

Application of edge computing to optimise energy efficiency and real-time temperature control in manufacturing processes

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Abstract

In modern agricultural production, there is an urgent task is to improve the efficiency of thermal process control to optimise crop growth and reduce energy consumption. This study presents the development of a system for optimisation of temperature and energy consumption based on edge computing technologies, designed to control thermal processes in real time. The proposed system uses Raspberry Pi microcomputers as nodes, which allows to collect, process and store data directly at the receiving sites. This ensures minimal latency in data transmission and high responsiveness of the system to environmental changes. Microcomputers are integrated with high-precision temperature and humidity sensors. The data from these sensors are processed using specialised software designed for efficient parallel processing of large amounts of data. Local data processing reduces the load on central servers and allows the system to function autonomously, without constant connection to cloud services, which is especially important in agricultural environments with limited network infrastructure. The implementation of the developed technology contributes to improving the efficiency and sustainability of agricultural production, opening up prospects for further development of intelligent management systems in the industry.

Keywords: *edge computing, energy efficiency, temperature control*

References:

1. [Energy Efficiency Improvement in Industrial Processes: A Review of Energy Management Techniques](#)
Sharma A.
2. [Impact of Temperature Control on Product Quality in Manufacturing Processes](#)
Zhang Y.
3. [Environmental Benefits of Temperature Management in Industrial Applications](#)

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22 June 2022, Stavropol, Russian Federation, ISSN 0094-243X

Wang J.

4. [Optimizing Temperature Control for Energy Efficiency and Emission Reduction](#)
Lee S.-H.
5. [Environmental Impact of Temperature Management in Industrial Processes](#)
Chen L.
6. [Advancements in Temperature Management and Their Environmental Benefits](#)
Kumar R.
7. [Advanced temperature sensor technologies for industrial applications](#)
Song Y.,Zhang W.,Chen Z.
8. [Adaptive algorithms in industrial temperature control systems](#)
Miller A.,Gupta R.
9. [Reliable communication protocols for industrial temperature management systems](#)
Garcia L.,Lopez A.,Martinez F.
10. [Software integration strategies for temperature control in industrial environments](#)
Chen J.,Liu P.
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[Engineering Applications of Computational Fluid MechanicsOpen source preview, 2021](#)
DOI: 10.1080/19942060.2021.1984991Copy to clipboard
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DOI: 10.1063/5.0071314