Singapore-IEEE Industry Applications and EMC/EMI Chapter

IEEE INDUSTRY APPLICATIONS SOCIETY

2000-2001 DISTINGUISHED LECTURES PROGRAM

ONE Day Tutorial on

"ELECTROMAGNETIC COMPATIBILITY IN INDUSTRIAL EQUIPMENT: STANDARDS, PROBLEMS AND SOLUTIONS"

Paolo Tenti and Giorgio Spiazzi
Department of Electronics & Informatics, University of Padova, Italy

Date: Thursday, January 31st, 2002
Time: 0830 - 1700
Venue: Department of Electrical & Computer Engineering,
Seminar Room EA 02-11, National University of Singapore
Admission is Free (Please fill in the registration form)
Limited Seat Available (Max 80)

Outline:

The application of European Union Directive 89/336 on Electromagnetic Compatibility requires a reconsideration of several design aspects of industrial equipment including electronic components, apparatus and systems. In fact, according to the directive, each electric and electronic apparatus is required to operate properly even in presence of an electro-magnetically polluted environment (immunity requirement); moreover, the amount of electromagnetic noises it generates are not allowed to go beyond given levels (emission requirement).
In order to develop cost-effective products complying with EMC regulations, industrial equipment designers must reconsider their design approach, so as to include a number of provisions to mitigate internal generation of noises and to increase immunity to externally generated noises.
The tutorial covers the main aspects related to electromagnetic compatibility issues in industrial equipment, starting from a presentation of the main standards enveloped by the EMC European Directive, illustrated by some significant study cases, and then discussing the most important engineering aspects that must be considered to properly approach the EMC-related problems.

Program Schedule

1) Introduction to European Directive on EMC (½ h)
- Fundamental Definitions
- Regulations
- EU Directives
- EMC Directive
- Application of EMC Directive

2) High-frequency emission standards & case studies (1 h)
- Conducted Emission measurement
- Radiated Emission measurement
- Discontinuous Disturbance
- Disturbance Power
- Test Examples and Corrective Provisions

3) Origin of High-Frequency Pollution & Design Provisions to Reduce EMI (2½ h)
- Common coupling mechanism analysis: capacitive, inductive, common impedance, etc. (½ h)
- Spectra of EMI Signals (½ h)
- Grounding and other layout aspects (½ h)
- Common mode and differential mode filter configurations (½ h)
- Analysis of shielding mechanism (½ h)

4) Low-frequency emission standards: definition & case studies (½ h)
- EN 61000-3-2 : Harmonic Pollution
- EN 61000-3-3: Voltage Fluctuation & Flicker

5) Origin of low-frequency pollution, definitions and basic compensation techniques (½)
- Diode rectifiers
- Dimmers
- Passive compensation techniques
- Active compensation techniques (Power Factor Correctors)

7) Example of application: boost PFC (½ h)

8) Immunity standards & case studies (½ h)
- Electrostatic Discharge (ESD): IEC 1000-4-2
- Radiated Noise: IEC 1000-4-3
- Burst Voltage: IEC 1000-4-4
- Surge Voltage: IEC 1000-4-5
- Conducted Noise: IEC 1000-4-6
- 50 Hz Magnetic Field: IEC 1000-4-8
- Voltage dips, short interruptions and voltage variations: IEC 1000-4-11

Speakers

Paolo Tenti

Paolo Tenti is professor of Electronics and Power Electronics and Department director at the University of Padova and a Fellow of the IEEE. His main interests are in industrial electronics, static power conversion, and electromagnetic compatibility. In these areas he holds national and international patents and published more than 100 scientific and technical papers. Main topics of research relate to the application of modern control methods to power electronics equipment for industrial and space/avionics applications and EMC analysis of electronic equipment.

In 1996 Paolo Tenti served as Vice-President of the IEEE Industry Applications Society and Technical Chairman of the IAS Annual Meeting, in 1997 he was Society President. Recently, he served as the general chairman of the 2000 IAS Annual Meeting (World Conference on Industrial Applications of Electrical Energy, Rome, Oct 2000). For the years 2000-2001 he has been appointed IAS Distinguished Lecturer, discussing the theme "Electromagnetic compatibility in industrial equipment".

Paolo Tenti is also President of CREIVen, an industrial research consortium for tecnological development in industrial electronics, with special emphasis on electromagnetic compatibility issues.

Giorgio Spiazzi

Giorgio Spiazzi graduated cum laude in Electronic Engineering at the University of Padova in 1988. In 1993 he got a Ph.D. in Industrial Electronics and Computer Science at the Department of Electronics and Computer Science of the same University, working with the Power Electronics Group leaded by Profs. Luigi Malesani and Paolo Tenti. In January 1993, Dr.Spiazzi became a permanent researcher of the University of Padova, where he currently serves as associate professor of Power Electronics.

His main research activities are in the areas of control techniques of dc to dc converters, ac to dc converters with high power factor, soft-switching techniques, and electromagnetic compatibility in Power Electronics. In these areas Giorgio Spiazzi wrote more than 60 papers, presented at international conferences or published in international journals.

In recent years, Giorgio Spiazzi gave lectures on EMC at international conferences (including IEEE IAS Annual Meeting) and engineering schools (including Aalborg University in Denmark).

Registration Form

(Please make copies of this if necessary)

Please register the following person for the above seminar.

Name: _____

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Fees: FREE

Signature:_____

Please mail/email/fax this form **Before 22 January 2002** to

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Your registration is accepted/rejected.

Organizing Committee