

An assessment on the possibility of process modification for crumb products, from manual packing to a semi-automated packing mechanism

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Introduction

Production management is an area of management concerned with overseeing, designing and redesigning business operations in the production of goods and services. Automation of a packing line will increase the productivity and will reduce contamination. Modern warehouses are called distribution centres, to emphasize that they only profit by moving goods. To a distribution centre, storage represents unproductive assets. In present era, fast food consumers are looking for readymade products and increased interest is shown in partial replacement of meat system with extenders/binders/fillers (Sohila, 2008). In recent times there has been a remarkable increase in demand for ready to eat meat products (Duxbury, 1989). Therefore food industry is now forced to develop a variety of convenience products with improved quality and lower cost to meet increasing demand for meat based food products (Thomas *et al.*, 2007). The study evaluated the current packing mechanism with new, planned semi-automated mechanism relevant to the aspects such as overall labour effectiveness, warehouse utilization and etc. After analyzing the current and future scenarios, the study focused on the suggesting a vacuum packing operation for crumb products.

Methodology

The packing volume and the consumed labour hours were observed and noted in the data collection sheet as to evaluate the productivity difference between labour and machine. Then the chicken drumstick samples were subjected to a transport trial and the number of non-conformance units of chicken drumstick occurred in the transport trial was observed and noted regarding the current pack arrangement and new pack arrangement. Then two different arrangement methods were compared by using two sample T test to see whether there is a significant difference in defects/non conformances occurred during transportation (ISTA Guidelines). Also the number of non-conformance units of chicken drumstick occurred in the transport trial was observed regarding the new pack arrangement relevant to 310 gsm and 350 gsm pack densities. Then two different gsm packs were compared by using two sample T test to find out whether there is a significant difference in defects/non conformances occurred during transportation (ISTA Guidelines). The sample (10 g) was taken in to a 100 ml beaker and 25 ml of distilled water was added and mixed

well. Then the pH measure was taken. About 5 g of the sample was weighed in to a moisture dish which was previously dried in an oven maintained at 105 °c and weighed. Once in every week TPC, *E.coli* count, *Streptococci* spp. count and fungus count were tested for each vacuum packed and non- vacuum packed samples. The sensory qualities of vacuum packed and non vacuum packed crumbed products (Chicken drumstick) were evaluated by a panel of ten panelists who were trained to familiarize with the sensorial attributes of fried chicken drumsticks using differentiating and descriptive tests.

Result and Discussion

According to One sample T test results, Labour packing productivity was significantly different ($P < 0.05$) from the given machine packing productivity and unionized labour packing productivity was significantly different ($P < 0.05$) from the non-unionized labour packing productivity. Also the “c” of Cobb-Douglas function was less than 1 and it reveals that non-unionized labour is more productive. According to the Two sample T test result, defects occurred in current packing arrangement was significantly different ($P < 0.05$) from the defects percentage that occurred in new packing arrangement for 1kg and 300 g packs and defects occurred in 350gsm packs was not significantly different ($P < 0.05$) from the defects percentage that occurred in 310gsm packs which are arranged in new packing arrangement for 1kg and 300g packs. Space saved by the new arrangement, for 1kg pack was $0.84 \times 10^{-3} \text{ m}^3$ and for 300g pack it was $0.85 \times 10^{-4} \text{ m}^3$. In the Two sample T test, vacuum packed chicken drumsticks and normal packed chicken drumsticks had a significant difference ($P < 0.05$) in moisture levels measured in the consecutive storing weeks. Vacuum packed chicken drumsticks have a less variation pattern compared to the normal packed chicken drumsticks in moisture percentage. But there was no significant difference in pH variation ($P > 0.05$) between the two samples. *Salmonella*, *E.coli*, *Staphylococci* Spp., Yeast and mold were not observed during the 8 weeks of storing period (-18 °C) in both the vacuum packed and normal packed chicken drumstick samples. But the Total plate count increased with the storing period (-18 °C) according to the packing method. According to the Kruskal-Wallis test results colour, texture, taste and overall acceptability were significantly different in the vacuum packed (sample 622) and non vacuum packed (sample 351) chicken drumsticks. But odour was not significantly different between the two samples. Also the panelists more preferred the vacuum packed sample.

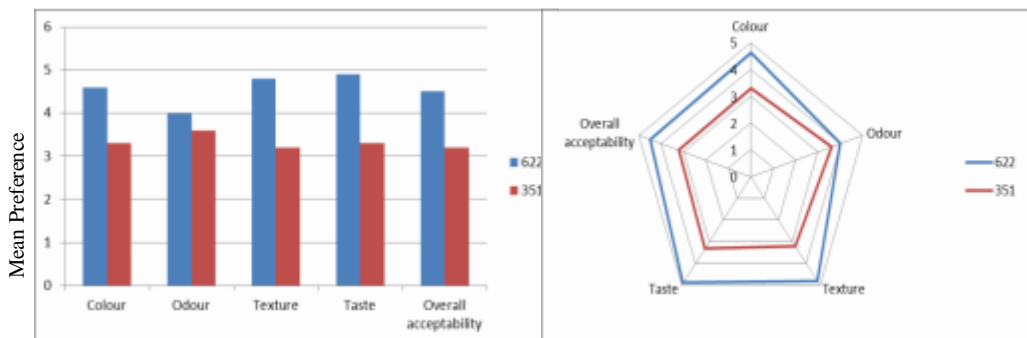


Figure 01: Graphical representation of the sensory analysis

Conclusions

From the results of this study, it can be concluded that there is a significant difference in productivity of the labour and the automated packing machine in terms of packs per hour. Packing machine has a considerable higher productivity. There is a significant difference in labour productivity of unionized labour and non-unionized labour. Unionized labour productivity is lesser than the productivity of non-unionized labour. Sometimes total stoppages of packing (Production) can happen due to union actions and it will lead to higher losses during seasons of higher demand. The new arrangement method of Chicken drumsticks reduces the defects than the current practice during transportation, storage and handling. New arrangement has few defects compared to the current method. The chicken drumsticks packed in 350 gsm packs and 310 gsm had no significant difference in number of defects during transportation, storage and handling. Even though current practice is to pack, chicken drumstick in a normal cardboard box and shrink wrap it, this can be changed in to vacuum packing, as it is having lesser increment in total plate count. Also the vacuum packed chicken drumsticks contained lesser percentage of moisture compared to the normal pack in the time of storing (-18°C) and the variation with the storing period is smaller than the normal pack variation. But the pH variation is not considerably different between two packing methods. Also the sensory evaluation conclude that the vacuum packed chicken drumsticks are preferred over normal packaged drumsticks with respect to sensory attributes such as colour, texture, taste and overall acceptability. Sensory analysis revealed that the products were better preserved under vacuum conditions.

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