SUSTAINABLE DEHYDRATION OF FRUIT AND VEGETABLES IN CAMPUSES OF ISEL, IPS, IPBeja AND UAlg

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Abstract

This article describes the process of development of a fruit and vegetable dehydrator modular, portable, low-energy consumption and low-cost equipment, working with renewable energy (solar thermal and photovoltaic) that can operate even under unfavourable weather conditions. The design of this equipment, currently in the prototype phase, was born at the request of an agricultural cooperative. The model presented is quite versatile and can be explored in applied thermodynamics and food technology classes of courses, as well as demonstration units after their implementation in the campuses of Lisbon Superior Institute of Engineering (ISEL), Polytechnic Institute of Setúbal (IPS), Polytechnic Institute of Beja (IPBeja) and University of Algarve (UAlg). Its construction on several campuses will allow for interdisciplinary classes and projects. It is intended that this project be oriented towards specific goals of food preservation, plus the transmission of scientific, technical, and technological knowledge.

Introduction

The development of this dehydrator was based on optimizing the dehydration process by improving the factors: time processing, energy efficiency, cost, product flavour and aroma (Baraday et al., 2015). This is achieved by actively controlling dehydration air temperature and air circulation velocity (Boyer and Huff, 2008). The developed equipment optimizes the dehydration process by measuring the ambient temperature and relative humidity at the inlet and outlet air of the dehydrator, allowing at any time through the mixture control system to adjust the operating conditions. The equipment consists in a mobile device, easily moved and placed in the position that best suits the dehydration process, increasing the energy efficiency, and considering the local conditions of the production site. This innovative device plays a crucial role in promoting sustainable practices across the entire food supply chain, and reducing the ecological footprint of food processing and diets (Kendall et al., 2012). This is achieved by

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preserving surplus produce, extending the shelf life of perishable items, reducing food waste. This not only conserves valuable resources but also minimizes greenhouse gas emissions associated with food decomposition in landfills. Additionally, fruits and vegetables dehydration retains their nutritional content (Patel et al, 2013), promoting healthier dietary choices among campus residents, and offering a sustainable and convenient alternative to processed snacks, dehydrated fruit and vegetables contribute to a greener and more mindful approach to eating. Moreover, this device, serves as an educational tool, raising awareness about sustainable practices and the importance of conscious consumption. As students witness the positive impact of renewable energy on food preservation, they become more inclined to embrace eco-friendly lifestyle choices beyond the university setting.

Interdisciplinary classes and projects in campuses

As a demonstration project to be developed on several campuses, it is necessarily a multidisciplinary project that requires interdisciplinary dialogue and collaboration, based on teamwork towards a common goal: adding value to a product from a probable food waste. Such approach makes possible the intervention of different study area, such as agriculture, food, mechanics, instrumentation, management, marketing, communication, design, energy, logistics and chemistry. Additionally, other specific disciplinary areas can be called to participate, such as: mechanical design, electrical design, instrumentation, electronics, product management, communication and brand image, logistics of perishable food, thermodynamics, electrical energy, thermal energy, renewable energies, air conditioning, chemical and food analysis, control instruments, computerization of systems, among others.

Conclusions

A fruit and vegetable dehydrator modular, portable, low-energy consumption and low-cost equipment, working with renewable energy (solar thermal and photovoltaic) that can operate even under unfavourable weather conditions, was presented and described. This equipment, is versatile and can be used as a project for mechanical, energy and food technology classes. Authors have plans to install it in several campuses to be explored a project for mechanical, energy and food technology classes and also as a demonstration project for farmers.

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