CONTINUING the work initiated in the February 2005 issue of the IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, it is my pleasure to now present this “Special Section on Modern Rectifiers—Part II.”

While Part I was dedicated to single-phase rectifiers, Part II is mainly dedicated to three-phase topologies.

Most of the electrical energy is generated, distributed, and used in three-phase form and, for this reason, three-phase rectifiers are of very high importance and interest. In three-phase applications, the challenges for modern research in rectifiers remain the same: reduction of input current harmonics, improvement of power factor, increase in efficiency, reduction of costs and, when necessary, allowance for reversion of power flow.

The papers in this “Special Section on Modern Rectifiers—Part II” are grouped into the following main categories.

I. CONTROL STRATEGIES

These papers:

- “Continuous and Discrete Variable-Structure Controls for Parallel Three-Phase Boost Rectifier,” by S. K. Mazumder
- “Steady-State and Dynamic Study of One-Cycle-Controlled Three-Phase Power-Factor Correction,” by G. Chen and K. M. Smedley
- “Complex State-Space Modeling and Nonlinear Control of Active Front-End Converters,” by R. P. Burgos, E. P. Wiechmann, and J. Holtz
- “Implementation Issues of a Fuzzy-Logic-Based Three-Phase Active Rectifier Employing Only Voltage Sensors,” by C. Cecati, A. Dell’Aquila, A. Lecci, and M. Liserre
- “A Voltage-Sensorless Control Method to Balance the Input Currents of a Three-Wire Boost Rectifier Under Unbalanced Input Voltages Condition,” by S. Chattopadhyay and V. Ramanarayanan
- “A Novel Control Concept for Reliable Operation of a Three-Phase Three-Switch Buck-Type Unity-Power-Factor Rectifier With Integrated Boost Output Stage Under Heavily Unbalanced Mains Condition,” by M. Baumann and J. W. Kolar

present different control methods like discrete control, fuzzy logic, one-cycle control, and nonlinear control using complex state-space modeling. Some of these papers study the behavior of rectifiers with unbalanced input voltages condition.

II. PULSEWIDTH-MODULATION (PWM) RECTIFIERS WITH ACTIVE FILTERING

These papers:

- “Active Filtering Function of Three-Phase PWM Boost Rectifier Under Different Line Voltage Conditions,” by M. Cichowlas, M. Malinowski, D. L. Sobczuk, M. P. Kazmierkowski, P. Rodríguez, and J. Pou
- “Application of a Sinusoidal Internal Model to Current Control of Three-Phase Utility-Interface Converters,” by S. Fukuda and R. Imamura

discuss the addition of the active filtering function to three-phase PWM boost rectifiers.

III. SOFT SWITCHING IN A PWM RECTIFIER

The use of soft switching in a PWM rectifier, reaching high power factor with reduced conduction losses, is presented in:


IV. PWM RECTIFIERS IN AUTOMOTIVE APPLICATIONS

Some interesting operation issues of a PWM rectifier in automotive application are reported in:


V. NEW TOPOLOGIES

These papers:

- “Three-Phase Single-Stage Four-Switch PFC Buck–Boost-Type Rectifier,” by V. F. Pires and J. F. Silva

present very creative circuits and concepts, like the “electronic smoothing inductor,” to reach high performance in the rectification process.

VI. THREE-LEVEL RECTIFIERS

These papers:

- “A New Control Strategy for Neutral-Point-Clamped Active Rectifiers,” by M. Marchesoni, P. Segarich and E. Soressi
- “Resonances in a High-Power Active-Front-End Rectifier System,” by J. R. Rodríguez, J. Pontt, R. Huerta, G. Alzamora, N. Becker, S. Kouro, P. Cortés, and P. Lezana

discuss different operation and control aspects of three-level rectifiers for low- and medium-voltage applications. In addition, one of the papers evaluates the benefits of using three-level rectifiers instead of two-level rectifiers for low-voltage applications.
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