

NEW ENERGY EFFICIENT MODEL OF CONVERTING SYSTEM OF SOLAR PHOTOVOLTAIC STATIONS IN THE LOCAL STRUCTURE OF ENERGY SUPPLY SYSTEM

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The method for constructing of a control system for the power converter of a local photovoltaic station, which allows simultaneously with the energy generating mode of a renewable source to implement a active compensator mode without changing the topology of the power part is presented.

Keywords: *inverter, power active filter, solar photovoltaic station, energy efficiency, energy supply system*

The operation of photovoltaic solar stations in parallel with the power supply system is standardized regarding to the quality of electrical energy at the point of attachment. In local power supply systems, this problem is most acute as a result of the influence not only the solar power plant but also the modes of the consumer's regimes on the quality of electricity [1]. Most of the mains inverters presented in the market for converting equipment of photovoltaic stations are not programmed to solve this complex problem [2]. In our opinion, this is a significant drawback of inadequate use of converting equipment capabilities, since the topologies of the power part of the transistor voltage inverter and the power active filter (SAF) coincider.

The purpose of the work is to create an algorithm for controlling the converter of a solar photovoltaic station of a standard topology, which simultaneously with the function of generating energy from a renewable source to the power supply can support the function of the power active filter-compensating device.

The transformation equipment of photovoltaic solar power plants is usually selected with a specific current and voltage reserve and is calculated for the maximum generation mode of operation corresponding to the maximum of solar insolation for the climate zone where the power plant will operate. For a moderate climatic zone, the maximum of solar insolation is achieved in rare cases, indicating the possibility of additional use of conversion equipment as a filter-compensating device (PAF).

Figure 1 shows a structural scheme of the local power supply system, which includes an array of photovoltaic modules (SB), a main inverter, based on an enhancement DC / DC converter and an NPS inverter, an industrial energy supply

system (ESS) of 380 V, 50 Hz and a load.

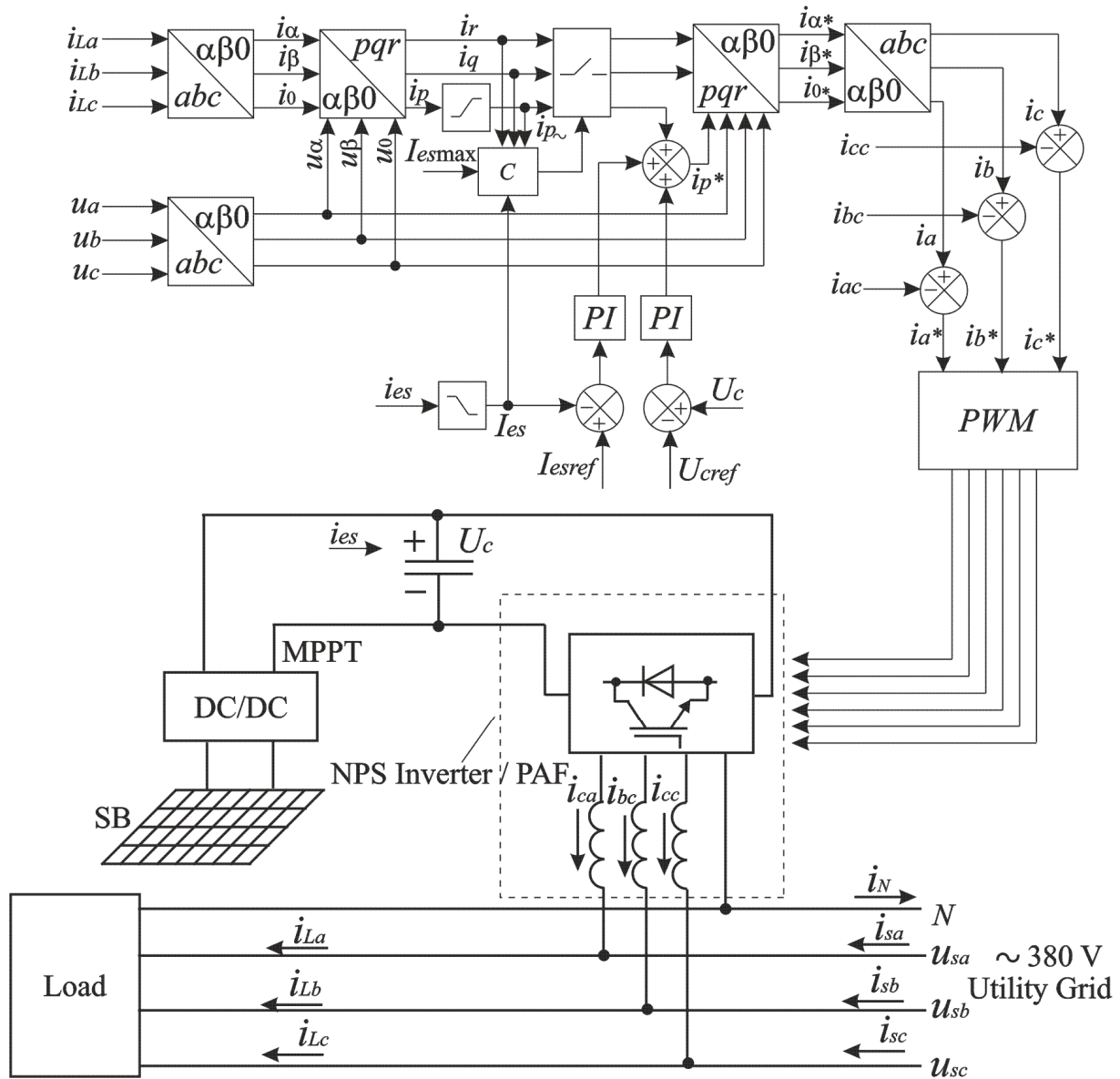


Figure 1 - The structural scheme of the local power ESS

The operation of the NPS inverter is controlled by a vector-based autoregulation system that is characteristic of PAF, synthesized on the basis of the power theory pqr [3]. After consecutive spatial coordinates converting $abc \rightarrow \alpha\beta 0 \rightarrow pqr$ relative to phase load current, as well as filtering of the variable component for the current axis p (i_p), a task is formed according to the currents in pqr coordinates. The calculation of the task at the current (i_p) is supplied with two signals coming from independent regulators, namely the voltage on the condenser of the DC link of the converter and the current of the generation of photovoltaic panels. If the power plant operates in the mode close to maximum generation, the signal to the block of the task is received from only the last regulator, that is, the converter operates as a standard network inverter, giving the energy of the photoelectric station to the industrial ESS.

As soon as inequality is performed

$$\sqrt{I_{es}^2 + I_c^2} \leq I_{esmax} \quad (1)$$

where I_{es} – is the real generation current; I_{sbmax} – maximum generation current;

$$I_c = \sqrt{\frac{1}{T} \int_t^{t+T} (i_p^2 + i_q^2 + i_r^2) dt} \quad (2)$$

current compensator, comparator (C), switches and the task of current compensator adds to the task signal.

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COMPUTER TECHNOLOGIES IN MODERN CONSTRUCTION

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The need to introduce information technology for the development of civil engineering is explained by the requirements for reducing the design and preparation time for the production of new and modernized products, the cost of design and production, and the cost of long-term after-sales service. Today we can notice a strong development of the functionality of computer-aided design, database management systems, project data management systems, automation calculation methods etc.

The process of urbanization of cities has led to the fact that the number of new construction objects is increasing every day. The structures of buildings begin to become more complex, which leads to the complication of calculations of load-bearing structures. Only computers, modern software and specialists who use them for work can solve such a complex and difficult task.

Today, special program complexes have been developed for help engineers for create designs for frame structures, and can even produce ready-made working drawings and schemes. These opportunities of computer technology can significantly speed up and simplify all design work. To install such a program, it is better to seek the help of specialists who can do everything quickly, and most