

PALLETIZED FOOD: A CASE STUDY IN THE CONTEXT OF FOOD WASTE

Mariana Alves da Costa¹; Romero Luiz Mendonça Sales Filho²

Abstract

Refrigeration technology plays a key role in the food supply chain. We can use it in their different stages such as processing, transportation, and storage. That is why we adopted the term cold chain. Any interruption in this chain has negative impacts on the food's quality, safety, and contribute to food waste. A problem faced worldwide which represents 30% of all food production. Taking these concepts as a base, we investigated a cooling system from one food industry. It aimed to find cold chain failures that increase waste in the distribution stage. Methodology: The cooling system was a forced-air type that is versatile and allows the cooling palletized products. It consists of forced cold air circulation through the pallets. And this accelerates the convective thermal exchange between cold air and products. The product was yogurt, highly perishable, and stored at 283.15 K. In a week, we studied the cooling process for different batches of one product type. The temperature of each product in the pallets would decrease from 308.15 to 283.15 K after 5,400 s. After, we inspected the product temperature in different layers by using simple random sampling. In total were inspected 27 units of the product per pallet. Last, we examined the design of the secondary packaging (cardboard boxes) and the palletization pattern. Results: The cooling was not homogeneous for all batches evaluated. For those products inside the pallet, the temperature was almost at the initial value (308.15 K). For those in the edges, it decreased as expected (to 283.15 K). The cold air was not achieving all products in the same way. The cardboard boxes had openings, but once palletized they were blocked. So, the boxes were acting as a barrier for cold airflow through the pallet. It was creating a preservation problem in the distribution chain, due to a higher temperature (> 283.15 K) which makes its shelf life shorter. About 23% of each pallet was the potential to get spoiled before reaching consumers. It was affecting waste indicators. Faced with this, we proposed to redesign the boxes by improving openings distribution. It would reduce the percentage of spoilage by 13% what was confirmed through the plant indicators. Conclusion: The packaging design should meet the product requirements and the specificities of the food chain. They should ease cooling process and assure food preservation. The packaging improvement brought good results in this study. Situations like this can exist in many industries (especially in the smaller ones) without specialist support. Thus, by investigating failures in the processes, food waste can be reduced through the food chain.

Keywords: refrigeration, food packaging, forced-air cooling system, food waste.

¹Environmental Sciences, Universidade Federal Rural de Pernambuco (UFRPE)/Universidade Federal do Agreste de Pernambuco (UFAPE), maac.cic@gmail.com;

²Doctor, Universidade Federal Rural de Pernambuco (UFRPE)/Universidade Federal do Agreste de Pernambuco (UFAPE), romero.sfilho@gmail.com.