ABSTRACT

Due to the increased awareness of the many undesirable consequences of harmonic distortions in the line-currents drawn by nonlinear loads such as line-fed rectifiers with smoothing capacitor, regulatory agencies impose statutory requirements to limit the harmonics in the line current drawn by various electrical appliances, e.g., EN 61000-3-2. In order to satisfy these requirements, power factor correctors usually have to be installed for achieving high power factor and low line-current harmonic distortion.

In the case of switching power supplies, a common approach for complying with the harmonics current requirements is to incorporate an additional power factor corrector stage preceding the normal DC-DC switching converter stage. In this approach, the DC-DC switching converter maintains a regulated output voltage while the preceding power factor corrector stage ensures a high input power factor. As such, the combined circuit usually has a lower overall efficiency and is less cost effective in terms of component count, especially for low-power applications, due to the use of two separate power stages. In low-cost applications, many attempts have been made in combining the power factor corrector and the DC-DC converter by sharing some of their circuit components, e.g., their active switches. It is also possible to incorporate some additional functions, e.g., soft-switching, into the combined circuits without the use of extra components. Instead of reducing the component count, the main concerns with high-power PFC switching regulators are the overall efficiency and the component stress. Therefore a new set of topological arrangements has also been proposed in the building of PFC switching regulators such that the overall efficiency can be improved. This talk will address the above issues with reference to the works of the Power Electronics Research Centre.

ABOUT THE SPEAKER

Martin H.L. Chow received his Higher Diploma in Electronic Engineering from Hong Kong Polytechnic in 1978, his B.Sc.(Eng.) in Electrical Engineering from the University of Hong Kong in 1980, his M.Sc. in Systems Engineering from the University of Surrey, UK, in 1984 and his Ph.D., in the area of power-factor-corrected switching regulators, from The Hong Kong Polytechnic University in 1999. In the course of his career, he has worked in RF circuit design with Philips, Hong Kong, and switch-mode power supplies design with Thomson, Singapore. In 1985, he started his teaching career at Hong Kong Polytechnic and is currently a Senior Lecturer in the Department of Electronic & Information Engineering. Since 1991, he has been publishing papers in IEE Proceedings and IEEE Transactions in the areas of CAD and Power Electronics. Dr. Chow is the one of the recipients of the IEEE Power Electronics Society Transactions Prize Paper Award 2002.

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