

## ANALYSIS OF FACTORS INFLUENCING THE RELIABILITY INDICATORS OF DISTRIBUTION SYSTEMS IN THE AGRO-INDUSTRIAL SECTOR

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### Introduction and Background

At present, distribution systems in the agro-industrial sector are experiencing a growing number of failures, which undermine operational reliability and have a substantial impact on enterprises involved in the processing and storage of agri-food products. The underlying causes of these failures, as well as the patterns governing their occurrence, are not yet fully understood. However, identifying these factors and assessing their influence on the reliability of equipment used in agro-industrial distribution systems would enable the development of targeted measures to improve operational reliability and mitigate losses incurred by the affected enterprises.

### Methodology

The study relied on graph and matrix theory, probability theory, statistical methods for experimental data processing, linear and nonlinear equation theory, and mathematical modeling, supported by numerical calculations performed in Microsoft Excel, StatGraphics, Curve Expert, and EasyFit 5.5 Professional.

**Results:** At the first stage of the research, the methodological concept of the analysis and processing of experimental refusal data in electrical distribution systems in the agro-industrial sector was developed, depending on the nature of their occurrence and on the influencing factors, which provides the opportunity to calculate and compare reliability indicators for systems with different lengths, regardless of the structural graph and the number of component elements. At the next stage of the research, the regularities of the refusal occurrence were established, conditioned by various influencing factors and distribution parameters, corresponding to Weibull, exponential, log-logistic, and lognormal functions, thereby enabling reliability forecasting of distribution systems with 95% confidence.

### Conclusions and Implications

The results obtained made it possible to identify the regularities of the refusal occurrence, conditioned by each influencing factor individually and the distribution parameters, which permit forecasting distribution system reliability indicators with a 95% confidence level in the agro-industrial sector. It allows the operating services to ensure the reliability of operation and reduce damage to enterprises involved in the pre-processing and storage of agro-food products.

**Keywords:** *agro-industrial sector, distribution systems, influencing factors, reliability indicators*

### References

1. Victor S. Popescu, Sergey V. Vasilevich, Igor S. Kurdov, Tatiana V. Balan, Cristian G. Malai, Onorin L. Volconovici, Viorel V. Rotari. Distributions of refusals in electrical systems from the agricultural sector of Moldova. In monograph: Problems of sustainable development in agriculture including environment protection and alternative energy production as well as biogas. TOM XXVIII, Falenty – Warsaw, Poland, 2022, pp. 86-93. ISBN 978-83-65426-68-0.
2. Popescu V., Racul A., Bodarev G. Reliability index evaluation of electrical distribution systems. In: International Journal of Innovative Research in Science, Engineering and Technology, Volume 4, Issue 6, Florida, 2015, pp. 4229-4232. ISSN 2319-8753.