# Combined Windmill and Wind-turbine Blades Wind-Machine


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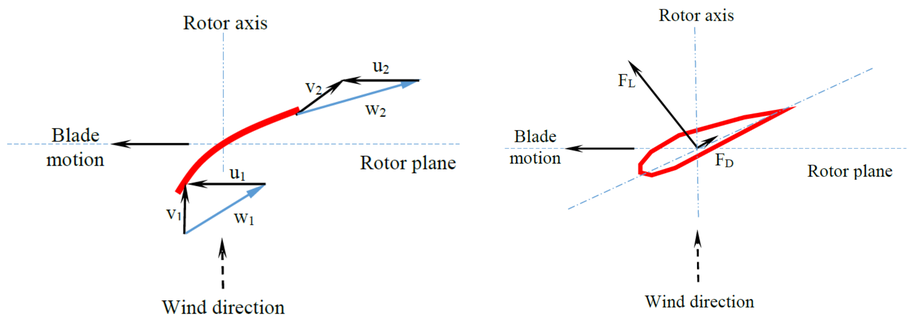
CASE LAB.

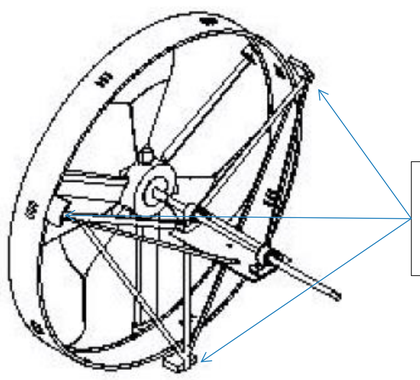

## Abstract

Nowadays, wind energy plays an important role as the promising renewable energy in many countries worldwide. There are two types of wind machine, windmill and wind-turbine. Actually, windmill require lower wind speed than wind-turbine. Many cases of wind turbine failure were caused by high speed wind or storm, they collapse from blade crashing or hitting the tower. This research aims at proposing a novel combined windmill and wind-turbine blades (CWTB) machine for mechanical power generation purpose for low wind speed location. The test results demonstrated that CWTB can be operated at low wind speed with wider range of wind speed with wider range of power output. In addition, with the stronger structure and a new simple efficient brake system, the proposed wind machine will has more enduring than the conventional one due to it will never collapse because the blade hitting the tower.


## Introduction

Nowadays, two major issues which substantially affect on all lives on the earth are the energy crisis and environment problems. One of the best ways to simultaneously address these serious problems is replacing the conventional fossil-energy based systems with the renewable-energy based systems. Wind energy plays an important role as the promising renewable energy in many countries worldwide. Wind speed are proposed to feasibility assess the potential of wind energy utilization for any location. There are two types of wind machine which extract energy from an air flow and convert it into useful works, windmill and wind-turbine, they work on the different principles as shown in above figure. Owing to their working principles and structure, therefore they serve different purposes as aforesaid and have different advantages. Actually, windmill require lower wind speed than wind-turbine. Almost all wind turbines are traditional horizontal axis wind turbines. There are many sources of risk for the wind machine failure, many cases of turbine failure were caused by high speed wind or storm. Regarding the safety and endurance of wind machine protecting the collapse from blade crashing or hitting the tower due to strong wind or storm. This research aims at proposing a novel combined windmill and wind-turbine blades (CWTB) machine for mechanical power generation purpose for low wind speed location. CWTB can be operated at wider range of wind speed with wider range of power output and has the stronger structure. In addition, with the stronger structure and a new simple efficient brake system, the proposed wind machine will has more enduring than the conventional one due to it will never collapse because the blade hitting the tower.



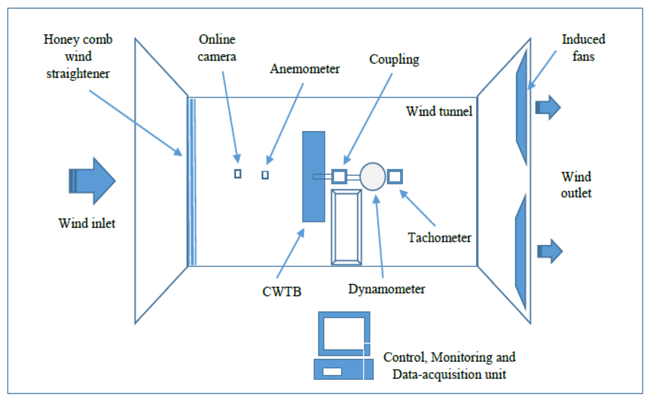
Simple 3-point static brake pad

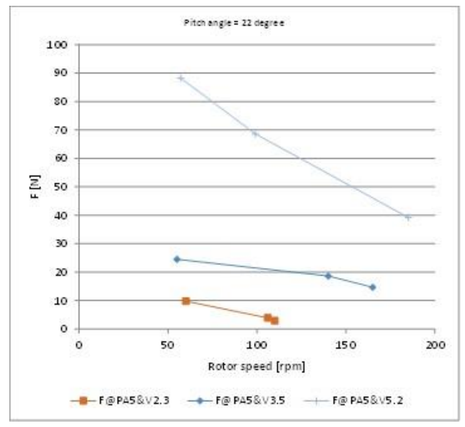
IP STATUS: The application is in approval process (application no. 1601007393)

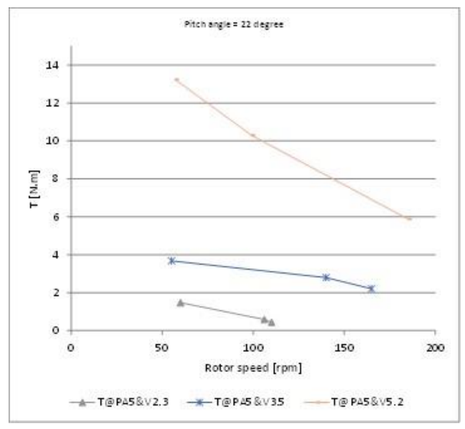
## Novelty & Featured of CWTB

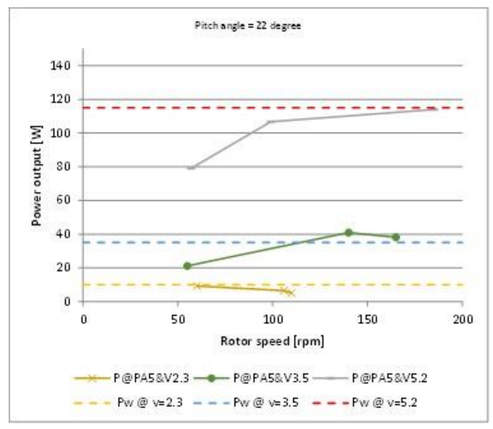
- CWTB is a novel innovation and outperforms the conventional wind machine. The power output is close to the theoretical value at the same swept area.
- CWTB has likely cylindrical structure, therefore, its structure is stronger or more durable than the conventional one.
- CWTB has more effective area and the turbine-blade can be designed for constant-width, thus the specific power output can be increased.
- CWTB can be started and operated at low wind speed with wider range of wind speed with higher power output, thus the investment with short payback previous would be achieved.
- CWTB has a new simple brake system at the blade tip (more efficient than the conventional brake system), it will never collapse because the blade hitting the tower.
- CWTB can be localized fabricated with the available materials from the local markets.

## Performance Test of CWTB




The experimental results reveal that, at a very low wind speed of 1.4 m/s, the proposed wind machine could not be started for any blade pitch angle. At low wind speed of 2.3 m/s, the proposed wind machine was started when the blade pitch angle was adjusted to be 15 degree. As shown in Fig. 8, the experimental results demonstrate that the proposed wind machine will outperform when the best blade pitch angle of 22 degree. It can be seen that, for low wind speed level (3-5 m/s), the proposed wind machine can generates the mechanical power output very close to the wind power input and have a good trend for higher wind speed.


**Bibliography:** Boonrit PRASARTKAEW received his D.Eng. in Energy from Asian Institute of Technology (AIT), Thailand, in 2011. He is currently an Assistant Professor at the Faculty of Engineering, Rajamangala University of Technology Thanyaburi, Thailand. His research interests include solar energy, combustion, and thermal driven refrigeration systems.