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Calculation of the Optimal Parameters of the Electrical Apparatus for the Irrigation System

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Abstract

A current problem in irrigated agriculture is the use of electrical apparatus of a certain class and power. Key factors in selecting electrical equipment for sprinklers include minimizing mass and volume, ensuring moisture protection, and maximizing reliability, efficiency, and operational longevity. Optimizing the design of electrical apparatus can enhance these performance indicators. The paper presents a mathematical model for optimizing a general industrial electromagnetic system based on a comparative analysis method. This method is based on controlled geometric variables, that are independent of electrical parameters. The indicator of the objective function and the ratio of the controlled variables have been obtained. The verification of the mathematical model for finding the optimal parameters of the armour of the electrical apparatus for the sprinkler machine was carried out. The physical models of the electromagnetic systems were constructed according to the geometric dimensions of the real and optimized magnetic starter on the basis of the software solution. The results of the comparative analysis of the distribution of magnetic induction over time were obtained, which allowed the theoretical confirmation of the optimally calculated parameters according to the minimum mass criterion. © 2024 IEEE.

Abstract

Author keywords
Indexed keywords
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Author keywords

electrical apparatus; mathematical model; optimal size; special execution; verification

Indexed keywords

Engineering controlled terms

Agricultural machinery; Electric network parameters; Optimization; Sprinkler systems (irrigation)

Engineering uncontrolled terms

Comparative analyzes; Current problems; Electrical apparatus; Electromagnetic systems; Irrigated agriculture; Irrigation systems; Optimal parameter; Optimal size; Power; Special execution

Engineering main heading

Verification

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