

Designing of a Proper Package to Minimize Trade-Non Vacuum Condition in Vacuum Packed Sausages

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Introduction

Food packaging is an integral part of food processing and a vital link between the processor and the eventual consumer for the safe delivery of the product through the various stages of processing, storage, transport, distribution and marketing. The selection of the packaging material has to be done very carefully to protect the different physico-chemical properties like nature of pigments, sensory attributes and micro flora (Marsh and Bugusu, 2007).

Due to various types of defects, the return of product causes a considerable reduction of profit annually. Formation of non vacuum condition in vacuum packed products has become one of the reasons for market return. Vacuum packages of pre-cooked sausages, meat ball products create non vacuum condition at different stages from packaging to consumption due to poor mechanical shock resistance of the packaging materials that cause damage during loading, unloading, poor handling, packing and storage (Chainey, 1989). The objective of the study was to design a proper package to minimize the trade non vacuum condition in vacuum packed sausages and minimize the market returns.

Methodology

Experimental work was conducted at the Keells Food Products PLC, Ja-Ela. Tests for the materials were carried out at the JF packaging (Pvt) Ltd, Kotugoda and the Varna Laminations (Pvt) Ltd, Rathmalana. Initially 4M analysis was conducted in order to identify possible root causes that create non vacuum condition in vacuum packed sausages. Contribution of man, material, method and machine were critically analyzed through observation of machine, handling and transportation system.

Five types of coextruded, three layer lamination pouches, varying in thickness as given below were used as treatments for the experiment.

T1 = Nylon (15 μ)/LLDPE (60 μ)

T2 = Nylon (15 μ)/LLDPE (70 μ),

T3 = Nylon (25 μ)/LLDPE (60 μ),

T4 = both side metalized: PET (10 μ)/MPET (10 μ)/LLDPE (100 μ) and

T5 = back metalized and front transparent pouch: PET (20 μ)/LLDPE (100 μ)

All the film samples were corona treated and solvent based, prepared according to standard industrial procedure.

Twenty samples with three replicates were used for each treatment in the investigation. Each pouch was filled with sausages and subjected to vacuum process. Vacuum packed pouches were stored at -18 °C. Treatments were examined for non vacuum condition by visual observation once per week for a month. Each material was analyzed for puncture resistance and tensile strength of films before and after freezing conditions. Data were analyzed using analysis of

variance (ANOVA) incorporated in MINITAB 14 statistical software at 5% level of significance.

Results and Discussion

Non vacuum count for the investigated samples showed a significant difference ($p < 0.05$) indicating that there is an effect of the materials/films for the non vacuum incident. Statistical analysis for non vacuum count have shown that the investigated materials were significantly different ($p < 0.05$) from each other but a significant difference was not found among T4 (both side metalized pouch) and T5 (front transparent and back metalized). The lowest means were recorded in both Treatment 4 and 5 which revealed that the mean non vacuum count is zero in both samples throughout the investigated period.

Treatment 4 and 5 were selected for further experiment and were subjected to appearance and customer acceptability test. As revealed by the statistical test there was a significant difference between treatment 4 and 5 ($p < 0.05$) and treatment five was selected as the best treatment (Front transparent PET (20 μ)/LLDPE (100 μ)).

Treatment which was consisted of PET (10 μ)/MPET (10 μ)/LLDPE (100 μ) showed higher material performance over other treatments during the storage period. Treatment 4 showed a significant difference ($p < 0.05$) in puncture resistance and tensile strength over other treatments as well as approximately remained stable during the study period compared to other investigated treatments.

Statistical data for tensile strength and for the puncture resistance among investigated samples showed a significant difference ($p < 0.05$) indicating that there is an effect of the materials/treatments on the mechanical strength (puncture resistance and tensile strength). Again PET/MPET/LLDPE showed highest performance among others during the study period. It has the highest puncture resistance and the tensile strength over other materials as well as it approximately remained stable during the study period compared to other investigated materials. Therefore again it was selected as the best sample. According to the results of the tukey test any sample similar to the best sample could not be found either for the puncture resistance or for tensile strength ($p < 0.05$) among investigated samples.

Conclusions

Therefore, treatment 4, PET (10 μ)/MPET (10 μ)/LLDPE (100 μ) and treatment 5, front transparent (PET20 μ /LLDPE100 μ) can be determined as the best samples among the investigated samples. It can be concluded that metalized films (PET/MPET/LLDPE) which have the highest puncture resistance and tensile strength value was the film that could be used to minimize the market returns due to non vacuuming of the products and could provide best protection against the mechanical damages.

References

- Chainey, M., 1989. Transport phenomena in polymer films. Handbook of polymer science and technology, 4 Composites and specialty applications, Marcel Dekker, pp.499-540.
- Marsh, K., Bugusu, B., 2007. Food packaging-Roles, materials, and environmental issues. Food Science 72(3), R39-R55.