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# Abstract

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In Sri Lanka, people have been using hoppers as a substitute for the staple food or supplementary diet from an immemorial time. Hoppers are a delicious food that can be taken at any time of the day. However, use of hoppers has been limited due to hard work and time consuming nature of hopper-making process. The traditional method of production suffers from few critical deficiencies, which have not drawn much attention so far:

1. inefficiencies in production process such as, wastage of fuel, labour and raw materials.
2. loss of qualitative and quantitative properties such as uniqueness in size, weight, shape, thickness, hardness and colour.
3. lack of assurance for hygienic conditions owing to prolong exposure of flour mixture to the open air during the manual treatment of processing.
4. given the maximum number of frying pans that can be handled by a single hopper maker, in the traditional method, the rate of production of hoppers is limited and low. Furthermore, customers are interested in buying fresh and hot hoppers, since they taste good when hot.
5. in the traditional method, each and every hopper being burnt needs individual attention and the hopper maker has to estimate the time for removal from frying pan using his experience.
6. in commercial production the cost is high due to inclusion of higher level of labor cost and the wastage of cooking gas.

The objective of this study is to “DESIGN AND FABRICATE A HIGH QUALITY AUTOMATED HOPPER-MAKING MACHINE”usable in large-scale commercial production, which would bring solutions to many of the problems, discussed above.

Three models of the machine were successfully designed and fabricated during this study. First model of the machine designed especially with mechanically driven components. Second model designed as a commercial production with some structural and technological improvements. Second model was improved further up to the third model with an advanced electronic controlling system and low cost components. Hence making hoppers from the third model of the machine became easier, and more efficient.

The automated hopper-making machine consists of 12 pans and one hopper is produced by the machine in every 10-12 seconds. Usually the efficiency of making hoppers of the automated hopper-making machine could be controlled according to the requirement or the skill of the hopper maker.

A comparison between the mechanical and manual process of making hoppers was performed using data collected from individual hopper makers. As a result of the analysis of the data we were able to find some important results related to hopper-making process and some of them could be applied directly to the automated hopper-making machine. Approximately, the average cost per single hopper in traditional methods is 4.92 rupees and the average cost per single hopper in using the machine is 3.53 rupees. The results show that the mechanical process saves 28% of production cost compared with the manual process. The major advantage of the machine is the production efficiency.

Furthermore, using some of the components of the machine a semi automated hopper-making machine is fabricated for domestic use, which is also a marketable production. Another concern in this study was the wastage of cooking gas, especially, in cooking using a spherical base pans like *thachchiya*. In this study, we have fabricated a simple device that could save approximately 24% of gas in cooking using spherical base pans. As a by product of this invention, a component of the machine has been slightly modified to fabricate a machine to release a certain amount of liquid from a container, which has several practical applications. The designing of the automated hopper-making machine, the semi automated hopper-making machine and the energy saving cooking device could be timely needed items bearing a national interest as marketable productions in Sri Lanka as well as in other countries.