PROCEEDINGS

IPEMC '94

THE FIRST INTERNATIONAL POWER ELECTRONICS AND MOTION CONTROL CONFERENCE

Volume 1

June 27 – 30, 1994, Beijing, China

Sponsored by:
China Electrotechnical Society

INTERNATIONAL ACADEMIC PUBLISHERS

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IPEMC '94 PROGRAM SUMMARY

Monday, June 27

8:30am 8:50am	**Opening Ceremony**					
8:50am 12:00pm	**Plenary Session 1**					
1:30pm 5:00pm	**Session 1A** Devices, Components and Materials 1	**Session 2A** Power Supply 1	**Session 3A** AC / DC Drives	**Session 3B** AC / DC Drives and Control Techniques	**Session 4A** Soft-Switching Techniques	**Session 5A** Excitation Systems & Reactive Power Compensation
5:00pm 6:00pm	Welcoming Reception					

Tuesday, June 28

8:30am 12:00pm	**Plenary Session 2**					
1:30pm 5:30pm	**Session 1B** Devices Components and Materials 2	**Session 2B** Power Supply 2	**Session 3C** AC / DC Motor Control Techniques and Algorithms	**Session 3D** Microprocessor & Digital Architecture for Drives Control Applications	**Session 4B** Inverter & Converter 1	**Session 5B** Harmonic Compensation Modeling & Simulation

Wednesday, June 29

8:30am 12:00pm	**Session 1C** Devices Modelling, Simulaton & Application	**Session 1D** Devices Application	**Session 3E** Servo Systems & Others	**Session 3F** Modelling, Simulation and CAD of Drives	**Session 4C** Modelling Simulation of Converters	**Session 4D** Inverter & Converter 2
1:30pm 5:00pm	Visiting Exhibition (1st International Exhibition on Power Electronics & Electrical Drives)					
6:30pm 9:00pm	Banquet					

Thursday, June 30

8:30am 5:00pm	Great Wall & Ming Tombs Tour

* Coffee break time is about 10:15 — 10:30 am and 3:30 — 3:45 pm every day

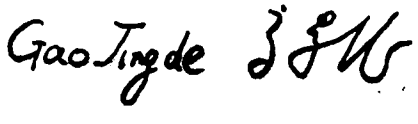
Beijing Science Symposium Hall, 3 Baishiqiao Rood , Beijing, China

FOREWORD

This Proceedings contains 193 papers accepted by the First International Power Electronics and Motion Control Conference (IPEMC'94). These papers are submitted by authors from 18 countries and regions. The Conference is jointly sponsored by China Electrotechnical Society (CES) and National Natural Science Foundation of China and co-organized by Zhejiang University, CES Power Electronics Society, CES Electrical Control System & Equipment Institution, Shanghai University of Technology and Beijing Power Electronics R&D Center. IEEE Beijing Section and IEEE Power Electronics Society also offered their successful cooperation to this Conference. The Conference will be held at Beijing Science Symposium Hall, Beijing, China from June 27 to June 30, 1994. New progress in the field of power electronics will be found in this Proceedings.

These papers have been divided into five sessions, covering various topics on Power Semiconductor Devices, Components and Materials, their Modelling, Simulation & Application; Electronic Power Supply; AC/DC Motor Control Techniques, Servo Systems, Microprocessor & Digital Architecture for Drives Control Applications; Soft-Switching Techniques, Inverter & Converter; Power Electronics used in Excitation Systems for Generator, Reactive Power Compensation and Harmonic Compensation, etc. Besides that, there are 10 invited papers to be presented during the plenary sessions. I hope that this Conference will act as an international arena for participants to exchange information and discuss new ideas.

Please let me take this opportunity to express my personal gratitude to all my colleagues who have contributed a lot to the publication of this Proceedings.



Jingde Gao
Professor, Tsinghua University
IPEMC'94 Conference Chairman
Vice President of China Electrotechnical Society

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PROCEEDINGS OF THE FIRST INTERNATIONAL POWER ELECTRONICS
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ADVANCES OF AC-DRIVES, A REVIEW

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Abstract The field of adjustable speed electrical drives is experiencing a transition from DC- to AC- machines, which now embraces all types of applications, from the smallest to the largest power ratings. Macroelectronics and microelectronics are complementary, providing the power and the intelligence for the complex control functions. In contrast to DC- drives, there is a choice of many different combinations of power converters and AC- machines, each having particular advantages, but there exists a common principle of control. The review outlines this transition and assesses likely future developments in the field of AC- drive control.

Keywords: AC- Drives, Power Electronic Converters, Control

Introduction

Energy in its many forms plays a decisive role in our lives: without adequate supply of energy, a main prerequisite for human progress and better working conditions is lacking. Electricity is of particular importance because it can be generated from any primary source, be it fossil, nuclear or solar (including hydro or wind). Natural energy that would otherwise be unaccessible is thus made available to everybody and for any application. Since electricity can be transmitted over wide distances at good efficiency and without transporting material, it permits the place of generation to be separate from the point of consumption. Through interconnected grids, a pool of energy is created that is filled from the most diverse sources and from which the consumers can draw varying amounts of power. When extending the grid over whole continents, possibly comprising different countries, the geographic shift in time and climatic conditions causes a levelling effect on the daily fluctuations of power, thus improving the economies of generation and transmission. Energy becomes a normal commodity, the flow of which is governed by physical laws; it is unimpeded by frontiers and can be traded like any other good.

Much of the electrical energy is eventually converted into mechanical form to be used in all production processes, transportation of goods and people, as well as untiring help in the household, such as in washing machines. In fact, electromechanical energy converters, i.e. electrical drives, are the largest group of consumers, using more than half the electrical energy produced in an industrial country. Most of these drives are of the constant speed variety as exemplified by induction or synchronous motors; they need no control except for starting, stopping or protection. However, there is a smaller but expanding group of controlled drives, possibly 20%, whose tor-

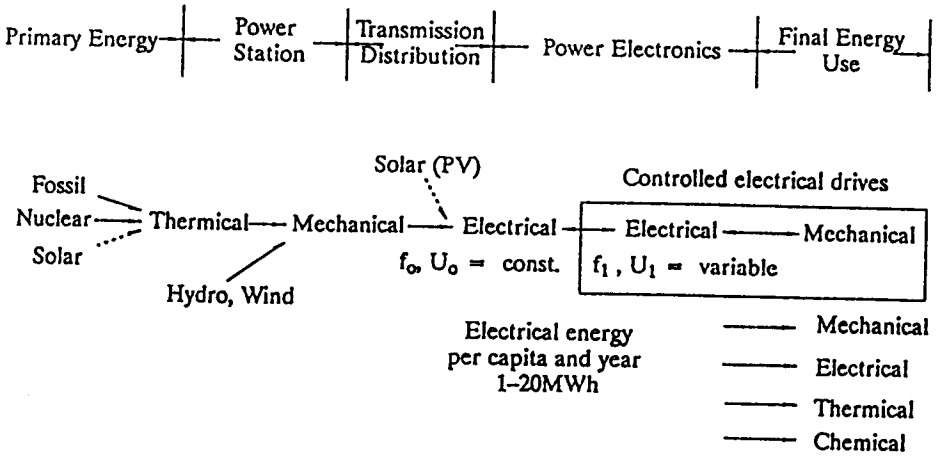

Fig. 1
From primary source to final use, a chain of conversion processes

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