

Overview

Food safety is a top issue today. Consumers are informed daily of the link between diet and health along with reports of potential food risks, such as microbial contamination, chemical adulteration, nutritional hazards, and illegal food additives. Another potential danger is that of the food package itself. What is the safety provided by the package and its interaction with the food it contains?

During the past ten years, a virtual explosion of new food product introduction has been witnessed, demonstrating a six-fold growth from 1980 to 1990. The industry has become technically more complex as new ingredients, additives, and processing techniques are introduced. The revolutions in food packaging and marketing are posing new challenges to food safety assurance.

Consumers have come to expect more of government regulators and the food industry and are asking pertinent questions related to the safety of the food supply. With regard to food packaging, questions are asked such as: How much product protection do packages supply? Do they help to preserve the nutritional worth of the food supply? Does packaging act as a source of food-related health risks by directly or indirectly contributing substances to products such as toxins or chemicals? Does packaging extend or shorten the shelf life of products? How are food packages developed, and what is the criteria for the packaging material selection?

These and other questions are being asked by the members of the F-2 Committee on Flexible Barrier Materials. The symposium on Food Packaging Technology from which this volume was taken was organized to provide a forum for the discussion of the research and test methods currently in use by members of the food and packaging industries along with academic interest. The nine papers presented at the symposium review emerging technologies in the food packaging industry. The topics include extended shelf life of food products through the use of computer modeling, time-temperature indicators, and a total system approach based on the dynamics of the food-packaging and distribution systems. Emerging markets for shelf stability versus convenience in packaging, material test method development, and new applications for high barrier plastics packaging are also discussed.

The paper by *Cage* provides a comprehensive overview of the basic principles of food packaging development, from conception to distribution; technological breakthroughs and ecological and environmental concerns are discussed.

Marsh, Ambrosio, and Guazzo demonstrate how one company confirmed a product's two-year shelf life in three months of research time, allowing for early product introduction with the most reasonable packaging cost. Computer modeling techniques were employed, and novel analytical procedures were developed and used for both product information and computer input.

Harte et al. evaluate the change in mechanical properties of polymers due to sorption of flavor compounds. Flavor component scalping by polymeric films is an important factor in the quality of flavored products, and the selection of appropriate packaging materials is aided by knowing the mechanical response of polymer sealant film in contact with aroma/flavor components. Sorption of three plastic films that are potential candidates as food contact material are investigated.

The use of ethylene vinyl alcohol copolymer (EVOH) resins in high-barrier plastics packaging is discussed by *Schaper*. The types of processing used with EVOH resins and how the use of these resins compare with alternative forms of packaging are reviewed, along with new and existing resin properties and applications.

Techniques used to measure the oxygen transmission rates of packaging films under humid conditions are described by *Pike*. Various methods of humidifying gas streams used in the standard methods for dry gas transmission rate measurements and the controlled humidity "sandwich" method are given. The new Modern Controls' "H-System," designed specifically for this purpose, is also described, along with advantages and disadvantages of each method.

Gyeszly contends that shelf life modeling must be based on the entire food packaging and distribution systems for selecting optimum packaging. A total system approach to modeling shelf life of packaged food products is described. Discussion of the major parameters of the shelf life simulation model includes recommendations for developing product and distribution-specific models. Development of appropriate shelf life simulation models is analyzed mainly from a packaging point of view with consideration of cost.

The paper by *Taoukis, Labuza, and Francis* addresses the reliability of time-temperature indicators (TTI) as food quality monitors under nonisothermal conditions. This study develops an application scheme based on the kinetic parameters of the TTI as well as the food distribution chain which allows for a direct correlation of the TTI response to the food's loss in quality. This is shown to be reliable under variable temperature conditions and should be of benefit to the packaged food industry, especially for refrigerated extended shelf life. Three major types of commercial TTI's were studied, a diffusion-based tag, an enzyme-based tag, and a polymerization-based tag.

Flavor management for food products is important because consumers want food that tastes good, in addition to safety and nutrition. *DeLassus* and *Strandburg* use "flavor" in a broad nontechnical way that includes several human responses to both chemical and physical stimuli. Results from a new experimental technique are used to illustrate the important variables for permeation of flavors and aroma in polymer films. The permeability is separated into its component parts, namely the diffusion and solubility coefficients. A review of physical interactions between food and plastic packaging that can lead to loss of flavor is given.

Matty, Stevenson, and Stanton provide a detailed review of techniques and equipment developed for easy-to-use, reproducible, standardized procedures to evaluate the performance of polymer-based food packages. The paper discusses test results and their relationship to package performance, with a focus on test methods, including equipment and instrumentation, applicable to container seal integrity, lid peelability, and container abuse resistance. The impact of fundamental specimen properties, instrument response limitations, and other factors influencing results is also reviewed.

This volume covers a wide range of topics in the area of food packaging, with applications and test methods that may be useful in all packaging disciplines. It was not intended to be totally comprehensive and the areas discussed are clearly not complete, but should provide the reader the kind of considerations necessary when developing packages for food.

The papers presented here have been successful both in illustrating various problems and in presenting potential solutions. This book should be useful to those in the food industry who develop, design, and test food and food packages. Hopefully, it will serve to stimulate all groups involved to work closely together to provide a safe food supply.

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