

Models of residual life forecasting and estimation of risk of power station equipment failures in the conditions of information illegibility in case of disturbance in the Electric Power System (EPS)

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Results.

The complex solving of problems of forecasting of residual life of EPS power stations and subsystems electrical equipment and estimation of risk of power supply reliability decreasing in case of electrical equipment failures is in the conditions of an illegibility, incompleteness of the information and practical absence of the mathematical description of the electric equipment processes with the aim of determining the residual life. Therefore for problem solving of study modern achievements in the field of an artificial intellect, in particular the expert systems, which central element is the knowledge base and the mechanism of an indistinct logic conclusion, were used.

In this study the formation methods and models of knowledge base of expert system of decision-making support on maintenance of consumer power supply reliability are offered and proven. As an integrated indicator the use of risk of infringement of the power supply considering probability of refusal of electric equipment, probability of occurrence of an emergency on one of scenarios, and also losses of economic, material and social character is offered.

In the conditions of the limited amount of the accessible information and absence of the mathematical description of processes in electric equipment the problem decision is carried out on the basis of indistinct models of electric equipment (the switch and the transformer). As entrance linguistic variables of indistinct model of the switch it is accepted a mechanical and switching resource, and as a target variable - subjective probability of refusal of the switch (or the worked resource). For the purpose of increase of reliability of estimations of results on indistinct model of the switch parametrical identification of parameters of functions of an accessory with use of experimental sample has been executed. Comparison of results of calculation of probability of refusal of the switch on indistinct model and real technological refusal has shown high degree of the coincidence confirming adequacy of indistinct model of the switch.

The indistinct model of the post-maintenance conditions of the switch, that allows defining the restoration of the worn out resource after maintenance is developed.

For forecasting of a residual life of electric equipment it is offered the indistinct regression analysis whereby the time changing process of residual life is presented as an indistinct time series which is an ordered sequence of observations over residual life time changing provided that accessory function remains invariable. According to this approach indistinct factors regression models are defined in such a manner that the estimated indistinct output has the minimum indistinct disorder which satisfies the set degree of reliability which is set as a compatibility measure between initial data and regress model. For acknowledgement of adequacy of the developed indistinct regression models of forecasting of a residual life of the power transformer, for instance "ТДН - 10000/110" at Kanivska HYDROELECTRIC POWER STATION there were calculated the residual life with the use of parameters which are defined by the PHYSICAL AND CHEMICAL OIL ANALYSIS, that have shown, that term of exhaustion of a resource of oil isolation of the power transformer makes 4,2 years and is defined on dynamics of change of a tangent of a corner of dielectric losses of oil.

The indistinct model and treelike hierarchical block diagrams of risk factors with which help it is possible to define a technical and economic component of risk at each level of hierarchy, and also is developed for an estimation of risk of operation of an electric equipment of

system of own needs of power stations integrated risk of operation of an electric equipment of EPS subsystems at aggregation of influences of separate groups of parameters, and at unit-by-unit aggregations in the conditions of qualitative and quantitative representation of parameters.

The offered approach for the estimation of probability of occurrence short-circuit failures and electrical equipment failures in the set interval of time with the use of probability-distribution function of electrical equipment failures on the basis of statistical data of a general failures population of the defined type of equipment with specification of individual characteristics of a concrete equipment unit to the supervision moment.

The obtained results reliability has been proven by comparison of estimation of the technical state of switches and transformers which was conducted with the use of unclear models, with the real operating information on Kanivska HYDROELECTRIC POWER STATION, Dniprovska HYDROELECTRIC POWER STATION, and also by calculations for the knot of loading of major industrial enterprise.