HELICAL TURBINE FOR AEOLIAN SYSTEMS AND MICRO-HYDROSTATION

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Abstract: According to the wind cadastre existing in the Republic of Moldova and the development priorities of the wind energy conversion systems, which recommend the development of small power electric-energetic plants (approximately 3 – 5kW/h) for private consumers, the utilization of efficient working parts is crucial. According these rigors a helical wind and water micro turbine is proposed.

Key words: helical turbine, wing profile.

1. ELABORATION OF MATHEMATICAL MODEL FOR A HELICAL TURBINE

Knowing the aerodynamic characteristics is highly important for the design of the optimal wing profile of helical rotor and setting some constructive parameter values which can make efficient its functioning at usage conditions' variation and various wind speed. The design of the helical turbine (Figure 1) includes axis *1* where blades *2* are stiffly fixed on the constant pace helical line. The wing profile (Figure 2) is characterized by its blunted foreside and sharp backside. Its central line is the geometric place of circuit centres inscribed in the profile.

The main geometric parameters of the profile are:

a) relative thickness of the profile $\vec{c}$, which was determined as the relation of the peak thickness of the profile $\boldsymbol{c}$ towards the chord length $\boldsymbol{b}$, $\vec{c} = \boldsymbol{c} / \boldsymbol{b}$;
b) relative hollow $\vec{f}$ which was determined as the relation of peak bending-deflection of the axial curve f towards the chord length $\boldsymbol{b}$, $\vec{f} = f / b$;
c) the camber, which was determined through the bending angle of the central line $\boldsymbol{\varepsilon}$, that is the angle between the tangent lines at the central line

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of the profile in its foreside and backside.

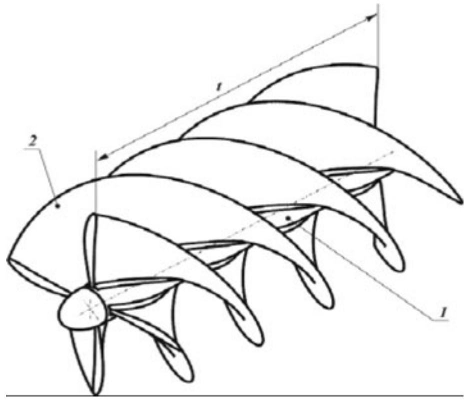

Figure 1. Helical turbine

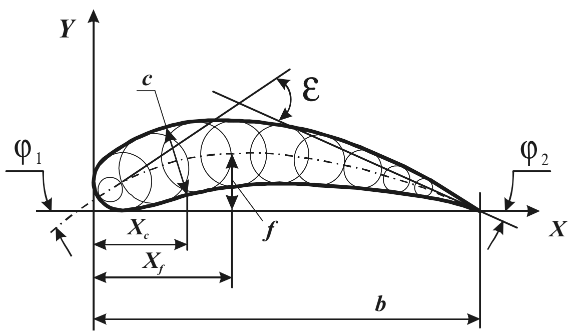

Figure 2. Wing profile

Positions $\vec{c}$ and $\overrightarrow{f}$ were determined through the relative abscissas: $\vec{x}_c = x_c / b$ and $\vec{x}_f = x_f / b$. The converse position of the profile in the reticule is characterized by pace ***t***, position angle ***Θ*** (the angle between the chord of the profile and the flank of the reticule), and angles φ_1 şi φ_2 between the tangents at central line of the profile in its points and the flank of the reticule. The relative pace of the reticule was determined by the relation of pace ***t*** towards the chord length ***b, t = t/b***. The reticular density, which is the inverse value of the relative pace, was determined from the relation $\tau = 1 / \vec{t} = b / t$.