

# LABORATOR CERCETARE-DEZVOLTARE-INOVARÉ

## SISTEME DE ACŢIONARE ELECTRICĂ ŞI EFICIENŢĂ ENERGETICĂ

### DirecŃii de cercetare:

1. Sisteme de acŃionări electrice reglabile, eficiente energetic, cu maşini de curent alternativ.
2. Sisteme cu turaŃie variabilă pentru producerea energiei electrice.
3. Sisteme de acŃionare electrică a vehiculelor hibride şi electrice.
4. Sisteme de tracŃiune electrică.

### Teme de cercetare

1. Sisteme de acŃionări electrice reglabile cu maşini asincrone.
2. Sisteme de acŃionări electrice reglabile cu maşini sincrone clasice.
3. Sisteme de acŃionări electrice reglabile cu maşini sincrone cu magneŃi permanenŃi, având întrefier radial sau axial.
4. Întocmirea bilanşurilor electroenergetice şi propunerea de soluŃii pentru îmbunătăŃirea eficienŃei energetice a consumatorilor industriali şi rezidenŃiali.
5. Sisteme eoliene de producere a energiei electrice cu generator sincron clasic cuplat direct cu turbina.
6. Sisteme cu turaŃie variabilă pentru producerea energiei electrice cu maşini asincrone şi convertoare statice.
7. Cercetări referitoare la convertoarele statice de putere utilizate pentru sistemul de acŃionare electrică al vehiculelor hibride, cu diferite grade de electrificare.
8. Cercetări referitoare la utilizarea unui singur convertor static de putere pentru controlul generatorului electric şi al motorului electric de tracŃiune la un vehicul hibrid serie.
9. Optimizarea încărcării bateriilor de acumulatori ale vehiculelor hibride.
10. Cercetări referitoare la convertoarele statice de putere utilizate pentru sistemul de acŃionare electrică al vehiculelor pur electrice.
11. Studiul sistemului electric diferenŃial, cu un stator şi două rotoare, de transmitere a cuplului la roŃile motoare.
12. Controlul sistemelor de tracŃiune electrică.
13. ÎmbunătăŃirea performanşelor energetice a sistemelor de tracŃiune electrică.

**Infrastructura de cercetare:** stand de încercare a sistemelor de acŃionare electrică în patru cadrane, sisteme diverse de maşini electrice cu convertoarele statice aferente, aparatură de măsură şi achiziŃie de date.

### Colaborari internaŃionale:

- Prof. Dr. ing. Fabrizio Marignetti, Universitatea din Cassino, Italia.
- Prof. Dr. ing. Tihomir Latinovic, Universitatea din Banja Luka, Bosnia şi HerŃegovina
- Prof. Dr.ing. Gabor Sziebig, Department of Industrial Engineering, Narvik University College, Norvegia

### Rezultate obŃinute:

- articole publicate în reviste internaŃionale
- prezentarea rezultatelor cercetării la conferinŃe naŃionale şi internaŃionale
- brevete de invenŃie

### **Articole in reviste și conferințe cotate ISI și BDI**

1. Tutelea Lucian Nicolae, Deaconu Sorin Ioan, Boldea Ion, Design and FEM Validation for an Axial Single Stator Dual Rotor PMSM, 38th Annual Conference on IEEE Industrial Electronics Society, IECON 2012, Montreal, Canada, 25-28 October, pp. 2911-2917, ISBN 978-4673-2420-5.
2. Lucian Nicolae Tutelea, Sorin Ioan Deaconu, Gabriel Nicolae Popa, Dual stator winding variable speed asynchronous generator: optimal design and experiments, IOP Conf. Series: Materials Science and Engineering 85 (2015) 012010, pp. 9, ISSN: 1757-899X, 2015.
3. Deaconu Sorin Ioan, Popa Gabriel Nicolae, Babău Radu, Study, Design and Industrial Implementation of Capacitive Power Factor Controller for Large Load Fluctuations in Steel Industry, 8th International Conference and Exposition on Electrical and Power Engineering, IEEE, EPE, Iași, România, pp. 962-967, ISBN 978-1-4799-5849-8, 2014.
4. Tutelea Lucian Nicolae, Deaconu Sorin Ioan, Boldea Ion, Popa Gabriel Nicolae, Dual Rotor Single-Stator Axial Air Gap PMSM Motor/Generator Drive for High Torque Vehicles Applications, IOP Conference Series-Materials Science and Engineering, vol.57(2014), pp.6, ISSN 1757-8981, 2014.
5. Tutelea Lucian Nicolae, Deaconu Sorin Ioan, Popa Gabriel Nicolae, Reduced Cost Low Speed Wind or Hydro Energy Conversion System with Twin Stator Windings Induction Generators, 16th International Conference on Power Electronics and Motion Control Conference and Exposition, PEMC, Antalya, Turcia, pp. 317-324, ISBN 978-1-4799-2062-4, 2014.
6. Marcel Topor, Sorin Ioan Deaconu, Lucian Nicolae Tutelea, Homo-heteropolar Synchronous Machine for Low Power Variable Speed Wind or Hydro Applications: Design, 3D FEM Validation and Control, Power Electronics and Applications (EPE'14-ECCE Europe), 2014 16th European Conference on, 26-28 Aug. 2014, Lapenranta, Finlanda, ISBN 978-1-4799-3014-2 and 978-9-0758-1520-7, pp.10, 2014.
7. Lucian Nicolae Tutelea, Ion Boldea, Nicolae Muntean, Deaconu Sorin Ioan, Modeling and Performance of Novel Scheme Dual Winding Cage Rotor Variable Speed Induction Generator with dc Link Power Delivery, IEEE ENERGY CONVERSION CONGRESS & EXPOSITION, ECCE 2014, September 14-18, Pittsburgh, USA, pp. 271-278, ISBN 978-1-4799-5776-7/14, 2014.
8. Lucian Nicolae Tutelea, Sorin Ioan Deaconu, Ion Boldea, Classical DC Excited Synchronous Generator for High Power Direct Driven Wind Turbine: Optimal Design and FEM Validation, EPE'15 ECCE Europe, Geneva, 8-10 septembrie, pp. 7, ISBN: 9789075815238, 2015.
9. Boldea Ion, Tutelea Lucian, Deaconu Sorin Ioan, Fabrizio Marignetti, Dual Rotor Single-Stator Axial Air gap PMSM Motor/Generator Drive for HEVs: A Review of Comprehensive Modeling and Performance Characterization, International Conference on Electrical Systems for Aircraft, Railway and Ship Propulsion, ESARS 2012, Bologna, Italy, 16-18 October, pp. 8, ISBN 978-4673-1371-1.
10. Tutelea Lucian Nicolae, Boldea Ion, Deaconu Sorin Ioan, Optimal Design of Dual Rotor Single Stator PMSM Drive for Automobiles, International Electric Vehicle Conference, IEVC 2012, Greenville, SC, SUA, 8 pp., ISBN 978-1-4673-1562-3.
11. Tutelea Lucian Nicolae, Boldea Ion, Deaconu Sorin Ioan, The Single Stator Dual Rotor PMSM for HEV: Two Windings and 4 Leg Inverter Control, EPE-PEMC ECCE Europe, 15th International Power Electronics and Motion Control Conference and Exposition, Novi Sad, Serbia, 4-6 Septembrie, 2012, pp. 6, ISBN 978-4673-1972-0.
12. Deaconu Sorin Ioan, Popa Gabriel Nicolae, Deaconu Răzvan, Commissioning, Monitoring and Control of a low power Hydroelectric Power Plant, 16th WSEAS International Conference on Systems, Kos Island, Greece, 14-17 iulie, 2012, ISBN 978-61804-108-1.



13. Tutelea Lucian Nicolae, Deaconu Sorin Ioan, Boldea Ion, Fabrizio Marignetti, Popa Gabriel Nicolae, Design and Control of a Single Stator Dual PM Rotors Axial Synchronous Machine for Hybrid Electric Vehicle, 14th European Conference on Power Electronics and Applications, EPE 2011, Birmingham, England, 1-2 September, pp. 10, ISBN 978-1-61284-167-0.
14. Deaconu Sorin Ioan, Tutelea Lucian Nicolae, Popa Gabriel Nicolae, Latinovic Tihomir, Mathematical Models and the Control of Homopolar and Homo-heteropolar Reactive Synchronous Machine With Stator Excitation, European Conference of Systems, ECS 2010, Puerto de la Cruz, Tenerife, Spania, November 30-December 2, pp. 78-83, ISBN 978-960-474-250-9.
15. Deaconu Sorin Ioan, Popa Gabriel Nicolae, Toma Ioan Adrian, Topor Marcel, Modeling and Experimental Analysis for Modernization of 100t EAF, IEEE Transactions on Industry Application, Vol. 46, no. 6, pp. 2259-2266, November-December 2010.
16. Boldea Ion, Topor Marcel, Fabrizio Marignetti, Deaconu Sorin Ioan, Tutelea Lucian Nicolae, A Novel, Single Stator Dual PM Rotor Synchronous Machine: Topology, Circuit model, Controlled Dynamics Simulation and 3D FEM Analysis of Torque Production, 12th Conference on Optimization of Electrical and Electronic Equipment, OPTIM 2010, Brasov, Romania, pp. 343-351, ISBN 978-4244-7020-4.
17. Deaconu Sorin Ioan, Marcel, Popa Gabriel Nicolae, Bistriana Diana Alina, Experimental study and comparative analysis of transients of induction motor with softstarter startup, Advanced in Electrica and Computer Engineering, Issue 3, pp. 27-33, 2010, ISSN 1582-7445
18. Deaconu Sorin Ioan, Topor Marcel, Popa Gabriel Nicolae, Bistriana Diana Alina, Application of the squirrel cage asynchronous machine working as single phase generator in Microhydro Power, Journal of Engineering Annals of Faculty of Engineering Hunedoara, ISSN 1584-2673, CNCSIS B+, 2009, Tome VII, fascicula 3, pp. 324-331.
19. Deaconu Sorin Ioan, Topor Marcel, Tutelea Lucian Nicolae, Popa Gabriel Nicolae, Abrudean Cristian, Modelling and Experimental Investigations of a Reactive Homo-Heteropolar Brushless Synchronous Machine, IECON 2009 Proceedings, Porto, Portugal, pp. 1205-1212, ISBN 978-1-4244-4659-0.
20. Deaconu Sorin Ioan, Topor Marcel, Popa Gabriel Nicolae, Popa Iosif, Comprehensive Analysis for Modernization of 100t Electric Arc Furnace for Steel Production, IAS 2009, Annual Meeting, Houston Texas, SUA, CFP 09 IAS-CDR, 4-8 Octombrie, ISBN 978-1-4244-3476-3, 6pp.
21. Deaconu Sorin Ioan, Topor Marcel, Tutelea Lucian Nicolae, Popa Gabriel Nicolae, Abrudean Cristian, Mathematical Model of a Reactive Homopolar Synchronous Machine with Stator Excitation, EPE 2009, 13th European Conference on Power Electronics and Applications CFP 09850- CDR, Barcelona, Spania, 8-10 Septembrie, 9 pp., ISBN 978-9-0758-1150-09.
22. Deaconu Sorin Ioan, Topor Marcel, Popa Gabriel Nicolae, Bistriana Diana Alina, Analysis of Hybrid Power System Incorporating Squirrel Cage Induction Generators, SYSTEMS 2009, 13th WSEAS International Conference on Systems, Insula Rodos, Grecia, ISSN 1790-2769, 22-24 Iulie, ISBN 978-960-474-097-0, pp. 289-294.
23. Deaconu Sorin Ioan, Tutelea Lucian , Popa Gabriel Nicolae, Popa Iosif , Abrudean Cristian , Optimizing the Designing of a Reactive Homopolar Synchronous machine with Stator Excitation , IECON 2008, 34th Annual Conference of the IEEE Industrial Electronics Society, Orlando, Florida, U.S.A. , ISBN 978-4244-1766-7, ISSN 1553-572X , pp. 1311-1318 .
24. Pănoiu Manuela, Pănoiu Caius, Deaconu Sorin Ioan, Study about the possibility of electrodes motion control in the EAF based on adaptive impedance control, 13th International Power Electronics and Motion Control Conference, EPE-PEMC 2008, Poznan, Poland, 1-3 Septembrie, pp. 1409-1415, ISBN 978-1-4244-1741-4.

25. Deaconu Sorin Ioan, Popa Gabriel Nicolae, Popa Iosif, Optimizing the Operation of an Urban District Heating System by Means of Variable Speed Drives, New Aspects of Systems. Part I, Proceedings of the 12th WSEAS International Conference on Systems (SYSTEMS '08), Heraklion, Grecia, Published by WSEAS Press, 22-24, iulie, ISBN 978-960-6766-83-1, ISSN 1790-2769, pp. 149-154.

### Brevete de invenție

1. Popa Gabriel Nicolae, Popa Iosif, Deaconu Sorin Ioan, Convertor liniar tensiune continuă-semnal sinusoidal de frecvență variabilă, RO130458 A2, 2015.
2. Boldea Ion, Deaconu Sorin Ioan, Marignetti Fabrizio, Tutelea Lucian Nicolae, Brushless electrical actuator with two independent rotors for hybrid electrical propulsion, IT 1409332-B, 2014.
3. Popa Iosif, Popa Gabriel Nicolae, Deaconu Sorin Ioan, Releu electronic de timp cu toate funcțiile uzuale, RO129042 A2, 2013.

### Echipamente și instalații pentru cercetare-dezvoltare

<p>Stand experimental cu funcționare în patru cadrane pentru încercarea sistemelor de acționare electrică și a sistemelor de producere a energiei electrice</p>	
<p>Sistem de acționare electrică cu convertor static ACS 800 cu control direct de cuplu (DTC)</p>	

Sistem de acționare electrică cu softstarter de tip MSF-017 pentru pornirea controlată a motoarelor asincrone



Generator sincron homopolar reactiv cu excitație statorică

