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EFEKTYWNOŚĆ ENERGETYCZNA JAKO KRYTERIUM WALIDACJI MODELOWANIA SYSTEMÓW NAPĘDÓW ELEKTRYCZNYCH DLA POTRZEB WIRTUALNEGO ROZRUCHU SYSTEMÓW AUTOMATYKI PRZEMYSŁOWEJ

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Energy efficiency as a criterion for validating the modeling of electric drive systems for virtual commissioning of industrial automation systems

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ABSTRACT

In the doctoral dissertation, the possibility of implementing industrial electric drive systems models reflecting their energy properties was considered. These models were to be used to validate the correct selection of individual components of electric drive systems.

It was decided to choose the virtual commissioning method due to its more and more common use as one of the stages of the the project realizaztions in industrial automation.

A set of models of individual components of electric drive systems was implemented. These models were created in a form that allows them to be used as a library - they can be used for devices of the same type from different manufacturers. It is only necessary to parameterize a given model, in accordance with the data sheet of the device in question.

The method of selecting the settings of electric drive systems was implemented. The growing interest in the use of artificial intelligence techniques and tools in industrial applications contributed to the selection of a genetic algorithm as a method of searching for settings. The Structured Text (ST) programming language described in the IEC61131-3 standard was used to implement the genetic algorithm.

Three functions of the objective have been proposed - minimization of electricity consumption by the electric drive system, maximization of its efficiency and minimization of electricity losses. A series of experiments were carried out on available research devices - a belt conveyors.

The original achievements presented in the dissertation are the development of industrial electric drive systems component models and their implementation in a virtual commissioning environment in a way that allows their use in projects carried out by ProPoint S.A. Implementation research was also carried out, as part of which the proposed models were verified. In addition, a genetic algorithm was used to search for the settings of these systems in terms of improving their energy efficiency. This algorithm has been implemented in the virtual commissioning environment used, which allows its use without the need to introduce changes to the existing or create a new simulation environment.