

## PECULIARITIES OF COMPUTER DESIGNING OF THE ROTORS WITH VARIABLE PARAMETERS IN DYNAMICS OF VARIOUS PURPOSES

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The analysis of literary sources and other information materials proves that since the existence of rotors there has been an abrupt problem of creation of designs of rotors with the possibility of change of the basic geometry parameters in dynamics. It is conditioned with the fact that rotors with fixed pitch are not optimal for all stages of operation of units of various purposes. The solution to this problem is possible only by use of the variable geometry rotor (VGR) due to the possibility of simultaneous change of the rotor diameter and also setting angle and twist of blades in dynamics.

As a result of manufacture and tests of the rotor demonstration model with variable geometry parameters in dynamics we have proved that, for example, for aviation the use of VGR enables especially effective optimization of flight of planes with vertical takeoff and landing (VTOL) providing maximum diameter and minimum twist in the hover mode and contrary minimum diameter and maximum twist during cruise flight. Particularly, during varying of the rotor diameter from 4,1 to 5,6 m and blade twist within it is possible to increase the aircraft payload 1,6 times or to increase the flight speed 1,4 times or accordingly to reduce the fuel consumption.

For wind energy installations especially with big powers the use of the VGR enables to widen the range of maximum values of efficiency of the setting during the change of the wind speed in big range from 3 to 20÷22 m/sec and also to provide the workability of the setting at those high speeds of the wind (22÷35 m/sec.), at which the existing nowadays settings are unable to work. This problem became especially topical after the accident in Fukushima, Japan. These events make the leaders of all the leading countries of the world search for possibilities in order to change maximum the part of nuclear energy with other types in the general energy balance. For nowadays for this purpose, unfortunately, there is no more effective method than wind energy by economic and ecological criteria and also potentially mastered volume of energy.

The conducted preliminary aerodynamic and economic calculations prove that by means of the design developed by us it is possible to increase the annual volume of the worked out energy of each wind station maximum by 100%.

In the presented work will be analyzed various versions of developed designs of rotors indicating their advantages and on the basis of the conducted aerodynamic tests of existing models recommendations have been issued for effective use of each version in these or those concrete fields of engineering.

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Especially, the effects of the variable parameters, such as the crack parameter, the rub parameter and the bearing parameter, are analyzed respectively. The results show that the effects of crack and rub-impact are not their linear summation but their coupling. A dynamic model is established for rubbing non-linear rotor system, and dynamics characteristics of the rubbing rotor based on numerical calculations are analyzed. The analysis shows that besides periodic and quasi-periodic vibration, abundant chaotic motions and bifurcations occur in the system. A computer simulation of the axial and radial vibrations caused [Show full abstract] by ball passage, as well as those generated by an important class of defects in ball bearings is presented. Table 4.1: Parameters of a locally optimal lifting rotor in hover.65 Table 4.2: Parameters of a globally optimal lifting rotor in hover .65. v. Acknowledgments. For the limiting case of the optimum rotor in hover, the compact form leads to closed-form expressions for both contraction ratio and pressure distribution in the far wake. This report also gives a formal proof that the Betz inflow distribution results in the maximum figure of merit, and it further demonstrates that some approximations used in earlier actuator-disk momentum theories have been inconsistent. He treated both two-bladed and four-bladed rotors at various inflow angles. The results agree nicely with computations based on Prandtl's. As a result of production and tests for various designs of the screw's demonstration model with changeable geometrical parameters in dynamics, it was proven that, for example, for aircraft use the WHIG gives the chance of especially effective optimization of aircraft flight in vertical takeoff and landing (SVVP), ensuring the maximum diameter and the minimum twist in the hanging mode and vice versa, the minimum diameter and the maximum twist at horizontal flight. Turmanidze R, Kervalishvili P, Popxadze G. (2018). New Designs of Rotors with Variable Geometry Parameters in Dynamics and Their Effective Use in Aviation and Wind Energy. In F. Kongoli, A. G. Mamalis, K. Hokamoto (Eds.), Sustainable Industrial Processing Summit SIPS2018 Volume 4. Mamalis Intl.