

Preface

Power quality is a term that describes a set of parameters of electric power and the load's ability to function properly with that electric power. Poor electric power quality can cause: overloading the network, overloading the neutral wire, dangerous resonance phenomena or even damage to the load. Generally it can lead to large economic costs particularly in countries with dynamic development of new technologies. It is estimated that problems related to power quality costs the European industry hundreds of billions of euros annually. By contrast, financing on the prevention of these problems are fragments of a percent of these costs. Therefore, research on methods of analysis and improvement of power quality are widely performed throughout the world. This book presents the issues related to methods of improving the power quality—in particular, using the active compensators. Considering the above the book can be a valuable source of information for both engineers and students in technical universities.

Chapter 1 introduces the fundamental problems of electrical power systems and elucidates the subject matter of this thesis.

Chapter 2 provides a comparison of several so-called power theories. These theories represent different approaches using both frequency and time domain. The basic criterion for the choice of the discussed theories will be historical development of knowledge in this field and the usefulness of power theory in solving practical problems: reactive power compensation, balancing the supply network load and mitigation of voltage and current distortion. Particular attention will be given to the theories defining the current components in the time domain as the basis for the present-day active compensation and filtering systems.

Chapters 3 and 4 present properties of the power electronics arrangements suitable for solving the selected power quality problems. The principle of operation and the basic properties of the series, parallel and series—parallel active compensating devices are presented.

Chapters 5 and 6 describe the operation principle of active compensators' control algorithms. Several examples of control algorithms, using the power theories described in Chap. 2 have been developed. Theoretical considerations have been illustrated by simulation and measurement results in the laboratory.

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