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**DEVELOPMENT OF INTELLIGENT CONTROL MODELS FOR INTELLIGENT CONTROL SYSTEMS IN ENERGY EFFICIENT SYSTEMS**

In electric power supply systems (PSS), one of the most urgent tasks, by the existing problems, is the reduction of losses during the transmission and distribution of electricity. In particular, many studies have been carried out on the assessment of the effect of the matched load on the efficiency of power transmission lines, and proof of the reduction of losses during electricity transmission due to the maintenance of the PSS line in the matched load mode with the help of phase shift devices (PSD) has been   
obtained [1].

In practice, PSD with mechanical switches of the number of turns on the transformer winding is widely used - that is, through a tap-changer device. Such systems cannot respond promptly to a sudden violation of the power system operation mode (short-circuit, disconnection of power transmission line or transformers, swaying of synchronous machines) associated with a momentary change in the balance of active and reactive power. PSDs, which are controlled by mechanical tap-changer devices, do not have the necessary sufficient speed, since it takes about 5-6 seconds to switch only one position during regulation. The number of switching steps can be 16 or more. The transition to the required level during adjustment can take up to a minute. Therefore, it is advisable to use such devices in cases where the speed of switching and the frequency of such switching do not play a role.

Thus, high-speed semiconductor devices should be the basis of the controlled power line (CPL) technology. High-speed PSDs controlled by switches, built based on power semiconductor devices, allow for a smooth adjustment to the current mode of operation of the PSS, ensuring its stability in transient processes with optimal parameters. However, a limiting factor for the widespread practical application of PSD with modern controls is the high cost of power semiconductor elements. This leads to the limitation of the functional properties of the control tools due to the implementation of minimally necessary operations, as well as the exclusion of some potentially possible functions.

There is an urgent need for the creation and development of the concept of an intelligent power system, that is, an active-adaptive network, which includes PSD control devices that will have high-speed operation and an intelligent control system. This will provide an opportunity to respond instantly to any changes in the operation mode of the power system. Support of the matched load mode in such systems is achieved through the use of FACTS technology devices [2]. Thanks to these devices, the electric network from a passive device of transportation and distribution of electricity turns into an active object, the so-called CPL, which is equipped with modern power electronics devices designed to control processes in the electric power system in real-time. To ensure the maximum efficiency of the power transmission line, an algorithm for the control information system of phase-reversing devices is proposed, and the principle of operation of the control system for CPL has also been developed. In particular, a mathematical (simulation) model of the control information system was developed for the two-chain line in the Matlab&Simulink software environment [3]. Verification of the model was carried out for different operating modes of the CPL.

Based on the above, it is possible to conclude that it is appropriate and necessary to develop new variants of PSD control systems that will ensure the achievement of the required characteristics in the control range, as well as increase the switching speed of the control windings, and improve the mode parameters of the control of transient modes.

The implementation of such systems is carried out taking into account the SMART GRID concept. SMART GRID is a high-tech system, the creation of which is impossible without the introduction of information technologies. They are necessary for PSS to create a stable system of information exchange, optimization, and reliability improvement in electric network management.

**Література**

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