

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
НАЦІОНАЛЬНА АКАДЕМІЯ НАУК УКРАЇНИ  
МАЛА АКАДЕМІЯ НАУК УКРАЇНИ

НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ  
“ПОЛТАВСЬКА ПОЛІТЕХНІКА  
ІМЕНІ ЮРІЯ КОНДРАТЮКА”



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# ЗБІРНИК НАУКОВИХ ПРАЦЬ XVI МІЖНАРОДНОЇ НАУКОВО-ПРАКТИЧНОЇ КОНФЕРЕНЦІЇ “АКАДЕМІЧНА Й УНІВЕРСИТЕТСЬКА НАУКА: РЕЗУЛЬТАТИ ТА ПЕРСПЕКТИВИ”



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*років освітніх традицій*

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reliability (according to norms [1]) and require connection from two independent sources.

The object of the research is the placement of all elements of the electrical network on the object, as well as the relevant regulatory requirements to be followed during the design of the power supply for a multi-story residential building.

During the design of the power supply system, the key is the selection of the optimal location of the power source for electricity consumers. The most advantageous location of the power source (main low-voltage substation, central substation, etc.) is the point where the center of electrical loads is concentrated [2].

If the power source is located in the center of electrical loads, the costs for the power supply system reach a minimum value, as the loads are symmetrically distributed around the center. Proper construction of the electrical power supply scheme, careful selection of the necessary equipment, accurate calculations of electrical loads and conductor cross-sections, and the installation of protection at all levels of the power supply network will ensure ease of operation, as well as a high level of security for the object.

### References:

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### УДК 621.3

## INVESTIGATION OF TRANSIENT PROCESSES IN THE SYSTEM «INVERTER – ASYNCHRONOUS MOTOR» OF THE ELECTRIC DRIVE OF A PUMP INSTALLATION

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In the world, active research is being conducted on the development of multilevel voltage inverters, including three-level ones. The scheme with limiting diodes (or the fixed neutral point scheme) is the most suitable for such converters as it requires fewer capacitive elements and only one DC power source. However, this scheme poses a challenge in controlling the voltage on the input capacitors. Many pulse width modulation (PWM) algorithms proposed in various sources do not address this issue. Some do not investigate the converter's operation under loads with electric motors, which is most commonly used, or focus solely on studying the output voltage spectrum.

Research on the operation of a three-level inverter is highly relevant. Despite the complexity of control due to the large number of semiconductor switches and high voltages, they demonstrate high-quality output voltage. The main advantage of such converters lies in distributing the voltage among the switches, allowing the use of switches with lower voltage but capable of operating at higher switching frequencies, instead of selecting one switch for high voltage.

The research aims to develop a space-vector PWM algorithm, model a three-level voltage inverter using this algorithm, and investigate the inverter's operation under active-inductive load and loads with short-circuited rotor asynchronous motors.

The main research tasks include:

Overview of multilevel voltage inverter topologies and PWM algorithms for their control, as well as justification for choosing a scheme with limiting diodes.

Development of a space-vector PWM algorithm with voltage control on the input capacitors of a three-level inverter.

Investigation of the mathematical model of the converter under active-inductive load and loads with asynchronous motor.

To address these tasks, the following research methods are necessary: analysis of technical literature, especially foreign literature, and the use of MATLAB software packages.

The conducted mathematical modeling has shown that the use of the proposed Space Vector Pulse Width Modulation algorithm allows maintaining the voltage on the capacitors at approximately half the inverter supply voltage level. The results of this study include developed mathematical models of a three-level voltage inverter operating under active-inductive load and a system consisting of a 'three-level inverter – asynchronous motor' with a vector control system.

#### **References:**

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### **ДО ВИКОРИСТАННЯ ГІДРОДИНАМІЧНОЇ КАВІТАЦІЇ В ТЕХНОЛОГІЧНИХ ПРОЦЕСАХ**

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**Актуальність.** Підвищення ефективності технологічних процесів при видобутку й переробки рідких, газоподібних та твердих вуглеводнів пов'язана з використанням енергозберігаючих технологій при їх інтенсифікації. До основних проблем відносяться: зниження дебіту свердловин з видобутку рідких та газоподібних корисних копалин; переробка відходів нафтопереробної