MODERN ASPECTS OF CALCULATION AND ANALYSIS OF THE OPERATING REGIMES OF CENTRIFUGAL PUMPS DRIVEN BY INDUCTION MOTORS, WITHIN THE ANCILLARY SERVICES OF THERMOELECTRIC POWER PLANTS

ASPECTE MODERNE DE CALCUL ȘI ANALIZĂ A REGIMURILOR DE FUNCȚIONARE A POMPELOR CENTRIFUGE ANTRENATE DE MOTOARE ASINCRONE, DIN CADRUL SERVICIILOR AUXILIARE ALE CENTRALELOR TERMOELECTRICE

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Abstract: *In this paper, the authors present a systematized methodology for modelling and analyzing the operating regimes of centrifugal pumps as working machines in electric drive systems. For solving, algorithms and calculation programs developed in the Mathcad programming environment were designed. For example, a representative case study was chosen of a condensing electric pump from the own services of a thermoelectric power plant with groups of 500 MW, driven by an induction motor with a squirrel cage rotor of 6 kV. It was thus possible to comparatively analyze two solutions for regulating the flow of a centrifugal pump in terms of energy efficiency.*

Keywords: centrifugal pumps; induction motors; ancillary services; thermoelectric power plants; flow regulation; energy efficiency.

Rezumat: *În această lucrare autorii prezintă o metodologie sistematizată de modelare și analiză a regimurilor de funcționare a pompelor centrifuge ca mașini de*

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Thus the economy at mechanical power is 40.608 % higher than at hydraulic power, due to different efficiencies at the points of the reference system H - Q.

This finding emphasizes the importance of knowing the exact values of the efficiency at the points in the working area of the pump.

4. Conclusions

It emphasized the originality of the solutions chosen by the authors (applicable for any other electric drive system (pump - drive electric motor) of this type), for solving the algorithms for modelling and analyzing the operating regimes of centrifugal pumps seen as working machines in the electric drive systems.

In this sense, the authors designed the calculation programs using the facilities offered by the Mathcad mathematical software package (custom interpolation, providing exact and precise numerical values, the coordinates of the maximum point of the graphically represented characteristics, solving linear systems of *n* equations with *n* unknown etc.) combined with those of appropriate customized graphically assistance (Cartesian representation, 3D graphics for real functions of two real variables, Parametric functions, etc.).

The comparative analysis of the flow control solutions of a centrifugal pump in terms of energy efficiency, highlighted the need and importance of accurately determining the efficiency values at the pump operating points. Thus, the authors consider it appropriate and propose as a further direction of research, the use of a more reliable procedure for evaluating the efficiency of the pump by interpolating it with polynomial fractions.

This type of analysis provides the primary data necessary to take measures to reduce the consumed power (hydraulic, mechanical required at the pump shaft), allowing a functional-constructive optimization of the pump-drive electric motor assembly and thus improving its energy efficiency.

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