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ELECTRICAL POWER SYSTEMS QUALITY

THIRD EDITION



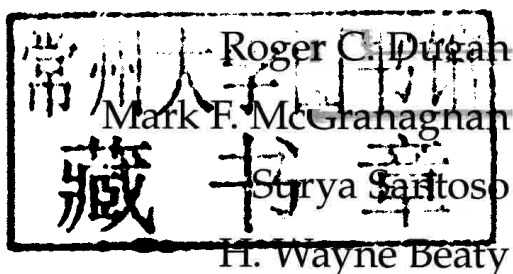
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Electrical Power Systems Quality



Third Edition

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Foreword

Alex McEachern*

Almost three decades ago—back in the days when the only person with a cell phone and a pager was Dick Tracy in the comic pages—I stumbled into my first power quality problem. A minicomputer (for those of you too young to remember, a minicomputer was a refrigerator-sized device with the computing horsepower of a cheap calculator and the storage capacity of a couple of floppy disks) crashed at about 3:00 p.m. every day.

Everybody was sure it was a power problem. But nobody knew what to do.

A salesman convinced the owner of the company, whose name, oddly enough, was Jerry Lee Lewis—not the famous one—that a transient suppressor would fix any power problem. At great expense, one was installed. The minicomputer kept crashing. And nobody knew what to do.

If only we had this book back then!

Back in those days, power quality was mysterious; most of the people who claimed to understand it were interested in selling something, and few engineers were in a position to understand what appeared to be rare, random events on those dangerous power lines.

Things changed over the next couple of decades. A huge increase in sensitive loads raised the visibility of the power quality problem. Graphic recording instruments, starting with François Martzloff's automatically photographed oscilloscopes and continuing with my own digital PowerScopes, laid out what was going on for every engineer to see.

*Alex McEachern is one of the pioneers in the field of power quality monitoring and analysis. Having spent two decades studying the power quality problem, he has now decided to spend the next two decades fixing it. You can track his progress at <http://www.Alex.McEachern.com>.

The power quality industry developed, with independent contributions from several segments: the power conditioning industry, the electric utility power quality programs, the instrument manufacturers, and the standard-setting organizations like the IEEE and the IEC. The amount of information available to an engineer exploded. There was great stuff available, but you had to look hard for it, and you had to look in a lot of places.

The book you hold in your hands is what we have needed for years: a single, authoritative source containing all the knowledge about power quality that has accumulated in so many different places. Messrs. Dugan, McGranaghan, Santoso, and Beaty—experts all, and good people too—have performed a valuable service by gathering and organizing this information for us. I'll keep this book nearby on my bookshelf, and pull it down every time I have another question about power quality.

By the way, that power quality problem, three decades ago, was eventually solved. As the most junior engineer around, I was assigned to sit in a folding chair in front of the minicomputer every day at 3:00 p.m. and watch what happened. What happened was this: The company owner came by to visit his big investment on his daily rounds. He smoked a cigar. And, back at the minicomputer factory, the disk drive's air filter had been inadvertently omitted. The smoke particles were enough to crash the computer. Like many power quality problems, it wasn't.

Acknowledgments

This book would not have been possible without the support of our employers and colleagues. Nearly everyone in the Knoxville, Tennessee, office of Electrotek Concepts, Inc., has contributed something to this book. Some contributions are acknowledged, but there were many other contributions that cannot be acknowledged specifically. We thank all the contributors for their help. We also thank our friends in the power industry who have graciously provided us with equipment photographs and other material for inclusion in the book.

The first three of us would like to thank Wayne Beaty for making our words read better and for dealing with the publisher. As anyone who has tried this knows, it is very difficult to write a book while working full time in a demanding job. Wayne removed much of the burden from us, which is greatly appreciated.

Finally, this third edition, as well as the second edition, of the book includes the name of a new author, Surya Santoso. There is a good reason for this. Dr. Santoso was the driving force behind the expansions and updates in many of the chapters, and the other authors are very grateful for his untiring efforts.

*Roger C. Dugan
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