Theoretical and experimental investigations to define optimal parameters of the straight-flow turbine for non-dam hydro power station

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In the article, there are theoretical and experimental investigations presented with regards to determination of optimal parameters of the straight-flow turbine for non-dam hydro power stations.

The goal for conducting theoretical and experimental investigations is to increase electric power of the hydro turbine.

The most optimal angle of attack of the flow direction at the inlet has been calculated. Accordingly, the results of velocity, pressure, lift and drag forces as well as lift and drag coefficients along the blade have been received. Also, hydro turbine’s work with non-rotating and rotating shaft modes have been taken into account. The achieved results executed in 2D and 3D simulation software modes allowed visualization of the hydro turbine performance through depicting arrows, streamlines, contours, surfaces and line graphs.

The calculations with regards to incompressible liquids were measured with the help of COMSOL Multiphysics and ANSYS Fluent software packages through application of Direct Numerical Simulation (DNS) and K-epsilon methods on the base of Navier-Stokes equations.

Changing water discharge through a ball valve, the amount of the rotation of the hydraulic turbine rotor was determined using a tachometer. The produced electric power due to the rotation of the hydraulic turbine rotor in minutes is calculated according to Ohm's law.

**Key words**: renewable energy sources (renewables), hydro turbine, Navier-Stokes equations, COMSOL Multiphysics, ANSYS Fluent