FACULTY OF ELECTRICAL AND POWER ENGINEERING

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DEPARTMENT OF ELECTRIC MACHINES, DRIVES, ELECTRICAL LIGHTING AND ELECTROTECHNOLOGIES

MAIN RESEARCH FIELDS

- Electric machines and equipment modeling, simulation, optimal design and testing (EME)

Keywords: electric machines, electric equipment, field calculation, optimal design, computer aided testing.

- Power electronics and motion control (PEMC)

Keywords: electric machines and drives, power electronics, speed and position control, digital control.

- Switched reluctance motor drive (SRMD)

Keywords: electric machines and drives, reluctance motor, power electronics, digital control.

- Power industrial electric drives (PIED)

Keywords: electric machines and drives, power electronics, speed control.

- Electrical lighting and Electrotechnologies (ELE)

Keywords: electromagnetic fields, applied electrostatics, welding, electrothermal processes, ultrasonics, power electronics, lighting devices.

Researches are organized in the centre **New system of intelligent motion of the electric machines.**

Researches in *ELECTRIC MACHINES AND EQUIPMENTS, OPTIMAL DESIGN, TESTING, MODELING AND SIMULATION*

FIELD DESCRIPTION

Electric machines modeling including saturation and frequency effect both in the lumped parameter or distributed parameter (field distribution) forms are paramount for global optimization design and new computer - aided testing and parameter identification methods, modeling and simulation.

ACTIVITIES AND RESULTS

Since 1980 aggressive theoretical and experimental work on ever better electric machine modeling, simulation, optimal design, testing and parameter identification has been taking place with the results of two U.P.T. codes for optimal design of large power a.c. machines and a few new testing and parameter identification techniques for electric machines. Most of the work resulted in prototypes tested (or built) in cooperation in industrial partners.

Due to the long time collaboration with the Faculty of Automation and Computer Science from Timişoara, in the field of data acquisition systems and digital signal processing, the D-109 Laboratory was affiliated at the research center in automation and computer science

RESEARCH BENEFICIARIES

Ministry of Hydro-Power plants such are Lotru-Ciunget, Slatina Aval-Drăgăneşti (hydro reversible generators of 14000 kVA), Iron Gates 1, Râul Mare Retezat (hydrogenerators of 175000 kVA), Turnu-Ruieni (hydrogenerators of 76500 kVA) and Nuclear Power Plant Cernavodă – Unit 2.

External cooperation – design and prototype of a low speed wind generator with HEXATRONIC Inc. – Canada.

RESEARCH TEAM

- Acad. Toma DORDEA
- Prof. dr. eng. Marius BIRIESCU
- Prof. dr. eng. Marius BABESCU
- Prof. dr. eng. Vladimir CREŢU
- Dr. eng. Gheorghe MADESCU, CS II
- Lect. dr. eng. Mihai MICEA
- Eng. Marţian MOŢ, CS III
- Assoc. prof. dr. eng. Sorin MUŞUROI
- Assoc. prof. dr. eng. Dan NICOARĂ
- Lect. Dr. eng. Ciprian Şorândaru
- Dr. eng. Ileana TORAC, CS II
- Eng. Lucian OCOLIŞAN, CS III

RESEARCH OFFERS

Advanced design methods of large a.c. machines including saturation and frequency effects, coupled with dynamic simulation, advanced design methods for ultrahigh torque induction motors, new design methods for capacitor induction motors, computer - aided parameters identification - software and hardware - for electric machines, consulting on large power electric machines design and testing.
Consulting regarding optimization, efficiency improvement testing procedures and refurbishment of hydro-generators.

CONTACT PERSON

Prof. dr. eng. Marius BIRIESCU
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Researches in *INTELLIGENT MOTION CONTROL*

FIELD DESCRIPTION

Intelligent motion control integrates motors, static power converters, digital controllers, sensors in systems that perform industrial motion automation with high efficiency (low losses).

ACTIVITIES AND RESULTS

Research activities on linear and rotary motors & drives since 1975 with numerous prototypes built and tested. Integration of intelligent motion systems in

Romanian industries up to 2000 kW units since 1994. Various applications of power electronics in energy conversion and digital control concerned with: wind and hydraulic energy conversion systems into electric energy by means of variable speed operation, starter-alternators with digital control designed for hybrid and electric vehicles, and PM machines-based digital control systems up to 150 rpm

RESEARCH BENEFICIARIES

Various Romanian industrial companies such as: Beespeed Automatizări Timişoara, UCM Reşiţa, Azomures Tg. Mureş, Aquatim Timisoara, SE Iernut, Electrocentrale Deva, CNCSIS, ANSTI etc.
External co-operations: Aalborg University Denmark, EBM Papst Germany, Casino University Italy

RESEARCH TEAM

- Prof. dr. eng. Ion BOLDEA
- Assoc. Prof. dr. eng. Nicolae MUNTEAN
- Assoc. Prof. dr. eng. Lucian TUTELEA
- Lect. dr. eng. Cristian LASCU
- Assoc. Prof. dr. eng. Lucian MIHEŢ-POPA
- Assist. Dr. eng. Sorin AGARLIŢĂ
- Assist. Dr. eng. Codruţa PAICU
- Ph.D. Student Vlad GRĂDINARU
- Ph.D. Student Robert ANTAL
- Ph.D. Student Alin ŞTIRBAN
- Ph.D. Student Liviu IEPURE
- Ph.D. Student Ana MOLDOVAN
- Ph.D. Student Ana-Maria UNGUREANU
- Ph.D. Student Mihaela GAVRIŞ
- Ph.D. Student Diana PETRILA

RESEARCH OFFERS

HARDWARE: Integration of intelligent motion control systems in various industries (automotive electric actuators and renewable electric energy converters are key subjects of interest) from process identification to commissioning and service. Prototyping of new systems for given specifications.

SOFTWARE: Electric motor - linear and rotary - design software aids in the form as software licensed products by request.

Intelligent motion control system.

International intensive courses: in Germany at EBMPapst, in Italy at Vicenza Centro Produttivita, in Korea at Hanyang University from Seul and at KIMM (Korean National Institute of Machinery and Materials).

CONTACT PERSON

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Researches in *SWITCHED RELUCTANCE MOTOR DRIVES*

FIELD DESCRIPTION

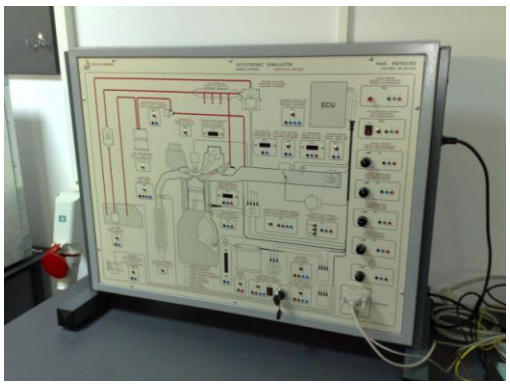
Switched reluctance motor (SRM) is a position-controlled power stepper motor with a very rugged topology and low costs but requires a specific static power converter and digital controller. Numerous potential applications in harsh environments look adequate for this kind of drive which drew world - wide attention in the last 10 years.

ACTIVITIES AND RESULTS

The actual activity aims at introducing the modeling, simulation and validation of the permanent and dynamic performances of the SR Drives

RESEARCH TEAM

- Prof. dr. eng. Gheorghe ATANASIU
- Prof. dr. eng. Dorin POPOVICI
- Lect. dr. eng. Alin ARGEŞEANU
- Lect. dr. eng. Ciprian ŞORÂNDARU
- Assist. eng. Octavian CORNEA
- Ph.D. Student Marcus SVOBODA



Automotive testing bench.

RESEARCH OFFERS

New drives with SRMs - from research to prototyping for various applications at variable speed, digital control of industrial drives with static power converters, medium power variable frequency motor drives (research and consulting)

CONTACT PERSON:

Prof. dr. eng. Dorin POPOVICI
E-mail: dorin.popovici@et.upt.ro

Researches in *POWER INDUSTRIAL ELECTRIC DRIVES*

FIELD DESCRIPTION

Power electric drives with variable speed are useful to increase productivity and quality in various processes and require means for speed control invariably. The load requirements are very specific and the best solution depends notably on the application.

ACTIVITIES AND RESULTS

Since 1980, with emphasis on overhead cranes using various static power converters, research efforts have been developed to define, design, built and test power drives with variable speed. New design methods and converter realizations have been obtained both with rotary or linear motors.

RESEARCH BENEFICIARIES

Mechanical works Timisoara, Ministry of Education, PROMPT Research Institute.

RESEARCH TEAM

- Prof. dr. eng. Eugen SERACIN
- Prof. dr. eng. Dorin POPOVICI
- Assoc. prof. dr. eng. Sorin MUŞUROI
- Assoc. prof. dr. eng. Ioan GHIUR
- Lect. Dr. eng. Ciprian ŞORÂNDARU
- Lect. Dr. Eng. Cristian LASCU
- Ph.D. Student Marcus SVOBODA

RESEARCH OFFERS

Optimal design methods for power industrial drives, current inverter power drives, linear motors conveyors.

CONTACT PERSON

Assoc. prof. dr. eng. Sorin MUŞUROI
E-mail: sorin.musuroi@et.upt.ro

Researches in *ELECTRIC LIGHTING AND EQUIPMENT FOR ELECTROTECHNOLOGIES*

FIELD DESCRIPTION

Modern lighting sources and lighting devices, optimal lighting design, power electronics for electric lighting, electrotechnologies - based on electromagnetic or electrostatic fields are widely used in the fabrications manufacturing systems and include electrothermal processes, welding power sources, power ultrasonics, electrostatic etching etc.

ACTIVITIES AND RESULTS

Since 1980 notable research efforts have been devoted to investigate induction - the welding process and the power sources, new electric welding and ultrasonic power electronics sources. A few prototypes have been built and tested. New researches have been oriented to ultrasonic enhancement of liquid magnetic processing and sonosinthesys of nano-materials.

RESEARCH BENEFICIARIES

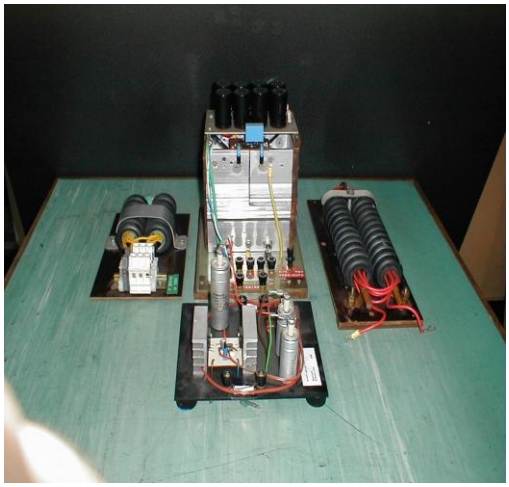
Ministry of Research, ISIM Timişoara

RESEARCH TEAM

- Prof. dr. eng. Ioan ŞORA
- Assoc. prof.. dr. eng. Dan NICOARĂ
- Assoc. prof. dr. eng. Alexandru HEDEŞ

RESEARCH OFFERS

Power electronics, for electrotechnologies, including high-frequency power transformers, arc welding power sources, advanced power electronics ultrasonics sources (from research to prototyping), ultrasonic processing of materials, consulting in electrotechnologies and electric lighting devices.



High frequency welding transformers.

CONTACT PERSON

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MAIN PUBLICATIONS

PUBLISHED PAPERS

1. Dordea, T., Dordea, T. P., Biriescu, M., Madescu, Gh., Torac, I., Moţ, M., Ocolişan, L., *Les courants electriques par les conducteurs elementaires tubulaires d'une barre Roebel - Part 1. Calcul des fluxes interieurs,* Revue Roumaine des Sciences Techniques. Serie Electrotehnique et Energetique, Tom 53, nr. 4, 2009, pp. 377-391, ISSN 0035-4066
2. Dordea, T., Câmpeanu, A., Madescu, Gh., Torac, I., Moţ, M., Ocolişan, L., *Strips method for evaluating ac losses in slot portion of Roebel bars - errors analysis*, Revue Roumaine des Sciences Techniques - Serie Electrotechnique et Energetique, Volume 54, Issue 1, pp. 29-36, 2009, ISSN 0035-4066
3. Lascu, C., Boldea, I.,Blaabjerg, F. *A Class of Speed-Sensorless Sliding-Mode Observers for High-Performance Induction Motor Drives*, IEEE Transactions on Industrial Electronics,

Volume 56, Issue 9, Sept. 2009, pp. 3394–3403, ISSN 0278-0046

4. Boldea, I., Paicu, M.C., Andreescu, G.D., Blaabjerg, F., *"Active Flux" DTFC-SVM Sensorless Control of IPMSM*, IEEE Transactions on Enery Conversion, Volume 24, Issue 2, June 2009, pp. 314-322, ISSN 0885-8969
5. Lascu, C., Asiminoaei, L., Boldea, I., Blaabjerg, F., *Frequency Response Analysis of Current Controllers for Selective Harmonic Compensation in Active Power Filters*, Industrial Electronics, IEEE Transactions on Volume 56, Issue 2, Feb. 2009, pp. 337-347, ISSN 0278-0046
6. Paicu, M.C., Boldea, I., Andreescu, G.D., Blaabjerg, F., *Very low speed performance of active flux based sensorless control: interior permanent magnet synchronous motor vector control versus direct torque and flux control*, Electric Power Applications, IET, Volume 3, Issue 6, November 2009, pp. 551-561, ISSN 1751-8660
7. Argeşeanu, A., Ritchie, E., Leban, K. *A New Solar Position Sensor Using Low Cost Photosensors Matrix for Tracking Systems*, WSEAS Tranasactions on Power Systems, Volume 4, Issue 6, June 2009, pp. 801-810, ISSN 1790-5060
8. Mușuroi, S., Olărescu, N. V., Vătău, D., Șorândaru, C., *Theoretical and Experimental Determination of Equivalent Parameters of Three-Phase Induction Motor Windings in Case of Power Electronic Converters Supply*, WSEAS Tranasactions on Systems, Volume 8, Issue 10, October 2009, pp. 1115-1124, ISSN 1109-2777
9. Mușuroi, S., Șorândaru, C., Olărescu, N. V., Svoboda, M., *Mathematical Model Associated to Three-Phase Induction Servomotors in the Case of Scalar Control*, WSEAS Tranasactions on Systems, Volume 8, Issue 10, October 2009, pp. 1125-1134, ISSN 1109-2777
10. Biriescu, M., Frigură-Iliasa, F., Andea, P., Ehegartner, P., Moga, M., *A few aspects about increasing the thermal stability of low voltage ZnO based varistors*, Proceedings EUROCON 2009, EUROCON '09. International Conference of IEEE, Saint Petersburg,, Russia, 18-23 May 2009, pp. 598 - 1603, ISBN 978-1-4244-3861-6
11. Ritchie, E., Argeşeanu, A., Leban, K., *Robust Solar Position Sensor for Tracking Systems*, Proceedings of the 9th WSEAS International Conference on POWER SYSTEMS (PS '09), Budapest Tech, Hungary, September 3-5, 2009, pp. 49-54, ISSN 1790-5117
12. Argeşeanu, A., Ritchie, E., Leban, K., *An Optimized Version of a New Absolute Linear Encoder Dedicated to Intelligent Transportation Systems*, Proceedings of the 9th WSEAS International Conference on POWER SYSTEMS (PS '09), Budapest Tech, Hungary, September 3-5, 2009, pp. 22-27, ISSN 1790-5117
13. Șorândaru, C., Mușuroi, S., Svoboda, M., Olărescu, N.V., Popovici, D. *Field Oriented Control Drives for Naval Mechanism*, Proceedings EUROCON 2009, EUROCON '09. International Conference of IEEE, Saint Petersburg, Russia, 18-23 May 2009, pp. 717-720, ISBN 978-1-4244-3861-6
14. Olărescu, N.V., Weinmann, M., Zeh, S., Mușuroi, S. *Novel Flux Weakening Control Algorithm for PMSMS*, Proceedings of 2009 International Conference on Power Engineering Energy and Electrical Drives, Lisbon, March 18-20, 2009, IEEE Ind. Elect. Soc, pp. 123-127, ISBN 978-1-4244-4611-7
15. Mușuroi, S., Olărescu, N.V., Vătău, D., Șorândaru, C. *Equivalent parameters of induction machines windings in permanent regime. Theoretical and experimental determination*, Proceedings of the 9th WSEAS International Conference on POWER SYSTEMS (PS '09), Budapest Tech, Hungary, September 3-5, 2009, pp. 55-62, ISSN 1790-5117
16. Mușuroi, S., Șorândaru, C., Olărescu, N.V., Svoboda, M. *Mathematical Model of Three-Phase Asynchronous Servomotors in Stationary Non-sinusoidal Regime*, Proceedings of the 9th WSEAS International Conference on POWER SYSTEMS (PS '09), Budapest Tech, Hungary, September 3-5, 2009, pp. 63-66, ISSN 1790-5117
17. Dordea, T., Biriescu, M., Madescu, Gh., Moț, M. *Performances analysis of induction motor prototype for direct drive traction system of tramcar*, Journal of Electrical Engineering, Vol. 9, nr. 1, 2009, pp. 123-126, ISSN 1582-4594
18. Argeşeanu, A., Leban, K., Torac, I. *A New Matrix Structure Sensor for the Solar Tracking System*, Journal of Electrical Engineering, Volume 9/2009, edition 1, ISSN 1582-4594
19. Argeşeanu, A., Torac, I. *A New Sensor Structure for Intelligent Long Distance Transport*, Scientific Bulletin of the Politehnica University of Timişoara, Transaction of Mechanics, Tom 53(67), Fasc. S2, ISSN 1224-6077
20. Miheț-Popa, L., Groza, V. *Modeling, design and simulation of a grid connection control mode for a small variable-speed wind turbine system*, Electrical Power Conference-IEEE EPC 2009, Vol. 3, pp. 271-279, ISBN 978-14244-4509-7
21. Dordea, T., Proca, V., Madescu, Gh., Biriescu, M., Greconici, M., Moț, M., Torac, I., Ocolișan, L. *Roebel bar model for additional*

losses estimation in high power hydrogenerators, International Symposium on Electrical Engineering and Energy Converter, ELS – 2009, September, Suceava, Proceedings of International Symposium on Electrical Engineering and Energy Converter, pp. 33-36, ISSN 2066-835X

22. Dordea, T., Torac, I., Madescu, Gh., Moț M., Ocolişan, L. *Analytical Estimation of the Roebel bar Losses*, ELECTROMOTION 2009 EPE, 1-3 July, 2009, Lille, France, Proceedings of ELECTROMOTION 2009, CD, ISBN 978-2-915913-25-5
23. Boldea, I., Andreescu, G.D.,Rossi, C., Pilati A., Casadei, D. *Active flux based motion-sensorless vector control of DC-excited synchronous machines*, Energy Conversion Congress and Exposition, 2009, ECCE, IEEE, 20-24 September, 2009, Proceedings of Energy Conversion Congress and Exposition, ECCE, pp. 2496-2503, ISBN 978-1-4244-2893-9
24. Leban, K., Ritchie, E., Argeşeanu, A., Torac, I. *Doubly Fed Induction Generator Fault Simulation*, The Spot 2009 Proceedings, Aalborg University, Institute of Energy Technology, Denmark, CD, ISBN 978-87-89179-84-1
25. Leban, K., Ritchie, E., Argeşeanu, A. *Magnetic Field Enhancement using Ferrofluid and Iron Powder*, The Spot 2009 Proceedings, Aalborg University, Institute of Energy Technology, Denmark, CD, ISBN 978-87-89179-84-1
26. Leban, K., Ritchie, E., Argeşeanu, A. *Magneto-rheological (MR) Fluid*, The Spot 2009 Proceedings, Aalborg University, Institute of Energy Technology, Denmark, CD, ISBN 978-87-89179-84-1
27. Argeşeanu, A., Torac, I., Leban, K., Ritchie, E. *Low cost thermal energy storage system for excess electrical energy supplied by wind generators*, International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, Spetses Island, Greece, 24 - 26 September 2009, Proceedings of International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, CD, ISSN 1791-1133
28. Torac, I., Argeşeanu, A., Ritchie, E., Leban, K. *About the squirrel cage induction motor efficiency improvement*, International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, Spetses Island, Greece, 24 - 26 September 2009, Proceedings of International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, TEI of Piraeus & University of Paisley, CD, ISSN 1791-1133
29. Leban, K., Ritchie, E., Argeşeanu, A. *Magnetic Field Enhancement using Ferrofluid and Iron Powder*, International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, Spetses Island, Greece, 24-26 September 2009, Proceedings of International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, TEI of Piraeus & University of Paisley, CD, ISSN 1791-1133
30. Leban, K., Ritchie, E., Argeşeanu, A. *Novel Actuator I, Magneto rheological (MR) Fluid*, International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, Spetses Island, Greece, 24 - 26 September 2009, Proceedings of International Scientific Conference eRA-4, SynEnergy Forum(S.E.F.) – 2, TEI of Piraeus & University of Paisley, CD, ISSN 1791-1133
31. Coroban-Schramel, V., Boldea, I., Andreescu G.D., Blaabjerg, F. *Active-flux based motion sensorless vector control of biaxial excitation generator/motor for automobiles (BEGA)*, Energy Conversion Congress and Exposition, 2009, ECCE, IEEE, 20-24 September, 2009, Proceedings of Energy Conversion Congress and Exposition, ECCE, pp. 2131-2138, ISBN 978-1-4244-2893-9
32. Paicu, M.C., Tutelea, L., Andreescu, G.D., Blaabjerg, F., Lascu, C., Boldea, I. *Wide speed range sensorless control of PM-RSM via "active flux model"*, Energy Conversion Congress and Exposition, 2009, ECCE, IEEE, 20-24 September, 2009, Proceedings of Energy Conversion Congress and Exposition, ECCE, pp. 3822-3829, ISBN 978-1-4244-2893-9
33. Agarliță, S.C., Boldea, I., Marignetti, F., Tutelea, L. *Linear permanent-magnet valve actuator - The dynamic model: Digital simulations, open-loop U/f and I/f operation and position estimation performance, with experiments*, Advanced Electromechanical Motion Systems & Electric Drives Joint Symposium, 1-3 July 2009, Electromotion 2009, 8th International Symposium, Proceedings of Electromotion 2009, pp. 1-5, ISBN 978-1-4244-5150-0
34. Tutelea, L. *Stabilizarea temperaturii agentului de raciere pentru un calorimetru*, Sebeş, 5-6 June, 2009, pp. 309-316, ISBN 973-8130-82-4

BOOKS

1. Boldea, I., Tutelea, L. *Electric Machines: Steady State, Transients and Design with Matlab*, 775 pp., Editura CRC Press, 2009, ISBN 978-1-4200-5572-6
2. Biriescu, M. *Transformatoare şi maşini electrice. Teorie, identificări de parametri şi metode de testare*, 350 pp., Editura Orizonturi Universitare, Timişoara, 2009, ISBN 973-8391-64-5
3. Babescu, M. *Vehicule Electrice Hibride*, 277 pp., Editura Politehnica Timişoara, 2009, ISBN 978-973-625-999-9

RESEARCH GRANTS

1. Boldea, I., Muntean, N., Andreescu, D., Tutelea, L., Cornea, O., Gavriş, M., Antal, R., Petrila, D., Moldovan, A., MIRA Ltd (UK), Volvo Technology AB, Centro Ricerche Fiat Societa Consortile per Azioni, Robert Bosch GmbH, Lear Corporation Holding Spain SLU, MAGNA STEYR Fahrzeugtechnik AG & Co KG, Engineering Center Steyr GmbH & Co KG/ MAGNA Powertrain, FH-JOANNEUM Gessellschaft mbH, SC Beespeed Automatizari SRL, *Energy Efficient Vehicles for Road Transport, EE-VERT FP7*, Nr. SCS7-GA-2008-218598, An European Framework 7 project, Value 2009: 31.280 EUR
2. Biriescu, M., Liuba, Gh., Moţ, M., Irimia, D., Muşuroi, S., Greconici, M. *Optimizarea înfăşurărilor hidrogeneratoarelor electrice în vederea creşterii eficienţei energetice*, 21028/PNCDI2, ANCS, Value: 3.000 RON
3. Biriescu, M., Liuba, Gh., Proştean, O., Kilyeni, Şt., Grando, I., Filip, I., Moţ, M., Vasar, C., Szeidert, I., Ungureanu, D., Nedelea, V., Augustinov, L., Kunst, R., Frigură-Ileasa, F., Vuc, Gh., Şorândaru, C., Popovici, D., Boraci, R., Gherasimov, A., Gruescu, L., Bota, C., Lascu, M., Cornea, O., Nicoară, D., Micea, M., Ştef, V., Marchiş, C., Crasnanic, Gh. *Optimizarea funcţionării hidrogeneratoarelor electrice prin modernizarea sistemelor de excitaţie în vederea creşterii eficienţei energetice şi competitivităţii lor,* 21040/ PNCDI2, ANCS, Value 2009: 130.000 RON

PhD THESIS DEFENDED

1. Coroban - Schramel, V., *Bega – as a starter/ generator for automobiles*, PhD supervisor: Ion Boldea
2. Koblara, Th., *Contribuţii la conducerea performantă a motoarelor sincrone cu poli proeminenţi şi comutaţie secvenţială*, PhD supervisor: Gheorghe Atanasiu
3. Agarliţă, S. C., *Linear permanent magnet oscillatory machine and its control*, PhD supervisor: Ion Boldea
4. Paicu, M. C., *"Active flux" based wide speed range motion sensorless control of permanent magnet synchronous machines*, PhD supervisor: Ion Boldea

CONTACT

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DEPARTMENT OF POWER ENGINEERING

MAIN RESEARCH FIELDS

- Electromagnetic Compatibility in Power Systems

Keywords: electromagnetic field, environment, disturbance source, electromagnetic interference

- High Voltage Laboratory Tests and Quality Checking

Keywords: high voltage technique, overvoltages, testing record

- Modeling and Simulation of Electromagnetic Transients in Power Systems

Keywords: switching and lightning, overvoltages, transient response, simulation

- Power System Reliability

Keywords: loss of load probability, power system reliability, probability density function

- Power Apparatus and Equipments

Keywords: power apparatus, electrical equipment, switching devices, protection devices

- Power Quality

Keywords: harmonic analysis, data acquisition, computer aided statistical research

- Load Forecasting

Keywords: energy forecasting, expert system

- Power System Restructuring

Keywords: power system, energy pool, transmission open access, ancillary services, independent system operator

- Power System Transient Stability and Voltage Stability

Keywords: power systems, power systems stability, transient stability, voltage stability

- Electrical Materials

Keywords: ferromagnetic materials, hysteresis loop, transformer iron core, non-linear analyses methods

- Electrical Substations and Power Plants

Keywords: electrical energy production, power transformer, switching devices, protection devices, secondary circuits

- Energy Management

Keywords: energy efficiency, energy management systems, project feasibility

Researches in *ELECTROMAGNETIC COMPATIBILITY IN POWER SYSTEMS*

FIELD DESCRIPTION

Electromagnetically disturbances analysis produced by high and low perturbation sources; coupling mode between sources and victims and against perturbation action to protect the energetically field receptors analyses.

ACTIVITIES AND RESULTS

Over-voltage protection equipments, using ZnO varistors. Mathematics modeling and measurements of induced voltages in two-line circuit and adjacently circuits.

RESEARCH BENEFICIARIES

RN Transelectrica S.A., Timişoara

RESEARCH TEAM

- Prof. dr. eng. Flavius Dan ŞURIANU
- Prof. dr. eng. Viorel TITIHĂZAN
- Lect dr. eng. Ilona BUCATARIU
- Phd. Student Adrian OLARIU

Researches in *HIGH VOLTAGE LABORATORY TESTS AND QUALITY CHECKING*

FIELD DESCRIPTION

The purpose of high voltage tests consists of certifying the quality of insulation systems and emitting testing bulletins, optimal computation and experimental testing of insulation disturbance location and characteristic parameters measuring.

ACTIVITIES AND RESULTS

Tests on sparkover voltages (high voltages resistance variable arresters).
Tests on insulators of glass and composite insulators for a.c. overhead lines (Un >1000 V).
Tests on medium voltage 20 kV steel-aluminum conductor insulated with XLPE.
Tests on insulation of welding equipment.

RESEARCH BENEFICIARIES

SC Electroconstrucția ELCO Oradea S.A., S.C. Electrica Banat Timişoara, ISIM Timişoara

RESEARCH TEAM

- Prof. dr. eng. Flavius Dan ŞURIANU
- Assoc. prof. dr. eng. Viorel TITIHĂZAN
- Assoc. prof. dr. eng. Adrian PANĂ
- Lect dr. eng. Mariana TITIHĂZAN
- Phd. Student Adrian OLARIU

Researches in *MODELING AND SIMULATION OF ELECTROMAGNETIC TRANSIENTS IN POWER SYSTEMS*

FIELD DESCRIPTION

Studies present the statistical results of a switching or a lightning overvoltage performed on electromagnetic transients. The probability of shielding failures and backflashover have been evaluated and compared to the characteristics of transmission lines in service. Overvoltages caused by line energization, single and three phase reclosing have been investigated by statistical approach using ATP – EMTP.

ACTIVITIES AND RESULTS

In scientific research programs several models have been developed for calculation of switching or lightning overvoltages**.**

RESEARCH TEAM

- Prof. dr. eng. Corneliu VELICESCU
- Assoc. prof. dr. eng. Gheorghe VUC
- Phd. Student Daniel DONDERA

RESEARCH OFFERS

Power systems transients - modeling and simulation
Power systems reliability studies.
Transformer iron core, non-linear analyses methods.

Researches in *POWER SYSTEMS RELIABILITY*

FIELD DESCRIPTION

The research presents for different power systems configuration the probable energy value, which cannon be supplied and the loss of load probability. To obtain the probability density function the different probabilistic models are used like Gram-Charlier expansion or Monte Carlo simulation.

ACTIVITIES AND RESULTS

The scientific papers are published in power system reliability area**.**

RESEARCH TEAM

- Prof. dr. eng. Corneliu VELICESCU
- Prof. dr. eng. Mircea NEMEŞ
- Phd. Student Daniel DONDERA
- Phd. Student Felicia COROIU

RESEARCH OFFERS

Reliability evaluation of power system extension.

Researches in *POWER APPARATUS AND EQUIPMENT*

FIELD DESCRIPTION

There are a very large category of electrical systems, which include all type of switching devices (from Low to High Voltage), all the equipment existing in power stations, protection systems (surge arresters, current protections), automatic equipment (relays, contactors), power electronic devices and digital command equipment (such as PLC-s).

ACTIVITIES AND RESULTS

Design of new electrical switching devices, equipment and installations.
PCL's implementation for different applications
Software for digital command equipment.
On-line systems for monitoring and diagnosis of electrical equipment.

RESEARCH BENEFICIARIES

Ministry of Education and Research, S.C. Electrica S.A. (S.D. Timişoara and Sibiu), S.C. Transelectrica S.A. (S.T. Sibiu), Electroputere S.A. Craiova

RESEARCH TEAM

- Prof. dr. eng. Alexandru VASILIEVICI
- Prof. dr. eng. Iuliu DELESEGA
- Prof. dr. eng. Petru ANDEA
- Assoc. prof. dr. eng. Doru VĂTĂU
- Lect. dr. eng. Flaviu FRIGURĂ

Researches in *POWER QUALITY*

FIELD DESCRIPTION

Analysis of harmonics, unsymmetrical operations; equivalent parameter measurements for harmonic frequencies; evaluation of static reactive power compensation; control of passive power filter in electrical distribution systems.

ACTIVITIES AND RESULTS

Measurements were made in substations for Romanian National Electricity Company. A complex digital data acquisition system was used for the statistical estimation of harmonic distortion and unsymmetrical operation. New solutions were developed for the improvement of power quality in distribution systems.

RESEARCH BENEFICIARIES

National Agency of Scientific Research
Electrical Power Distribution Company – Electrica
National Power Transmission Company – Transelectrica

RESEARCH TEAM

- Prof. dr. eng. Vasile DUŞA
- Prof. dr. eng. Petru GHEJU
- Assoc. prof. dr. eng. Adrian PANĂ
- Lect. dr. eng. Ilona BUCATARIU

RESEARCH OFFERS

Measurement and characterization of harmonic distortion for large industrial loads, location of harmonics in power systems, estimation effects for harmonics and unbalanced load on power system's equipment, analysis of power quality.

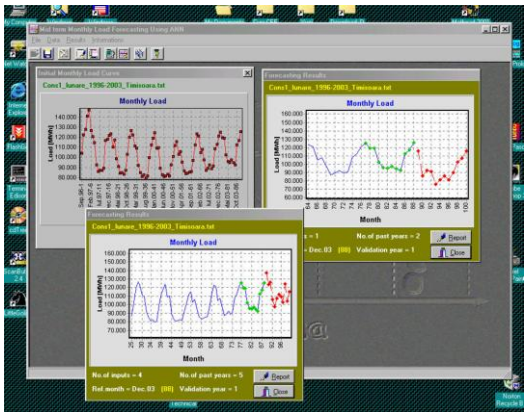
Researches in *LOAD FORECASTING*

FIELD DESCRIPTION

Analysis of electrical energy and power need for short and mid-term load forecasting; algorithm and program development for monthly energy consumption and daily load curves.

ACTIVITIES AND RESULTS

Electrical load data acquisition from "Electrica Banat" substations and data files processing.
Development of PRENPS and PELTMRNA programs for short-term daily load curve forecasting, respectively for mid-term monthly load forecasting.
Result analysis and forecast validation.



Load Forecast Software

RESEARCH TEAM

- Prof. dr. eng. Bucur LUŞTREA
- Assoc. prof. dr. eng. Adrian PANĂ
- Lect. dr. eng Ioan BORLEA
- Lect. dr. eng. Ilona BUCATARIU
- Phd. Student Constantin BĂRBULESCU
- Phd. Student Dan JIGORIA-OPREA

RESEARCH OFFERS

Short-term energy and load curve forecasting.
Expert systems for the checking of used database at forecasting.

Researches in *POWER SYSTEM RESTRUCTURING*

FIELD DESCRIPTION

The unprecedented world - wide restructuring of the power industry move away from the traditional monopolies and toward greater competition, in the form an increased members of independent power producers and an unbundling of the main services that were until now provided by the utilities, has been building up for over a decade.

ACTIVITIES AND RESULTS

Managing risk on new market power and price stability.
Pricing of network access.

RESEARCH TEAM

- Prof. dr. eng. Mircea NEMEŞ
- Prof. dr. eng. Corneliu VELICESCU
- Assoc. prof. dr. eng. Gheorghe VUC
- Assoc. prof. dr. mat. Doru PĂUNESCU (Department of Mathematics)

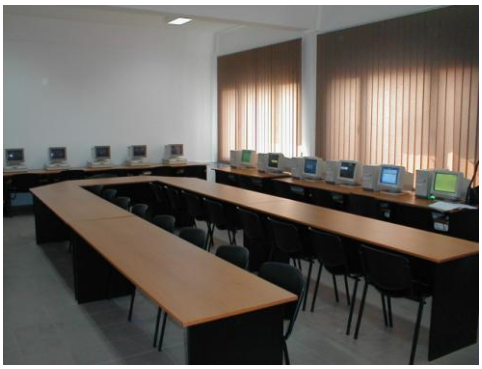
RESEARCH OFFERS

Digital model of power system
Optimal Power Price Simulator (OPP)

Researches in *POWER SYSTEM TRANSIENT STABILITY AND VOLTAGE STABILITY*

FIELD DESCRIPTION

Computer aided analysis and improvement of the stability of the electric power system (transient stability, dynamic stability and voltage stability).
New control technique for stability improvement.
Developing of the master studies in these fields.



Power Systems Optimization Laboratory

ACTIVITIES AND RESULTS

Advanced software for stability analysis.
New control techniques for the improvement of the dynamic behavior of synchronous generators
PHARE postgraduate and PhD program.

RESEARCH BENEFICIARIES

Ministry of Education and Research.
Electrical Power Distribution Company – Electrica
National Power Transmission Company – Transelectrica.

RESEARCH TEAM

- Prof. dr. eng. Stefan KILYENI
- Prof. dr. eng. Mircea NEMEŞ
- Prof. dr. eng. Ştefan PREITL
- Prof. dr. eng. Bucur LUŞTREA
- Prof. dr. eng. Mihai MOGA
- Prof. dr. eng. Radu Emil PRECUP
- Lect. dr. eng. Ioan BORLEA
- Phd. Student Constantin BĂRBULESCU
- Phd. Student Dan JIGORIA-OPREA
- Phd. Student Dan CRISTIAN
- Phd. Student Florin SOLOMONESC

RESEARCH OFFERS

Software for stability analysis and improvement
Studies concerning dynamic behavior of power systems.
Advanced control techniques for transient and voltage stability improvement.

Researches in *APPLIED NON-LINEAR MODELING OF FERROMAGNETIC MATERIALS*

FIELD DESCRIPTION

The modeling of non linear transformer iron core considered the hysteresis loop. Modeling methods for establishment and validation. Estimation of the transformer behavior under symmetrical (sinusoidal and non-sinusoidal) and asymmetrical supply conditions. Analyses the main quantities. Iron core losses harmonic analyses.

ACTIVITIES AND RESULTS

Measurements were performed in the "National Research Center for Welding and Material Trials-ISIM" and the "Power Energy Department" laboratories. A complex digital system was used for data acquisition and harmonics analyze of the transformer currents and tension for different supply conditions. The proposed transformer model was implemented into a welding machine and validated (comparison between the simulated and the measured results showed a very good agreement). Simulations were performed over in order to estimate the welding performances over a wide range of condition defined through: different firing pulse angle, materials, forms and thickness of welding pieces.

RESEARCH BENEFICIARIES

National Research Center for Welding and Material Trials-ISIM, Timisoara.
Power Energy Department of the "Politehnica" University of Timisoara.
ICPE Bucharest - manufacturer of the welding transformer under test.

RESEARCH TEAM

- Assoc. prof. dr. eng. Doru VĂTĂU
- Lect. eng. dr. Flaviu FRIGURĂ

RESEARCH OFFER

Modeling single-phase transformers and equipments with ferromagnetic core.
Estimation of electromagnetic quantities: time variation shape, r.m.s., peak values, harmonic analyze over a wide range of conditions.
Time and frequency analysis of electromagnetic quantities.
Behavioral analysis of a complex system containing a transformer or an apparatus.
Iron core power losses detailed analysis.

Researches in ELECTRICAL SUBSTATIONS AND POWER PLANTS

FIELD DESCRIPTION

Constructive solutions optimization used for electrical equipments and installations in electrical substations, operating principles and general characteristic optimization for the reliability and system management improvement.
Specific problems of planning for the electrical network operating control and command.

ACTIVITIES AND RESULTS

Solutions for the electrical substation auxiliaries supplying from the 220/110 kV autotransformer tertiary. Development of an expert system which offer informational support for substation operating recovery, which following a failure, that monitor continually all functions needed by protection and control and which come in to support for operating personnel.

RESEARCH TEAM

- Prof. dr. eng. Petru GHEJU
- Prof. dr. eng. Vasile DUȘA
- Prof. dr. eng. Bucur LUȘTREA
- Lect. dr. eng. Ioan BORLEA
- Lect. dr. eng. Ilona BUCATARIU
- Phd. Student Florin MOLNAR-MATEI
- Phd. Student Alexandru BĂLOI

RESEARCH OFFERS

The opportunity analysis of the implementation intelligent systems needed for filtering, cataloguing and store of the information provided from the protection and control systems in the electrical substations for substation remote control.

Researches in *ENERGY MANAGEMENT*

FIELD DESCRIPTION

Energy audit, energy management are the only means for sustainable energy use and best economical performance in entire society.

ACTIVITIES AND RESULTS

Measurements audit were made in substations for "Transelectrica" National Transmission Company. Were realized feasibilities studies for new solutions in auxiliary services supplying and for public lightning systems energy efficiency improvement.

RESEARCH BENEFICIARIES

National Agency of Scientific Research.
Timisoara, Satu Mare City Councils.
National Power Transmission Company – Transelectrica.
Politehnica University from Timisoara.

RESEARCH TEAM

- Prof. dr. eng. Flavius Dan ȘURIANU
- Assoc. prof. dr. eng. Gheorghe VUC
- Assoc. prof. dr. eng. Dan NICOARA
- Assoc. prof. dr. eng. Alexandru HEDES

RESEARCH OFFERS

Feasibility studies for energy efficiency projects, energy audits, energy policies advising.

PUBLICATIONS

PUBLISHED PAPERS

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10. Jigoria-Oprea Dan, Lustrea Bucur, Borlea Ioan, Kilyeni Stefan, Andea Petru, Barbulescu Constantin, *Short term daily load forecasting using recursive ANN*, Proceedings of the IEEE International Conference Eurocon 2009, Saint-Petersburg, Russian Federation, pp. 646-651, ISBN 978-1-4244-3967-6
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13. Moga Mihai, Molnar Florin, Biriescu Marius, *Application Software for Minimum Loss Configuration of the Distribution Networks*, Proceedings of the IEEE International Conference Eurocon 2009, Saint-Petersburg, Russian Federation, pp. 2083-2088, ISBN 978-1-4244-3967-6
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15. Pop Oana, Paunescu Doru, Kilyeni Stefan, Nemes Mircea, Kilyeni Annamaria, Barbulescu Constantin, *Probabilistic distribution factors assessment using OptimalPowerPrice Mathematica software. Case study: Test25 buses test power system*, Proceedings of the 5th International Symposium on Applied

Computational Intelligence and Informatics (SACI), Timisoara, Romania, pp. 453-458, ISBN 978-1-4244-4478-6

16. Pop Dana, Kilyeni Stefan, Andea Petru, Barbulescu Constantin, *Congestion risk management using the probable value of congestion and the optimization of the operating regimes. Case study for Western part of the Romanian Power System*, Proceedings of the IEEE International Conference Eurocon 2009, Saint-Petersburg, Russian Federation, pp. 658-663, ISBN 978-1-4244-3967-6
17. Precup Radu-Emil, Tomescu Marius, Preitl Stefan, Petriu Emil, Kilyeni Stefan, Barbulescu Constantin, *Stability analysis approach to a class of fuzzy controlled nonlinear time-varying systems*, Proceedings of the IEEE International Conference Eurocon 2009, Saint-Petersburg, Russian Federation, pp. 970-975, ISBN 978-1-4244-3967-6
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22. Pop Oana, Barbulescu Constantin, Nemes Mircea, Kilyeni Stefan, *The influence of the common structure modification on the allocation*, International Journal of Electrical Power and Energy Systems Engineering, ISSN 2070-3767, Vol. 2, pp. 61-66, ISSN 2070-3767, Compendex
23. Barbulescu Constantin, Kadar Peter, Kilyeni Stefan, Vuc Gheorghe, Jigoria-Oprea Dan, Simo Attila, Cristian Petru Dan, *Probabilistic power flow using a software tool designed for stochastic power system analysis*, Revue Energetica, Vol. 10, pp. 523-529, ISSN 1453-2360
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35. Frigura-Iliasa Mihaela, Frigura-Iliasa Flaviu, *A New Configuration for High Energy Low Voltage disk ZnO Based Varistors*, The Second International Conference „Research People and Actual Task son Multidisciplinary Sciences", Lozenec, Bulgaria, Proceedings of the Second International Conference „Research People and Actual Task son Multidisciplinary Sciences", Lozenec, Bulgaria, pp. 215-223, ISSN 1313-7735
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RESEARCH GRANTS

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Euro, Value for UPT 12.000, Partners: ADR Vest, USAMVB Timisoara, UV Timisoara, UAV Arad. UPT team: Vasiu Radu, Frigura Iliasa Flaviu, Vatau Doru, Coroiu Felicia, Matiu Iovan Liliana, Rangu Marius.

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