



# 2<sup>nd</sup> Advanced Optical Metrology Compendium

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## Advances in control of power electronic converter connected drive and generation systems

Nowadays, a large number of different power electronic conversion systems are being designed. Most of them are based on power electronic converters. These converters are widely used to create highly efficient conversion systems. Among others, these converters are used in microgrids, distribution grids, and transportation infrastructure, generating new technology applicable to renewable grid integration, efficient power transmission and distribution, electrical recharging systems for EV/HEV vehicles, energy management, etc.

The performance of power electronic converters, and the systems containing them, are strongly influenced by the type of control algorithm and the hardware used to execute it. Then, the design of control strategies that enables the achievement of high performance systems is an important issue for industrial applications.

This special issue presents five papers introducing new control algorithms for attaining more efficient and/or reliable power electronic conversion systems.

In the first paper, “The Output Performance of High Power Quality Three-Phase to Single-Phase AC Power Generation System Based on Open-Winding PMSG for Standalone Power System”, a three-phase to single-phase direct AC power generation system based on the open-winding permanent magnet synchronous generator (PMSG) with the dual-inverter is proposed for the standalone power system. A cascade control is proposed and in the inner-loop currents are fed back and compared with current references. These references are obtained from DC bias voltage and root mean square values of the single-phase power errors, where references are calculated for satisfying a power balance.

In the second paper, “A Novel Digital-Signal-Processor Based Maximum-Power-Point Tracking Control Design for a Vertical-Axis Wind-Turbine Generation System Using Neural Network Compensator”, a novel algorithm based on neural network technique is introduced for maximum-power-point tracking algorithm of a vertical-axis wind-turbine generation system. This algorithm is implemented in a digital signal processing chip.

A robust grid voltage sensor fault-tolerant control for single-phase two-level rectifiers is introduced in the third

paper, entitled “Grid Voltage Sensor Fault-Tolerant Control for Single-Phase Two-Level PWM Rectifier”. In order to build the sensor fault-tolerant controller, an unknown input observer is designed for a model that includes the information of the grid voltage sensor fault. Then, observer gains are designed via H-infinity optimization.

In the fourth paper, “Implementation of a DSP-Based Speed-Sensorless Adaptive Control for Permanent-Magnet Synchronous Motor Drives with Uncertain Parameters Using Linear Matrix Inequality Approach”, a linear matrix inequalities approach is used for designing a speed sensorless adaptive control scheme for a permanent-magnet synchronous motor drive. In this way, a drive with good performance in the presence of varying parameters is obtained.

Finally, the fifth paper, “Improved Coordinated Control for TCSC and Generator Excitation,” proposes the coordinated passivation control for a thyristor controlled series compensation. The stability of the control scheme is based on the passivity properties of dynamical systems. The control scheme includes an adaptive sliding algorithm to reject parameter uncertainties. The paper shows that the proposed control scheme has strong robustness, good disturbance attenuation and transient performance.

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