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EXPERIMENTAL AND CFD INVESTIGATIONS ANALOGY FOR WIND TURBINE EFFICIENCY USING COMMERCIAL SMALL FAN BLADES

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ABSTRACT

To carry out Comprehensive Experimental, Analytical and Numerical investigations with the Commercial small Fan Blade Physical models to find Efficiency of Energy conversion based on Energy Possessed by the rotating fan blades. Explained with Analytical Reasons and worked with Computer Numerical Fluid Dynamics calculations for both useful energy produced and energy wasted by the running Physical actual commercial fan blades are completed for Ten Individual small Fan Blades. The whole aim is by analyzing the Fan Blade Geometry with their Theoretical and Experimental Performance for a Possible actual Efficiency of Energy utilization by every one of them. A Fan Blade is a Component in a Fan which is used here as a Turbine Blade and which can convert energy from the moving air into another useful form of rotating mechanical kinetic energy. Physical models of the fan blades are held in front of a constant velocity air flow source which a fan and various experiments are conducted using the commercial fan blades having different solidity ratio, blade angle and diameter of rotor and Tip width of the blades. For the Experimental study a Noncontact Tachometer is used to measure the maximum speed of rotation of individual fan blades in r/min when they are actually rotating like wind turbine blades while extracting energy from the Constant Air Flow. The energy possessed by the running rotors and their efficiency of energy conversion are calculated by suitable equations and results are found to be matching with result of CFD Analysis.

KEYWORDS: *Fan Blade, Numerical Fluid Mechanics, Digital Tachometer, CFD Computerized Fluid Dynamics*

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