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The Wind Energy apply to Water Pumping in Isolated Place

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Abstract. The stead-state analysis of Wind Energy Conversion Systems, consisting on windmill, synchronous generator, transmission line and induction motor driving a centrifugal pump is developed.

The performance of the system operating at variable speed with a flux control is examined using mathematical models and digital simulation. The control scheme is proposed and tested in laboratory and a test center to compare field results with simulation results.

Key words

AC-DC power converter, PWM rectifier, induction motor drive, synchronous generator.

Nomenclature

a - Coefficient from laboratory
b - Constants coefficients
E_1 - Force electric driving
f - Frequency
Kg - Generator constant
Ptot-motor - Total motor power
Pcobre rotor-motor - Copper loss
Ppump - Power in the axis pump
Pturbine - Power in the turbine axis
p - Pole number
q_1 - Stator phase number
Rturbine - Turbine ray
s - Induction motor slip
Tm - Induction motor torque
Tpump - Pump torque
Tturbine - Wind turbine torque
Vf - Generator field voltage
Vg - Generator voltage
Vm - Induction-motor voltage
vs - Synchronous velocity
vr - Asynchronous velocity
Vv - Wind velocity
Φ - Magnetic flux
λ - Velocity relation
u - Wind speed value subject to the disturbance
u_0 - Average wind speed
n - Is the kind of the mechanical eigenswing excited in the rotating wind turbine
A_n - Magnitude of the eigenswing n
ω_n - Eigenfrequency of the eigenswing n
Ve - Sinal no circuito de disparo dos scr's.
α - thyristor firing angle

1. Introduction

In this paper is shown a work developed in the Federal Paraiba University in Campina Grande City in Brazil as reference to master thesis.

This work is the stead-state analysis of a Wind Energy Conversion Systems, consisting of a windmill, synchronous generator, transmission line and induction motor driving a centrifugal pump where the performance of the system in variable speed was examined across mathematical models and digital simulation when a flux control was used

The control scheme was proposed and tested in laboratory and a test center was used to compare with simulation results.

2. Proposed System

The proposed system of "wind energy applied for water pumping in isolated place" had the first one objective make an analysis of wind energy system where was developed an automatic voltage device to control the field current of a generator to keep the maximum power transfer to electric motor pump.

This requires that the generator output voltage divided by line frequency is constant, V_g/f. Through this control was achieved the maximum transfer of power in this study pumping of the water.