01 Mar 2004

Power Quality Enhancement Using Custom Power Devices [Book Review]

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Recommended Citation

M. Crow, "Power Quality Enhancement Using Custom Power Devices [Book Review]," *IEEE Power and Energy Magazine*, vol. 2, no. 2, pp. 50, Institute of Electrical and Electronics Engineers (IEEE), Mar 2004. The definitive version is available at https://doi.org/10.1109/MPAE.2004.1269618

enhancing power quality

improving quality with custom devices

IN THIS ISSUE WE PRESENT reviews of two books on two different topics. We lead off with a book on custom power devices for power quality enhancement. The second review looks at a book that discusses electric power transformer engineering.

Power Quality Enhancement Using Custom Power Devices

By Arindam Ghosh and Gerard Ledwich. Published by Kluwer (Power Electronics and Power Systems Series), 2002. ISBN: 1-4020-7180-9, 460 pages including index.

This book provides a comprehensive overview of power quality events, power quality analysis methods, and new solid-state-based controllers. Each chapter in the book can be used independently or several chapters can be taken together for a short tutorial work in a specified area. This book is best utilized as a reference on the subject. If used as a course text, it is best suited for a graduate-level course due to the wide range and depth of material covered. One very attractive feature of this book is the breadth of literature the authors refer to in the text and at the end of each chapter. The authors share their considerable knowledge of many of the recent analysis and control methodologies developed by themselves and other experts in the field.

The first chapter provides an overview of the causes and effects of poor power quality in power distribution systems. This is followed by a quick tour of the currently available solid-state-based controllers including HVDC, SVC, TCSC, and the newer voltage-source-converter (VSC) devices such as the DSTATCOM, the DVR, and the UPQC.

The second chapter describes the basic issues surrounding poor power quality addressing questions such as: What are the different types of events? How are they caused? How do these events affect other customers on the distribution feeder? The third chapter introduces numerous analysis techniques for quantifying the type and severity of the power quality events. This chapter includes several numerical examples to illustrate the various indices and their interpretation.

Chapters 4, 5, and 6 summarize the state-of-the-art advances in custom power devices (Chapter 4) and solid-state switching (Chapter 6). These two chapters provide the reader with the current topologies and usages of solid-state-based devices. Chapter 5 describes basic VSC-based topologies that comprise the backbone of the DSTATCOM, DVR, and UPQC as well as the basic switching controls. The authors provide a good summary of several PWM strategies including sinusoidal PWM, hysteresis, and space vector modulation and their impact on the waveform harmonic content. The authors provide numerous approaches for the control of higher-order systems including sliding mode control, LQR, and deadbeat, to name a few. This chapter is unfortunately what keeps this book dedicated to the graduate level, as many undergraduate students do not have the control background to comprehend or implement the control strategies covered.

The following chapters are dedicated to specific implementations of the DSTATCOM (Chapters 7 and 8), the DVR (Chapter 9), and the UPQC (Chapter 10). These chapters provide a more in-depth analysis of the application of the different devices under various system applications. These chapters contain numerous numerical examples including time-domain waveforms to illustrate the impact of the devices on the power quality of the example system. Both balanced and unbalanced systems with and without harmonics are analyzed.

The final chapters investigate future directions of power quality improvement. Chapter 11 addresses the power quality issues associated with the integration of distributed generation in distribution systems, whereas the final chapter provides a qualitative discussion of the impact of future load types on power quality.

reviewed by Mariesa L. Crow

Electric Power Transformer Engineering

Edited by James H. Harlow. Published by CRC Press, 2003. ISBN: 1704 0849317045.

There have been earlier texts employing essentially the same title as this volume but with substantially different content. In this case, the new book

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