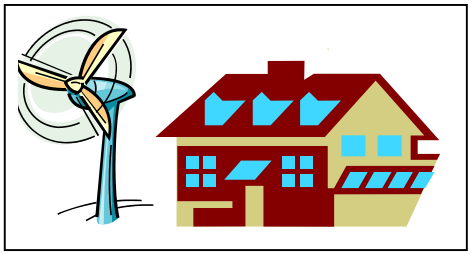
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"State-of-the-Art Power"

M E M O R A N D U M

TO: *WindDrive* ™ Development Group
FROM: C. Radcliffe, Controls Group Supervisor
DATE: January 18, 2010
SUBJ: 1st Order Models for Wind Power Plant Development Design and Testing



1. The Residential Wind Power Development Group is currently in the first phase of design, development, and testing of a new residential wind powered electric generator - the *WindDrive* ™™. The goal of this project is to provide a new standard in residential wind powered electric generator performance and efficiency for the 21st Century. This new wind powered generator should provide 30% better energy conversion efficiency over currently available products in the marketplace. The new design should provide a 150,000 hour median life before failure and provide a significant improvement in its dynamic response to load changes. The wind powered electric generator will incorporate whatever state-of-the-art materials and techniques are required to achieve the above goals..

2. This week the group will experimentally verify the system response of a first-order, linear, time-invariant, dynamical system.

You will operate an armature controlled DC servomotor, which behaves as a first-order system when the armature voltage 'e_a' is the input and the angular speed 'ω' is the output. You will observe the change in system response as the system parameters (Amplifier Gain 'K_a' and Moment of Inertia of the motor shaft 'J') are varied.

This experimental verification will help you understand the physics of the system and how it leads to a transient response that is well approximated by a first order model. Many such "1st order" systems exist in power generation systems like the *WindDrive* ™. Examples include the heat transfer properties and generator speed dynamics of the system.

In reporting the results of your investigation this week, you should specifically focus on a discussion of where this modeling technology could be applied to the analytical design of our new residential wind powered electric generator.