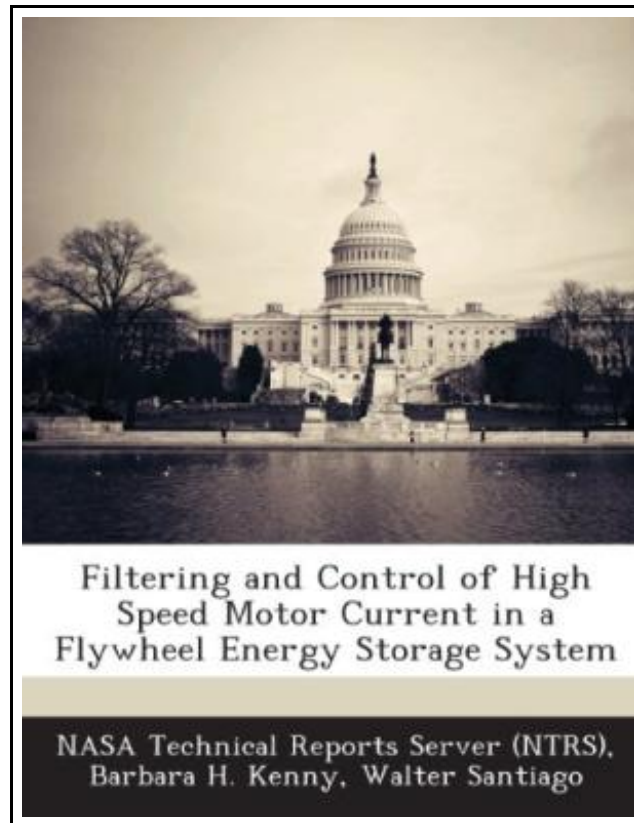


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(Rebecca Bechtelar)

FILTERING AND CONTROL OF HIGH SPEED MOTOR CURRENT IN A FLYWHEEL ENERGY STORAGE SYSTEM



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BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 24 pages. Dimensions: 9.7in. x 7.4in. x 0.1in. The NASA Glenn Research Center has been developing technology to enable the use of high speed flywheel energy storage units in future spacecraft for the last several years. An integral part of the flywheel unit is the three phase motorgenerator that is used to accelerate and decelerate the flywheel. The motorgenerator voltage is supplied from a pulse width modulated (PWM) inverter operating from a fixed DC voltage supply. The motor current is regulated through a closed loop current control that commands the necessary voltage from the inverter to achieve the desired current. The current regulation loop is the innermost control loop of the overall flywheel system and, as a result, must be fast and accurate over the entire operating speed range (20, 000 to 60, 000 rpm) of the flywheel. The voltage applied to the motor is a high frequency PWM version of the DC bus voltage that results in the commanded fundamental value plus higher order harmonics. Most of the harmonic content is at the switching frequency and above. The higher order harmonics cause a rapid change in voltage to be applied to the motor that can result in large voltage stresses across the motor windings. In addition, the high frequency content in the motor causes sensor noise in the magnetic bearings that leads to disturbances for the bearing control. To alleviate these problems, a filter is used to present a more sinusoidal voltage to the motorgenerator. However, the filter adds additional dynamics and phase lag to the motor system that can interfere with the performance of the current regulator. This paper will discuss the tuning methodology and results for the motorgenerator current regulator and the impact of the filter...

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