

DRYING IN FOOD PROCESSING: AIMS AND METHODS

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Drying is a fundamental unit operation in food processing, defined as the removal of water by evaporation at temperatures below the boiling point to obtain a product with sufficiently low moisture content. This process plays a crucial role in ensuring food preservation by inhibiting microbial growth. In addition to extending shelf life, drying reduces the cost and complexity of packaging, storage, handling, and transport, while also enabling the creation of new product properties.

Despite its benefits, drying is an energy-intensive operation, accounting for a significant portion of industrial energy consumption. A major challenge lies in the high latent heat of water evaporation, which strongly influences process efficiency. Key performance indicators, such as specific energy consumption and energy utilization efficiency, are therefore critical in evaluating and optimizing drying operations. Conventional systems, particularly convective dryers, dominate industrial practice, although they are often associated with relatively low thermal efficiency and limited heat recovery.

Drying methods in the food industry can be classified according to several criteria, including the mechanism of heat transfer (conduction, convection, radiation), mode of operation (batch or continuous), material movement, physical state of the feed, and operating pressure. Convective hot air drying remains the most widely used technique, encompassing equipment such as tunnel, belt, fluidized bed, and spray dryers. Conductive drying methods, including drum and freeze-drying, offer higher thermal efficiency and, in some cases, improved product quality. Radiation-based methods, such as infrared and microwave drying, as well as hybrid techniques, are increasingly explored to enhance energy efficiency and process performance.

This presentation provides an overview of the principles, objectives, and classifications of drying in food processing, with particular emphasis on energy aspects and technological diversity. It highlights the importance of selecting appropriate drying strategies to balance product quality, process efficiency, and sustainability.

Keywords: drying, food, conservation, convective drying, conductive drying, radiation drying