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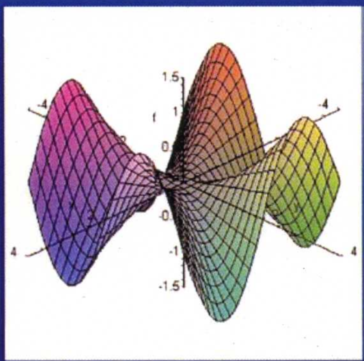


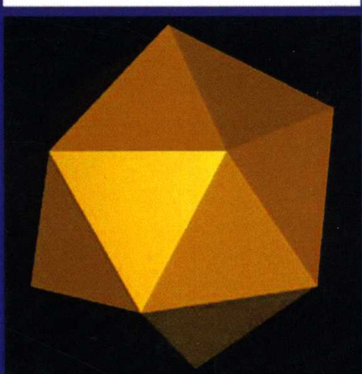

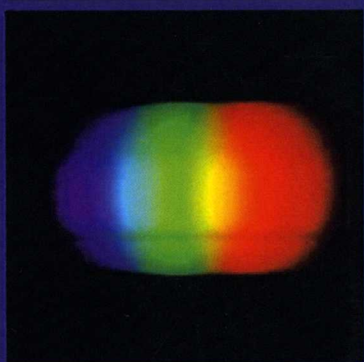

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Definition of aerodynamic characteristics wind turbine to Darrieus of system troposcino

Abstract: Recently the majority show interest in connection with a number of merits to vertically-axial wind turbine type to Darrieus. It is possible to tell that age such wind energy installations of 25-30 years whereas others types wind turbine (sailing, propeller) have seriously started to study almost 1,5 centuries. The theory of these wind turbine with sufficient completeness are resulted in known E. M.Fateyev's monograph.
In the present to article results of a theoretical substantiation for one of design kinds wind turbine are stated Darrieus - systems troposcino. This constructive form of the device to Darrieus becomes more and more popular. The general theory is constructed, almost all constructive and aerodynamic characteristics (linear speed, carrying power, front resistance are defined; wind power operating ratio; the moment of rotation of the turbine) this device. Thus, attempt to put basic bases of the theory of devices to Darrieus of system troposcino is made. This report shows main theoretical principles of troposkino wind-turbine. Theoretically were determined dynamical characteristics of the wind-turbine, such as: rotation moment, power, useful wind energy coefficient and physical model of the plant. The theoretical results were compared with well-known experimental data.
Key words: aerodynamic characteristics, wind turbine, wind turbine to Darrieus, system troposcino.

Introduction

The form troposcino (see Fig. 1) is rather close to a parabola described by the equation

$$x = r = r_m - \frac{9z^2}{16r_m} = \frac{3}{8}H - \frac{3}{2}\frac{z^2}{H}, \qquad (1)$$

where $r_m = \frac{3}{8}H$ – the maximum radius of rotation of the turbine (in considered by us of a design), - height. Therefore (1) it is possible to present the formula in a kind

$$r = r_m\left[1 - \left(\frac{z}{H/2}\right)^2\right]. \qquad (2)$$

In case of the turbine with direct blades "r" does not depend on "z" and $r_m = r_0$.

The area of the window formed in midlives metrically located pair of blades, is the area m sections of a surface of rotation of the turbine and is equal

$$F = \frac{4}{3}r_m H = \frac{H^2}{2}. \qquad (3)$$

Let's find total length of 2 blades. As it is known, the length $L_{1,2}$ of a curve on $[z_1, z_2]$ a piece is defined by the formula $L_{1,2} = \int_{Z_1}^{Z_2}\sqrt{(dx)^2 + (dz)^2}$. From here length of both blades is equal:

$$2L = 4\int_0^{H/2}\sqrt{1 + \left(\frac{dx}{dz}\right)^2}dz = 4\int_0^{H/2}\sqrt{1 + 9\frac{z^2}{H^2}}dz = 2\left[\frac{H}{2}\sqrt{1 + \frac{9}{4}} + \frac{H}{3}\ln\left(\frac{3}{2} + \sqrt{1 + \frac{9}{4}}\right)\right] \approx 2,6H. \qquad (4)$$

