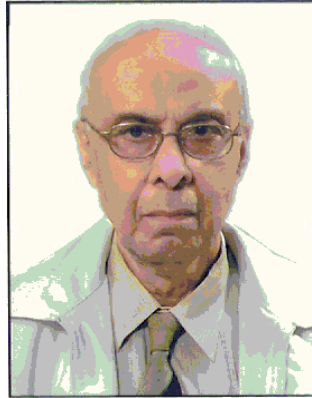


High Power High Performance Industrial AC Drives—A Technology Status Review

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ABSTRACT

The rapid developments of power electronic technologies, microprocessor / digital signal processor based control and estimation techniques and introduction of high power semi-conductors have resulted in an unprecedented growth in the high *power high performance ac drives* as demanded by automation industry over the past decade. In this lecture , a brief technology review on the state-of-the-art high power switching devices (like HVIGBTs, IGCTs, ETOs / MTOs / IGETs, etc.) , converter topologies (like PWM converters / inverters--VSI, CSI and Multilevel , cycloconverters, matrix converters, etc.) and control technologies (scalar and vector control strategies, direct torque and flux control (DTC), sensor-less control etc.) developed progressively for such high power industrial drives involving induction and synchronous motors is to be presented along with typical examples offered by the world's leading major manufacturers. Finally, the future trends and challenges on various aspects of such drives and the developing areas of their applications in the industry are also to be addressed.



AJIT KUMAR CHATTOPADHYAY

Ajit K. Chattopadhyay (SM'83, F'91) received the BE degree in Electrical Engineering from Calcutta University (B E College) , India, the M. Tech degree in Electrical Machines from the Indian Institute of Technology (IIT), Kharagpur and the PhD degree from the University of Manchester (UMIST), England in 1958, 1963 and 1971 respectively.

After working for more than one year in Guest Keen Williams Ltd., Howrah, India and for sometime in the Indian Standards Institution., New Delhi, he joined the Electrical Engineering Department of IIT Kharagpur in 1960, became a Professor in 1976 and the Head of the Department during 1992-95. During 1969-71, he was engaged in research work in the field of Thyristor ac drives at UMIST, Manchester as a Colombo Plan Study Fellow. In 1972, he established a Power Electronics Laboratory at IIT, Kharagpur, and pioneered M. Tech course and Ph.D. research programs in this field. He has supervised **11 Ph.D** projects, **25 M.Tech** Projects and authored/co-authored over **130** publications (including **50** in **IEEE** Transactions/ Conference Records) in the field of Electrical Machines, Power Electronics and Microprocessor-based control of dc and ac drives. He has filed 4 patent applications. He has authored **two** complete **video courses** on ***Machine Drives with Power Electronics*** ,sponsored by the Center of Educational Technology, IIT Kharagpur. He has authored an invited **Chapter** on ***AC-AC Converters*** in ***Power Electronics Handbook*** published by Academic Press (USA), in 2001.

During 1980-81, he was a *Visiting Professor* at the University of Technology, Baghdad, Iraq. He acted as a consultant-in-charge of several sponsored industrial projects. He organized a number of continuing education programs on Power Electronics & Drives and was the coordinator of the first *National Workshop on Power Electronics-Industry and Academic Interaction* held at IIT, Kharagpur in May 1988. He is serving as the **IEEE-IAS Calcutta Chair** since its establishment in November, 1997. He was elected as a **Distinguished Lecturer** of *IEEE Industry Applications Society* in 2002 and has delivered around 35 invited lectures so far at various IEEE Sections /Chapters throughout the world.

For his outstanding contributions in Power Electronics, Dr Chattopadhyay received the **Bimal Bose Award** in 1986 from the Institution of Electronics and Telecommunication Engineers (IETE), India. He was elected **IEEE Fellow** in 1991 for '***the leadership in the***

development of Power Electronics research and educational programs in India'. He is a **Fellow of the Indian National Academy of Engineering, a Fellow of the West Bengal Academy of Science & Technology**, a Life Fellow of the Institution of Engineers (IE) (I) and the IETE (I). He was awarded the Bharatia Cutler Hammer Prize in 1986, the Tata Rao Prize (1993-1994) and a Certificate of Merit (1992) from IE (I) for his papers. He has served on the Editorial Boards of the Journals of the IETE (I) and the Electrosoft (UK). He has served on the program committees of many international conferences and chaired many technical sessions in India and abroad. He is listed in several International Biographies.

After his retirement from IIT, Kharagpur, Dr Chattopadhyay worked in the Electrical Engineering Department, Bengal Engineering College (Deemed University), Howrah as an **AICTE Emeritus Fellow** (1996-1999), as a **CSIR Emeritus Scientist** (1999-2001) and as a **UGC Emeritus Fellow** till 2003. He is now continuing in the same place as a **Professor Emeritus**. In 2006, he received the **Distinguished Alumnus Award of the Bengal Engineering & Science University, Shibpur 'for outstanding contribution to the profession and the Alma Mater'**