

## Vacuum Frying—A Method to Make A Healthy Snaking

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### Introduction

Frying is an age-old method for food processing, where lipids are used as heat transfer medium that comes in direct contact to the food . There are different methods of frying like pan frying, stir frying and deep frying. Deep frying has now-a-days become an industrial operation, i.e. potato chips processing. During frying, both fats and oils are invariably used as heating medium at high temperature of 160 - 180o C or even more as per frying requirement. These are the phenomenal changes that occur during the frying process. Earlier it was thought that oil uptake takes place during the frying process (in the beginning phase of frying), as the moisture from the capillaries evaporates out of the food. But now recent studies have shown that major amount of oil uptake takes place from the adhering surface oil, in the cooling phase, when the fried product have been taken out from the oil by suction action. Conventionally fried product may contain as high as 40% oil, which affects the product characteristics and also the high lipid content of the fired product is becoming a source of health concern of the daily consumers. Some of the diseases occurring in human due to consumption of high lipid content foods are Obesity, prostate cancer, diabetes, CVD etc. Keeping all these immediate threats in consideration, the diet and health conscious consumers are changing their eating trends from high lipid containing foods towards nutritious foods. Even the food processing industries are looking towards better processing methods that would reduce the harmful effects of food processing and make foods safer and better for human consumption, without compromising the taste of the food. One such processing method is vacuum frying, which may be considered as an alternate method of conventional frying.

### Vacuum Frying Technology- Principle and its uses

Vacuum frying is similar to conventional frying, but it is carried out under low pressure below 50 Torr (6.65 kPa). In comparison to conventional frying, vacuum frying is

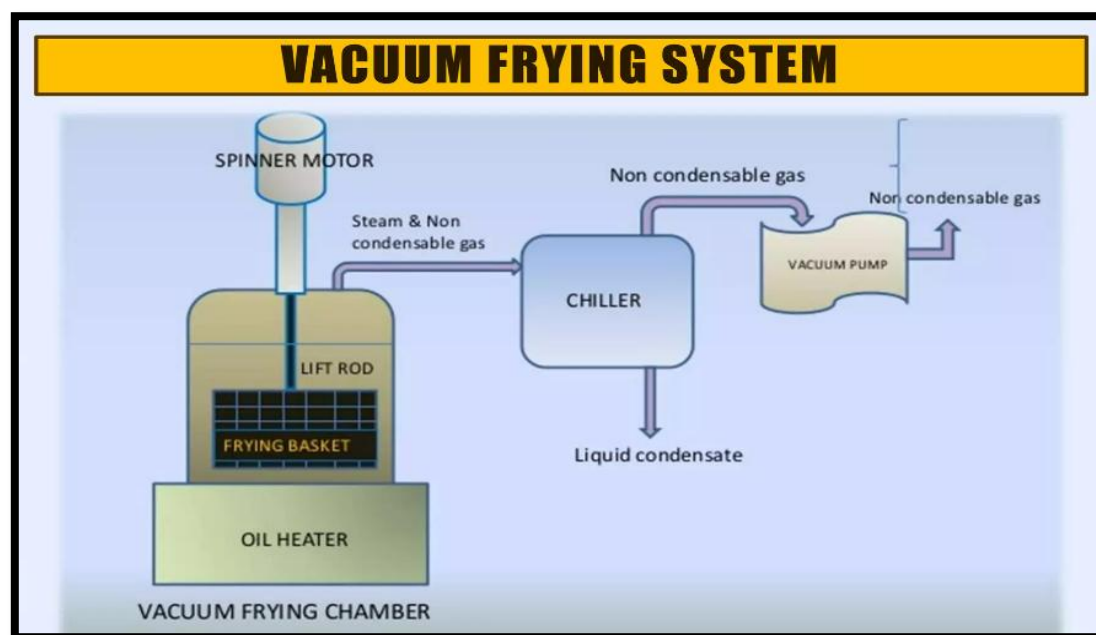
considered a much better option since vacuum fried product contains much lesser oil and lower acrylamide content, with similar texture/colour and better organoleptic and nutritional properties, in comparison to conventionally fried food. It is an efficient method to produce fruit and vegetable snacks with the necessary degree of dehydration without excessive darkening or scorching .

Vacuum frying is achievable at lower temperature than conventional frying, therefore vacuum-fried products have better nutritional quality (due to retention of essential phytochemicals and essential nutrition), enhanced colour (due to lesser oxidation) and oil degradation is much lesser than normal frying. Vacuum fried products contains lesser oil content, but this is not only the single health benefit of vacuum fried products. Lower operating temperature during vacuum frying, reduce 94% of acrylamide formation in potato chips. Acrylamide is recognised as a potential carcinogenic compound found in fried snacks, which is formed by the Maillard reaction. Vacuum frying have been adopted for processing (i.e. frying) different foods, but mostly for fruits and vegetables. Factors affecting the final vacuum fried products are frying time-temperature combination which determines the final acceptable physical attributes. For frying, the oil temperature may be increased to frying temperature by using gas, steam or electricity. As discussed earlier, during frying, there would be significant removal of moisture in form of steam along with other volatiles, which may be trapped using a condenser. Low pressure is created during vacuum frying with the help of either liquid ring or oil sealed vacuum pumps. After frying, the excess oil present in the product may be removed by centrifugation. A separate de-oiling operation needs to be done, to remove extra surface absorbed oil, during the last stage of vacuum frying operation.

#### **Steps Followed during Vacuum frying**

- ✚ **Blanching:** This step is done to prevent enzymatic activity before vacuum frying by either steam blanching and hot water blanching.
- ✚ **Freezing:** Contribute to form a porous sponge-like structure and improve the texture of the vacuum-fried food.
- ✚ **Vacuum Frying:** Already discussed.
- ✚ **Defatting:** Vacuum fried products, after frying are separated from excess oil by lifting up the product or subjecting it to centrifugal separator, with or without breaking the vacuum.

- ✚ **Packaging:** Similar to conventional fried products, the vacuum fried products are also having tendency of rancidity. PET (Polyethylene tetraphthalate) or Aluminium film laminate (AFL) with nitrogen gas filling may be used for packaging vacuum fried products



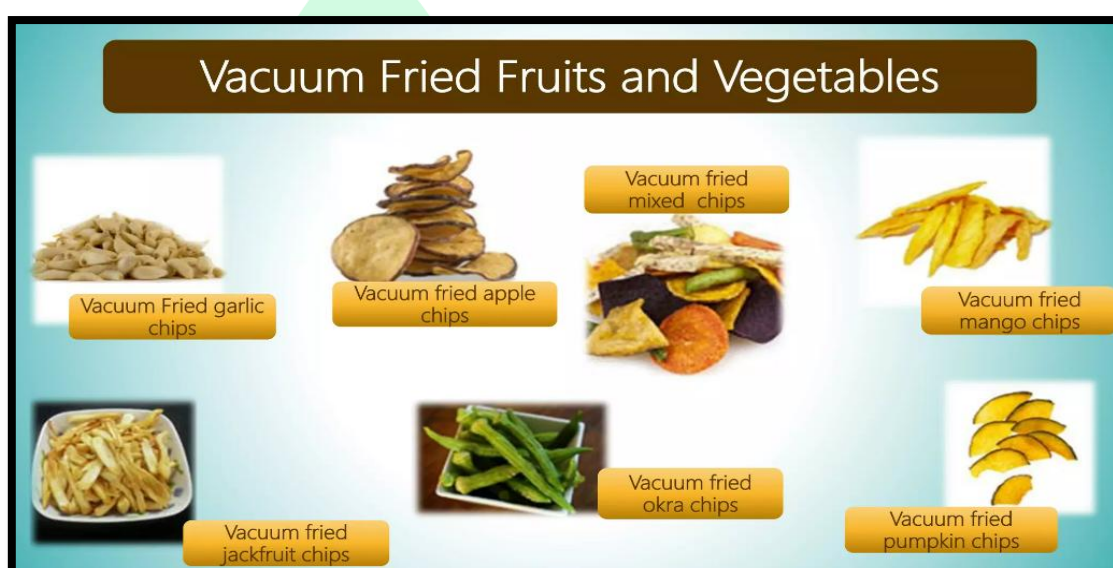
### Conclusion

Vacuum frying technologies have added advantages over conventional frying. Vacuum frying process is achievable at lower temperature than conventional frying and minimizes formation of acrylamide, which is a harmful thermal reaction product. Reduced lipid content of the final product, because of lower oil intake during vacuum frying process and higher rate of moisture evaporation are other advantages of the process, including improvement in sensorial and textural properties of the vacuum fried products. Bibliography Limitation for vacuum frying process is the initial investment for vacuum frying processing is quite higher as compared to conventional frying process. Beside this, small-scale vacuum processing plant is not available, which is a big hurdle faced by entrepreneurs, small organization etc. Higher costs of machineries for vacuum processing are difficult to afford. Moreover, studies needed to be done about application of vacuum frying on traditional food products. Changes of sensorial impact during vacuum frying needs to be established in comparison with conventional frying. Beside this there is scope of improvement in

fundamental process modelling of vacuum frying including the steps and changes taking place during the process.

### Future aspects

In future, the vacuum fried products would be a suitable alternate for conventional fried products with better nutritional and sensorial properties. It would be more preferred over the fried products due to low oil and acrylamide content. With time, consumers are becoming more and more health and diet conscious and this trend promises a bright future of vacuum processing as a novel method of food processing.



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