



Energy-efficient climate control of a greenhouse in Bucharest, Romania

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Abstract

In southern parts of Europe, a balanced use of both heating and cooling is required to control the greenhouse temperatures throughout the year. Especially, with climate change and increasingly hot summers, the need for efficient greenhouse cooling and humidity control has become more and more important. In this work, we present the status of a project that aims to demonstrate by proof of concept the integration of heat pumps and thermal energy storage in a research greenhouse in Bucharest, Romania. The objective is to convert the current fossil-based energy system of the greenhouse into a renewable and more energy-efficient system to optimize the indoor climatic conditions. This will contribute to a more sustainable operation of the greenhouse with minimized energy usage and reduced CO₂ emissions, while the overall productivity will be enhanced through increased growth of the plants and vegetables. The main challenge of the greenhouse is to provide sufficient cooling during the hot summer months, as the indoor temperature rises to unacceptable levels for the plants during summer. A novel, energy-efficient concept is currently being installed at the greenhouse, comprised of an integrated heat pump system, air handling units, dry coolers, and borehole thermal energy storage (BTES). The main principles of the novel energy concept are given in this presentation.

Keywords: air handling units, BTES, energy efficiency, energy systems, heat pumps