Design and Fabrication of Garlic Pre-Heater: A Review

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Abstract: Garlic peeling is the one of the most time consuming work in hotels and many food industries. In order the overcome for this problem is the demand for peeled garlic is rising day by day. But the garlic peeling machine are so costly and there production is insufficient to meet this demand . in order to increase the production of this industries there machine need some up gradation. The machine garlic peeling first heat the garlic for 10min and then the garlic comes in peeling chamber where they are peeled using pressurised air. This whole process take 20 min to peel 10 kg of garlic. So to reduce time of peeling using single machine the idea arise that if the garlic is preheated and then poured in machine then the time which was consumed before is been reduced if we preheat garlic.

Keywords: Garlic, Dehydrator or pre-heater, Peeling process , modelling.

INTRODUCTION

Devices require heat using energy sources such as solar or electric power or bio-fuel (i.e. oil) and vary in form from large-scale dehydration projects to DIY projects or commercially sold appliances for domestic as well as commercial use. Garlic and Ginger are important commercial crops cultivated throughout the country with major production in the states of Gujarat, Orissa, Maharashtra etc.

Garlic is mainly used as condiments in food preparation and is also used in many medicinal preparations. Ginger and Garlic based products have wide applications in food processing and many other industries. It is, therefore necessary to assess market for the contemplated products before finalizing the production capacity. There are good export prospects as well. Manufacturing process in case the dehydration of garlic cloves are separated manually and then dehydration is done in a drier. As regards garlic, fresh garlic is soaked in water and washed and then outer skin is peeled off in a barrel drum. Drying is done in the electrically heated controlled drier which is combined with steam heating arrangement. A commercial food dehydrator's basic parts usually consist of a heating element, a fan, air vents allowing for air circulation and food trays to lay food upon.

Modern food dehydrators are plastic or metal boxes that can dry foods by passing hot air through them. This hot air reduces the moisture content in foods. Moisture or water content in foods is generally of the order of 50-90% of the food's weight. As the saying goes, "Water is necessary for life", but in this case the life that flourishes because of that water in vegetables and meat consists mostly of bacteria and fungi. For now suffice it to say that such moist food, when stored away, gets "spoilt" and poses significant health risks. The solution is to remove water from the foods. Water cannot, and should not, be completely removed, but retained in a ratio of 0.75 to 1 to the protein content in the foods. Food dehydrators use circulating hot air to remove the excess moisture and so make the foods storage-worthy. The first step in food drying is to place or arrange the raw material on the trays. Avoid overlapping. If you want that your food dries completely, then set the temperature to 50-60degree. When the dehydrator starts working, then check it regularly after different intervals of time and don't forget to rotate the trays. Most fruits and vegetables take 2-19 hours for drying but it is sufficient to heat garlic of 2-3 hours.

To check either the food is completely dry or not, cut it into slices. When no moisture drop is appeared it means the food is completely dehydrated. when the food is dehydrated completely, cools it and store it in an airtight container. And place the container in dark and dry place. If you find some moisture in the leftovers, then place them again in the dehydrator for 1-2 hours.

Manufacturing Process In case of dehydration of garlic, cloves are separated manually and then dehydration is done O in a drier at about 55-60 C temperature. As regards ginger, fresh ginger is soaked in water and washed and then outer skin is peeled of in a barrel drum. Skin peeling facilitates removal of moisture. Drying is done in the electrically-heated thermostatic-controlled drier. Drier is combined with steam heating arrangement.

Drying temperature is in the range of O 55-60 C. After washing and peeling, ginger is cut in required sizes and boiled with small quantity of citric acid for about an hour under a pressure of 10 psig or for 6 hours under atmospheric pressure to improve its colour. Then the mixture is boiled with 30% sugar solution for 15 minutes and kept overnight. Same operation is repeated everyday till the sugar content is 60 brix and then small quantity of citric acid is added and the solution is boiled and kept till sugar penetrates in ginger. Finally, it is boiled for about 5 minutes and the sugar solution is drained out and pieces of ginger are rolled in ground sugar, dried and packed.

LITERATURE SURVEY

S. Nabnean [1] using experimental method analysed the performance of a new design of solar dryer from which he concluded that there is an considerable reduction in drying time and also concluded that the newly designed dehydrator can be potentially used to dry other fruits for the production of high quality dried product. M.V. Rama Murthy [2] investigated new technologies and models of the air dryers from which he concluded that performance evaluation procedure of driers can be simplified by using evaporative capacity and also Various types of driers are available to suit the need of farmers. Ratiya Thuwapanichayanan [3] analysed the Heat and moisture transport behaviour and quality of chopped garlic undergoing different drying methods from that he concluded that the changes in the moisture content of chopped garlic dried by HA and HP are not significantly different throughout the period of drying. Prashant Singh Chouhan [4] analysed the review on thermal models of greenhouse dryers and concluded that performance of greenhouse dryer under forced convection mode was found better for high moisture content crops on the other hand natural convection mode was found better for low moisture content crops. A.Fudholi [5] investigated different of solar dryers for agriculture and marine products and resulted that the technical directions in the development of solar drying systems for agriculture produce are compact collector design, high efficiency , integrated storage.

Ajam[6] analysed the Exergetic optimization of solar air heater and concluded that the exergy analysis was a better method for design,development and optimization of solar air heater.

Mahesh Kumar [7] investigated the Progress in solar dryers for drying various commodities and concluded that Among the various types of solar dryers, indirect mode forced convection dryer have been reported superior in drying speed and quality drying. A.Madhlopa [8] experimentally performed A solar air heater with composite-absorber system for food dehydration from which he concluded that the air heater achieved efficient drying of slices of fresh mangoes and relatively high retention of ascorbic acid. Valentina Prosapia [9] Influenced of osmotic dehydration pre treatment on oven drying and freeze drying performance and concluded that a significant reduction the processing time and improve the rehydration capacity in case of oven dried samples. V.K. Singh [10] experimentally performed the dehydration process and concluded that the explosure puff-drying process will be more costly than other processes but it appears to be more efficient than freeze drying. Sumit Tiwari [11] analysed Development and recent trends in greenhouse dryers and resulted the quality and colour of the crop can be retained by using indirect drying.Thin drying is better as compared to deep bed drying. Roozbeh Vaziri [12] analysed experimental performance of perforated glazed solar air heater and unglazed transpired solar air heater and concluded that thermal efficiency of dark colour PGSAHs were better than the light coloured ones.

Humberto Vega Marcado [13] explained advances in dehydration of food and resulted the selection of best drying technique is still determined by the type of product, its composition and its physical properties. Xiaomin Wang [14] isolated antioxidants in an aqueous aged garlic extract using Column Chromatography and resulted an aqueous age was manufactured by soaking sliced garlic in water at room temperature. Heng Yuan [15] analysed the changes on intermediate products during the thermal processing of black garlic and determined the changes in the levels of fructan,soluble sugar as well as the changes in ph and colour that occur during the thermal processing of black garlic. Phillip Dobson [16] investigated the thermocouple heating impact on the temperature measurement of small volume of water in a cooling system and concluded that a large sized thermocouple has a larger impact on the temperature measurement. Ebina [17] experimentally analysed the performance evaluation of a passive solar powered air heating system based on exergy analysis and concluded that system is suitable as a solar cabinet crop dryer for aromatic hubs,medical crops and other crops which do not require direct exposure to sunlight. Kutbas [18] investigated the solar air heater with free and fixed fins using exergia analysis and resulted the exergy loss ratio was affected less because heater has very little pressure drop.

Li Yu [19] prepared garlic powder with high allicine contents using MVD technology and concluded that optimal drying condition was microwave output power at 376.1W for 3 mins,188W for 9 mins respectively. Henry Jaeger

[20] gave opinion on the use of ohmic heating for the treatment of foods using ohmic heating method and intensifies water loss and solid gain at high temperature. Agnieszka Ciurzynska [21] analysed osmotic dehydration in production of sustainable and healthy food using pulsed vacuum technique and resulted the quality of final product is improved due to osmotic dehydration and this protecting the sensory properties of processed foods. T.Durance [22] microwave dehydration of food and food ingredients using microwave drying and concluded that time required for drying operation was curtialed to attain the standard moisture content (0.35 kg water /kg Dm).Kai Han[23] experimentally and theoretically studied the effect of suspendedthermocouple on the single droplet evaporation and resulted the evaporation rate changes non linearly with fiber diameter. Hong Chen [24] numerically and experimentally analysed the response of coaxial surface thermocouples for transient aerodynamic heating measurements and concluded that reducing the thickness of the insulation between the two electrodes is an effective means to improve the performance of thermocouple.Athanasia M.Goula [25] investigated the use of ultrasound for osmotic dehydration using microscopic analysis and shown that different fruits and vegetables respond differently to the application of these treatment.

Esen [26] experimentally performed energy and exergy analysis of a double flow SAH having different obstacles on absorber plates and resulted the optimal value of efficiency was in the middle level of absorbing plate in flow channel duct for the operating conditions. A Koca [27] investigated the flat plate solar collector with PCM using the energy and exergy analysis using PCM method and concluded that the exergy efficiency of latent heat storage systems with PCM are very low. A.Akbulut [28] experimently performed energy and exergy analysis of the thin layer drying process of mulberry via forced solar dryer and concluded that the exergy loss decreases with the increased in the mass flow rate of the drying air. E.K.Akpinar [29] experimentally investigated a new type solar air heater with and without obstacles and concluded that the exergy loss of the system decreased due to the increase in the collector efficiency. D.Alta [30] investigated the energy and exergy efficiency of three different types of solar air heaters and concluded that lower air flow rates will be beneficial in applications where higher temperature differences are more important.

CONCLUSION

This device can be reduction in time consumption. Hence the fabricated model is a simple solution for peeling the Garlic with reduced processing time. The model consumes very low power and saves time of the user by providing better efficiency with low cost. Due to the increased production, the company now can satisfy the changing cutomers demand.

FUTURE SCOPE

The related industry can introduce this project and make a new benchmark in the field ant this concept can increase the production rate of various small scale industry.

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