A Review Paper on Vacuum Frying System
Chakravarthi. P¹, Pugazhendi. S. K², Nandhakumar. S³, Pritam Bhattacharya. G³, Navaneethan. R⁴
Assistant Professor¹, UG Student²,³,⁴,⁵
Department of Mechanical Engineering
KSR Institute for Engineering and Technology, Tiruchengode, Tamil Nadu, India

Abstract:
This paper reviews a new trend in food processing technology vacuum frying system and aims to discuss on the equipment design, parameters of the system, processes optimization. Vacuum frying is carried in low temperatures and pressure compared to traditional frying system, and the products have higher quality in texture, colour and nutrients. The system needs specializing equipment for the frying process and design is quite sophisticated. This type of frying also reduces the formation of carcinogenic substance Acrylamide which increases the risk of cancer and is produced in frying potatoes in higher temperatures.

Keywords: Food Processing Equipment, Vacuum fryer, Vacuum frying equipment, Vacuum Technology

I. INTRODUCTION
Vacuum frying is fast growing technology in the food industry. Fryers of these types allows raw food to fry at lower temperature compared to traditional atmospheric fryers, and enhances the quality of the food product without compromising oil content, texture, nutrient and colour retention. The frying process is usually carried out on significantly lower temperature and pressure in vacuum frying process. The below schematic figure illustrates the essential components of a vacuum frying system.

![Figure 1. Schematic of Vacuum Frying System (Garayo, Moreira 2002)](image)

II. LITERATURE SURVEY
Diamante, L. M., Shi, S., Hellmann, A., Busch, J.¹ gives a brief introduction of the vacuum frying of foods and reviews various research papers on the vacuum fried from 2012. Summarizes the vacuum frying system, frying process, oil uptake of the fried foods, changes in the oil during frying in vacuum conditions. This paper also concludes the basic parts in the vacuum frying system namely vacuum frying chamber, condenser, vacuum pump and a heating method (gas, steam or electricity). Reviews the vacuum frying conditions of various food products and the need of different vacuum pressures for the optimal results. A. Andrés-Bello, P. García-Segovia, J. Martínez-Monzó² discusses on the vacuum frying process as an alternative method for getting high quality dried products and especially gives an overview of the three kinds of vacuum frying equipment systems including the semi-continuous vacuum fryer. Explains the pretreatments carried for the oil uptake as a quality parameter and summarizes the pretreatments for different products. Also gives importance to blanching process, drying, Osmotic dehydration, coating and post frying treatments. Tabulates the vacuum frying conditions (Temperature, Time, Pressure and boiling point) of different food products based on the previous researches done. Provides an idea for the modelling of vacuum frying process. The effects of vacuum frying on oil uptake, water loss, shrinkage, texture, colour, nutrient compounds, and formation of acrylamide were also discussed. Concludes that vacuum frying process is poorly studied and its effect on properties like oil uptake is not clearly studied. Finds contradictions in the literature on the role of vacuum frying process parameters and investigating it for industrial adoption.

Abhishek Gupta, Amit Choudhari, Taha Kadaka and Pavan Rayar³ gives a comparison of less productive horizontal vacuum frying machine with high productive vertical vacuum frying machine and proposed a design and manufacturing features of a vertical type vacuum frying machine with different inner configurations and mechanism of working. Explains the different components of the vertical vacuum frying system like vacuum pump, gauge, seals and oil separator (vacuum trap). Describes the working mechanisms and concludes for making the design available to small scale industries in India to promote ‘Make in India’ initiative, introduce vacuum fried products in the market with a comparatively low cost and health consideration. Purpose is to use simple techniques for the manufacturing of the project and improve overall productivity of the system.

Carla V. Yagua, Rosana G. Moreira ⁴ had done an investigation on the vacuum frying of potato chips and presents the physical and thermal properties of the chips. The experiment is carried by a vacuum fryer having a de-oiling mechanism for removing the excess oil in the fried chips as a post treatment method. Farm harvested potatoes were provided
by Frito-Lay North America, Inc. and the samples were prepared in the form of slices with standard thickness and prepared. The vacuum frying experiments were performed with various frying temperatures. Finally concludes with the physical and thermal properties observed.

Akhilesh Pandey, Rosana G. Moreira [5] gives experimental results which are useful for the effective system design and modelling of vacuum frying systems for high quality results.

Jagoba Garayo, Rosana Moreira[6] evaluates the feasibility of producing low oil content potato chips using the vacuum frying system and relates the oil absorption rate during vacuum frying with the moisture loss rate. Compares the results with the traditional (atmospheric) frying. Chips fried under vacuum pressure resulted in higher volume shrinkage, and were lighter than traditional potato chips.

III. CONCLUSION

From the literature review it is clear that vacuum frying system promises to produce high quality fried food products. But there is a need of research on further improving the quality and feasibility of the system. It seems to follow the vacuum frying system for small scale food processing as the cost of the equipment is too high comparative to other methods of frying foods. Oil absorption rate of vacuum fried foods need to be taken care as it is related to the moisture content in the raw vegetable or fruits. Reputation of the vacuum frying system should be increased in India so it will lead the perception of improving the system by Indian researchers and will increase the awareness on the low oil content healthy fried products and reduces the possibility of carcinogenic substance Acrylamide which increases the risk of cancer found in potato chips as consumption of potato chips in the country is higher especially children. Also vacuum frying augments the non-traditional vegetable fried snacks.

IV. REFERENCES


