color and high water content, and is not easy to cause appetite; under high vacuum, it is easy to cause bumping, so that the obtained French fries are deformed, have bubbles, and have deep color. Considering comprehensively, the vacuum is chosen to be 0.05 MPa.

#### Response surface analysis of vacuum frying process

The process was optimized using the response surface method. According to the Box-Behnken model design experiment, the single factor test results were comprehensively analyzed, and three factors that have significant influence on the French fries vacuum frying process were selected: vacuum frying temperature, time and vacuum, and the comprehensive score was used as the evaluation index. 3 Factor 3 level response surface analysis test.