

Seminar 9 Sunday June 17, 2001

POWER-FACTOR CORRECTION FUNDAMENTALS 9:00am – 6:00pm

Instructor: Dr. Richard Redl, ELFI S.A., Switzerland

ABOUT THE INSTRUCTOR

Dr. Richard Redl is the director of ELFI S.A., an electronics consulting company in Switzerland, specializing in power supplies and other power conversion equipment, electronic ballasts, and integrated circuits for power management. He holds fifteen patents, has written over hundred technical papers, and co-authored a book on the dynamic analysis of power converters.

CONTENTS

This seminar presents the fundamentals of power-factor correction and the related line-harmonics reduction. The first part of the seminar introduces the extended definition of power factor, discusses the causes and effects of reduced power factor and increased line harmonics, and reviews the limits and status of the harmonic regulations. The second part provides a comprehensive overview of the most important PFC techniques, including passive and active, single-phase and three-phase solutions. Special emphasis is given to control and feedback loop design issues. The third part is devoted to practical considerations in active power-factor correctors, like EMI, snubbing, and auxiliary circuitry. The following topics will be included:

Introduction

- Extended definition of power factor
- Causes and effects of reduced power factor and increased line harmonics
- Harmonic regulations; EN61000-3-2 limits and status

Overview of PFC techniques

Passive circuits:

- line inductor, harmonic traps, multi-pulse rectification

Active circuits:

- Active filter principle
- Energy storage considerations for low-harmonics rectification (LHR)
- Single-phase LHR topologies
- Current shaping techniques: forced, semi-automatic, automatic
- Improving the dynamic regulation with line voltage and load-current feedforward
- Modeling and feedback loop design
- Three-phase LHR topologies: six-switch, three-switch, and single-switch solutions
- Isolated single-phase ac/dc converters
 - a. Two-stage
 - b. Single-stage: energy storage at the output, energy storage at the input
- Isolated three-phase ac/dc converters
 - a. Two-stage
 - b. Single-stage

Practical considerations for active LHRs

- EMI/EMC, snubbing, auxiliary circuits

WHO SHOULD ATTEND

The seminar is intended for the engineer who is relatively new to the field of power-factor correction or who needs to refresh his/her knowledge about power-factor correction and line-harmonics reduction.