INOPTEP 2023 PTEP 2023

# BOOK OF ABSTRACTS

## VIII INTERNATIONAL CONFERENCE SUSTAINABLE POSTHARVEST AND FOOD TECHNOLOGIES **INOPTEP 2023**

and

## XXXV SCIENTIFIC - PROFESSIONAL CONFERENCE PROCESSING AND ENERGY IN AGRICULTURE **PTEP 2023**

Subotica – Palić, hotel Elitte Palić,
23 – 28. april 2023.

**Publisher / Izdavač**
National Society of Processing and Energy in Agriculture, Novi Sad, Serbia
Nacionalno društvo za procesnu tehniku i energetiku u poljoprivredi, Novi Sad,
Trg Dositeja Obradovića 8
**Co-publisher / Suizdavač**
Faculty of Agriculture, Novi Sad, Serbia
Poljoprivredni fakultet, Novi Sad, Trg Dositeja Obradovića 8
**Editor in Chief / Glavni i odgovorni urednik:**
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**Printed by / Štampa:**
E-publishing PTEP Society
**Edition / Tiraž:** 200
**ISBN:** 978-86-7520-581-4
**E-mail:** ptep@ptep.org.rs
www.ptep.org.rs

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# INTEGRATION OF ROOFTOP PHOTOVOLTAICS AND COGENERATION FOR DECARBONISING THE MARGARINE PRODUCTION PROCESS

*Dušan GORDIĆ, Jelena NIKOLIĆ, Mladen JOSIJEVIĆ, Aleksandar ALEKSIĆ, Vladimir VUKAŠINOVIĆ*
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Although the food industry is moderately energy-intensive, it belongs to industries with significant $CO_2$ emissions due to its scope, potential growth, and energy use. Therefore, it has been identified as one of the crucial factors in the industrial sectors' overall decarbonisation process. The margarine industry and processing of vegetable oils and fats are a fast-growing segment of this industrial sector, characterized by energy-intensive processes, such as cooling, water vapour preparation, and pasteurization. Energy supply (electricity and heat) is one of the essential parts of the technological process that can significantly contribute to the decarbonisation of the entire production process by applying energy-efficient technologies and renewable energy sources. The decarbonisation program can assist the margarine and vegetable oils and fats processing industries in becoming more competitive in the market while reducing their carbon footprint. Along with efforts to reduce $CO_2$ emissions, energy consumption costs are also decreasing. Furthermore, decarbonisation will result in lower future $CO_2$ expenses.

First of all, the global paradigm of industrial decarbonisation implies the electrification of processes, which assumes that facilities will be supplied with more renewable electricity. However, the ability to use renewable electricity is primarily determined by the characteristics of the power system to which the facility is connected. Cogeneration, on the other hand, is one of the most efficient technologies for generating electricity and heat. As a result, the paper proposes a methodology for determining the optimal solution for cogeneration (CHP) and rooftop photovoltaics (PV) for minimising $CO_2$ emissions. The methodology is based on material and energy flow analysis in the manufacturing process and electricity and heat consumption/load profiles. Based on the created consumption/load profiles, technical limitations, and legal regulations, the possibility of installing rooftop PV panels and implementing suitable CHP technology is considered. The proposed methodology is applied and tested on a margarine production facility. The integrated use of CHP and rooftop PV panels could reduce $CO_2$ emissions by up to 71% if the PV panels were installed on the fully accessible roof surface and up to 55.7% if 150 kW were installed in accordance with the new national regulation.

***Key words:*** *food industry, photovoltaic (PV), cogeneration (CHP)*


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