FACULTY OF ENGINEERING IN HUNEDOARA

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RESEARCH CENTER
OPTIMIZATIONS IN THE INDUSTRY OF MATERIALS

GENERAL PRESENTATION

The Research Center "Optimizations in the Industry of Materials" is recognized by the National Board of Higher Education Scientific Research through certificate No. 100/CC-C of 11.05.2001. It is established at the Faculty of Engineering in Hunedoara and it includes staff involved in the research activity in the fields of electrotechnics, mechanics and metallurgy.

The Department of Electric Engineering and Industrial Computer Science has specialized laboratories for researches on the functioning of the rotative electric equipment and transformers, electrical equipment, electric and electronic circuits, for carrying out the achievement and processing of data, the analysis of the quality of the electric power of different consumers, studying the electromagnetic compatibility, the analysis and synthesis of the automatic adjustment of the parameters of the industrial processes, using the classic adjustment methods, as well as new methods, based on the fuzzy logic, neuronal networks, expert systems.

In the laboratories of the Department of Engineering and Management, the teaching staff can carry out researches in the fields of chemistry, plastic deformation, studies related to the elaboration of iron and non-ferrous materials, thermal treatments and economic researches (prognosis, diagnosis etc.).

The material resources and infrastructure of the Department of Engineering and Management ensures the possibility of carrying out mechanic tests at the surrounding temperature and low temperatures, the research of the behavior of some machinery parts (belts, bearings, springs etc.) during functioning and the tribologic analysis of lubricants and various pairs of materials.

MISSION

The Research Center "Optimizations in the Industry of Materials" offers the framework for scientific research and human resources formation activities in the field of electrotechnics, mechanics, the science of materials, automotive engineering and industrial computer science.

The research activity carried out within the research center is strictly related with the teaching process and aims at:

- solving research topics in the field of materials
- forming specialists who may contribute, through their qualification and performances, to the enlargement of the state of knowledge
- raising the competitiveness of the Faculty of Engineering in Hunedoara on the qualifications market requested by the market economy
- forming of elites within the young generation
- obtaining outside the budget incomes for the modernization of the laboratory infrastructure.

FIELDS OF RESEARCH

Numerical modeling and control of the induction heating electro technology. Electromagnetic compatibility. Modeling and simulation of electro thermal installations. Modeling, simulation and automation of processes in the sintering plants by Fuzzy logic. Magnetism, physics of systems of magnetic nano-particles, magneto – insulator materials, methods and models of simulation. Adaptive processing of signals. Improvement of power factor in electric installations with automatic controllers. Improvement of performances for some industrial electric filters. Accomplishment of analogical and numerical protections for low voltage three-phase induction motors. Analysis of electric parameters, from the point of view of electro-magnetic compatibility, for different consumers: dust electric filters, lighting systems, and electric motors. Implementation of programming automatic machines and micro-controllers in applications. New design and diagnosis methods for electric installations. Design and accomplishment of some new electronic devices for protection of low voltage electric motors. Design and accomplishment of some new switch apparatus with integrated logical circuits. Design and accomplishment of data computers (switch boards) for different types of electric actuations in wire and programmed structure. Implementation of programming automatic machines in industrial applications. Research on modeling and management of metal continuous casting process. Research on electric power quality in the electric railway transport. Principles, methods and technologies for standardization of object oriented software systems. Artificial Intelligence. Distributed Software. Multi-agent Systems. Distributed Constraints' Software. Research on systems based on virtual reality and educational software applications. Resistance of materials. Elasticity. Plasticity. Processing technologies. Tests on materials at high temperatures. Thermal fatigue of hot rolling cylinders. Optimization of resistance structures. Analysis of tensions and deformations. Processing in semi-solid status of metallic alloys. Reliability and maintainability of industrial entities. Theory of linear operators' semi-groups. Study of spectral properties, convergence properties and some representation formulae both for semi-groups

of series C_0 and integrated ones. Research on fluid motions with sliding phenomena on plane surfaces in the first-order approximation. Processing of experimental data by mathematic modeling with truncate probability laws. Theory of operators, study of stability and dichotomy of a solution of differential equations. Machines and hydro-pneumatic actuations. Rolling of materials. Research development for continuous casting products. Waste recycling. Environmental protection. Materials science and technology. The optimisation of the processes of elaboration and solidification of the steel. Research development for continuous casting products. The recovery and the development of the metallic scraps. Waste recycling. Environmental protection.

KEYWORDS

Induction heating; numerical modeling; numerical control; electromagnetic compatibility, indicators of electric power quality, harmonic regime, continuous casting, crystallizer (mould), Fuzzy governing, expert system; electric installations, electronic relays, electric filters, protections, electromagnetic compatibility, programming automatic machines, protections, switch apparatus, data computers (switch boards), magnetism, nano-particles' systems, virtual reality, educational software, agents, constraints, messages and induction searching techniques, mechanical characteristics, high temperatures, fatigue, tensions, durability, optimization, cylinders, C_0-semi-groups, integrated semi-groups, adjunct semi-groups, diffusion operators, Schrödinger operators, L^∞- uniqueness, fluids, sliding phenomena, truncate probability densities, theory of semi-groups, operators in Banach spaces, machines and actuations, hydraulics, pneumatics, mechanics of fluids, steel, waste, environment, casting, ingot, continuous casting, semifinished products, pulverous waste, lime, dolomite, non-ferrous slags, quality, advanced materials.

ACTIVITIES

- Analysis of Some Programmable Logic Controller Used in Industrial Applications;
- Analysis of Modern Inverter Welding Power Sources;
- Analysis of Electronic Time Relais with Different Configurations;
- Optimizing of Mining Extraction Equipments
- Analysis of reliability and maintainability of industrial entities;
- Study on the catenary suspension-pantograph structure in the railway electric driving, in view of improving the energy transfer;
- Computer aided design of machine parts and mechanisms;
- Classical and special electrical machines;
- Electrical drives;
- Electrical traction;
- Static converters;
- Studies regarding the die-forging of the metallic alloys in semisolid state;
- Assimilating in the fabrication process of new technologies of carbon and alloyed steel making;
- Improving the technologies of carbon and alloyed steel making and casting in the direction of improving the physical – mechanical and technological characteristics;
- Reducing the electric power and thermal energy consumption, auxiliary and raw materials, refractories and metal specific consumption;
- Introducing in the iron and steel industry economic circuit of some metal waste with iron content resulted from different industrial branches (iron and steel industry, energetic industry, mining industry, mechanical engineering industry, chemical industry, etc.);
- Studies on the hydrodynamics and thermal work conditions of the alloy in the casting ladles;
- Studies in computational fluid dynamics, swirling flow motions and stability analysis of some type of vortices;
- Studies upon truncated distributions in multidimensional data modeling;
- Studies and investigations on automation and optimization of continuous casting process;
- Modelling and control of continuous casting process using Fuzzy logic;
- Analysis of electromagnetic interferences produced by operating the crucible induction furnaces which are supplied at industrial frequency;
- Studies and investigations on automation and optimization of sintering processes;
- Modelling and control of sintering processes using fuzzy logic;
- Software-oriented controller for hierarchycal management of materials transportation process in sintering plants;
- Researches regarding the quality assurance of the rolling mills cast-iron cylinders;
- Researches regarding the durability in exploitation of the rolling cast-iron cylinders;
- Researches regarding the materials destined to the rolling mills cast-iron cylinders;
- Analysis of the moulding – casting technology of the rolling mill cylinders;
- Experimental analysis of the strain state in the mill rolls, using the numerical simulation;
- Computer graphics;
- E-learning;
- Symbolic computation in education;
- Object-oriented programming;
- Advanced programming methods;
- The implementation of the asynchronous techniques in Netlogo. The management of the

messages in the case of the asynchronous search techniques. The introduction of the synchronization of the agents execution for the asynchronours search techniques;
- Implementation and evaluation model for the asynchronous search techniques: MAS NetLogo Models-c.Available: http://discsp-netlogo.fih.upt.ro/;
- The introduction of a model of implementation and evaluation for the asynchronous search techniques in NetLogo, with support for the message synchronization and management;
- Starting from the proposed implementation model, the making of two multi-agent systems with synchronization which can be used for the implementation and evaluation of the asynchronous techniques;
- The use of the model in the study of agents behavior in several situations, like the priority order of the agents, the synchronous and asynchronous case, leading, therefore, to identifying possible enhancements of the performances of asynchronous search techniques;
- Analysis of electromagnetic pollution produce by nonlinear power loads;
- Analysis of electromagnetic pollution produced by electrical locomotive;
- Modelling and simulation of the disperse systems of magnetic nanoparticles behavior in dynamics fields ;
- Optimization the process of bimetals lamination and the tables plating, using the asymmetrical rolling;
- Analysis of the thermal fatigue of the hot mill rolling cylinders;
- The study of the durability of the hot rolling mill cylinders;
- Researches and experiments regarding the thermal and the equivalent tensions from the hot rolling mills cylinders, in avoiding the growing thermal fatigue resistanc and the increase ofservice life;
- Identification, modelling and control of the continous casting;
- Analysis of processes in internal combustion engine;
- Analysis of heat transfer in internal combustion engine with FEA methods;
- Analysis of air flow in air filters for internal combustion engine with CFD software;

RESEARCH PROJECTS

1. No. 46GR/11.05.2007: *Research on the techniques for obtaining semisolid steel products by die forging*, Program CNCSIS TD, Manager: Stoica (Milostean) Daniela Cătălina Value: RON 40,000.
2. Research Contract No. 5889/18.09.2006 (continuing in 2007): *Researches regarding the quality assurance of the rolling mills cast-iron cylinders through mathematical molding of the manufacturing process and the experimental study of durability in exploitation* – Program CEEX for Young Researchers, Manager: Lect. dr. eng. Imre KISS. Value: RON 110,000.
3. Contract 3194/13.10.2005 (continuing in 2006 and 2007): *The optimization of the thermal regime of the steel on the direction furnace – secondary treatment unit – continuous casting installation* - Program CEEX for Young Researchers Director: Lect. dr. eng. Erika Ardelean. Value: RON 61,000.
4. Contract 232/20.07.2006: (continuing in 2007) *New refractories of complex functions used in steel industry, made by modern technologies*, Program CEEX Consortium – Partner P2. Responsible: Prof. dr. eng. Teodor Hepuţ. Total value of the contract RON 100,000 (for Partner P2 - UPT).
5. Contract 233/20.07.2006 (continuing in 2007): *Integrated technology to obtain some non-conventional energy – technological sources, used as raw materials for steel making*, Program CEEX Consortium – Partner P3. Responsible: Prof. dr. eng. Teodor Hepuţ. Total value of the contract RON 100,000 RON (for Partner P3 - UPT).
6. Contract 3196/13.10.2005 (continuing in 2006 and 2007): *Researches and experiments regarding the improvement of semi manufactured good structure continuous casting*, Program CEEX for Young Researchers. Director: Assoc.prof.dr.eng. Ana Socalici. Value: RON 75,000.
7. Contract 71-044/2007: *Advanced technology direction of pieces case-hardening industrial process in induced current***,** Program PN2 – Consortium. Responsible: Prof.dr.eng. Teodor Hepuţ. Value of the contract RON 102,895 (for Partner P2 - UPT).
8. Contract 31-098/2007: *Prevention and fighting pollution in the steel making, energetic and mining industrial areas through the recycling of small-size and powdering wastes*, Program PN2 – Consortium. Responsible: Prof.dr.eng. Teodor Hepuţ. Value of the contract RON 130,000 RON (for CO – UPT)
9. Contract no.40/20.04.2007: *The impact of lime-dolomite plants upon the environment and the possibility of reducing the ecological risk in these regions*, Balkan Environmental Association (B.EN.A.), Manager project: Lect. dr.eng. Erika Ardelean. Value: RON 2,300.
10. Contract no. 41/20.04.2007: *Practical application of deferized steelshop slags in agriculture*, Balkan Environmental Association (B.EN.A.), Manager project: Assoc.prof.dr.eng. Ana Socalici. Value: RON 2,100.

11. No. 63/2007: *Study about harmonic pollution mitigation in the electric power supply network caused by electrical locomotive* - Program Project B.EN.A Cosmote, Responsible: Assoc. prof. dr. eng. Panoiu Caius, Value: RON 3,200.
12. No. 62/2007: *Study about harmonic pollution mitigation in the electric power supply network at ultra high power electric arc furnaces* - Program Project B.EN.A Cosmote, Responsible: Assoc. prof. dr. eng. Panoiu Manuela. Value: RON 2,400.
13. No. 1385/2007 (continuing in 2007): *Multi-agent models and soft computing in knowledge engineering – MINDSOFT*- Program CEEX, Director: Prof.dr.eng. Negru Viorel.
14. Contract 5889/18.09.2006 (continuing in 2007): *Research on quality insurance for rolling mill cylinders by mathematic modeling of the manufacturing process and experimental study on durability in exploitation*, Program CEEX for Young Researchers. Director: Lect.dr.eng. Imre Kiss, Value: RON 110,000.

PUBLICATIONS

BOOKS

1. Stoica, D., Ilca, I., Cioată, V., Flori, M., *Contribution to the die forging of semisolid state metallic pieces*, 2007, CERMI Publishing House, Iaşi, ISBN 978-973-667-307-8, 249 pages (published in Romanian).
2. Vasiu, T., Budiul-Berghian, A., *The Reliability of Ball Mills*, INFOMIN Publishing House, Deva, 2007, ISBN 978-973-7646-05-7, 123 pages (publish in Romanian).
3. Ardelean, E., Hepuţ, T., Ardelean, M., Socalici, A., Abrudean, C., *Process optimization on the steel continuous cast*, CERMI Publishing House of Iaşi, 2007, ISBN 978-973-667-299-6, 200 pages (published in Romanian).
4. Socalici, A., Ardelean, E., Ardelean, M., Hepuţ, T., Josan, A., *Steel cast and solidification*, CERMI Publishing House of Iaşi, 2007, ISBN 978-973-667-303-0, 350 pages (published in Romanian).
5. Ardelean, M., Mihuţ, G., Prejban, I., *Thermal treatment – technological calculus*, CERMI Publishing House of Iaşi, 2007, ISBN 978-973-667-304-7, 150 pages (published in Romanian).
6. Iordan, A., Panoiu, M., *Object-oriented programming – Laboratory Guide*, „Mirton" Publishing House, Timişoara, 2007, ISBN: 978-973-52-0152-4, 205 pages (published in Romanian).
7. Vilceanu, L., Ratiu, S., *Thermodynamics and thermal machines* (problems collection), Mirton Publishing House, Timisoara, 2007, ISBN 978-973-52-0251-4, 180 pages (published in Romanian).
8. Osaci, M., *MATLAB for date prelucration in phisic laboratory*, Cermi Publishing House, Iaşi, 2007, ISBN 978-973-667-297-2, 200 pages (published in Romanian).
9. Tirian G.O, Anghel S., *Systems theory and automat control application in Matlab*, Mirton Publishing House, Timişoara, 2007, ISBN 978-973-52-0146-3, 106 pages (published in Romanian).

PUBLISHED PAPERS

1. Popa G.N., Popa I., Deaconu S., *Comparative Analysis of some Low Capacity PLC*, 7th National Conference "Professor Dorin Pavel – Romanian hydrotechnique founder", Science and Engineering, vol.XI, Sebeş, AGIR House, ISBN 978-973-720-122-5, ISBN 978-973-720-122-5, pp. 225-230;
2. Popa G.N., Popa I., Deaconu S., *Past and Present in Programming Time-Delays with Low Capacity Programmable Logic Controllers*, 8th International Conference on Accomplishments of Electrical, Mechanical and Informatic Engineering, section Automation, DEMI 2007, Banjaluka, ISBN 978-99938-39-15-6, pp. 391-396;
3. Popa G.N., Popa I., Deaconu S., *Analyze of Some Inverter Welding Power Sources Used In Manual-Metal Arc Welding*, 8th International Conference on Accomplishments of Electrical, Mechanical and Informatic Engineering, section Thermoenegetic and Energetic, DEMI 2007, Banjaluka, ISBN 978-99938-39-15-6, pp. 681-686;
4. Popa G.N., Popa I., Deaconu S., *Classical Power Supply Sollutions For Low Pressure Mercury Lamps*, Annals of the University of Petrosani, Vol. 9 (XXXVI), Universitas Publishing House, Petrosani, 2007, ISSN 1454-8518, pp. 22-27;
5. Popa G.N., Popa I., Deaconu S., *Coated Electrode Manual-Metal Arc Welding with High Frequency Welding Inverter Power Sources*, 6th International Conference on Electromechanical and Power Systems, vol.II, SIELMEN 2007, Chişinău, Republica Moldova, ISSN 1842-4805, pp. 279-284;
6. Stoica, D., Flori, M., *Reflection on the deformation behaviour of semisolid material with thixotropic behavior*, Xth Edition Timisoara Academic Days, International Symposium Engineering Materials New Horizons and Processing Techniques, Scientific Bulletin of the Politehnica University of Timişoara, Tom 52(66), 2007; pp. 119-124, ISSN 1224-6077;
7. Stoica, D., Ilca, I., Flori, M., *Consideration regarding semisolid materials and their deformation behavior*, 11th International Research / Expert Conference "Trends in the Developement of Machinery and Associated Technology", TMT 2007, Hammamet, Tunisia, 5-9 September, 2007, pp. 359-362, ISBN 987-9958-617-34-8;

8. Stoica, D., Ilca, I., *Reflection regarding the obtaining of precursor material at semisolid state procesing*, IXth International Symposium "Young people and multidisciplinary research", 15-16 November, 2007, Timişoara, Tom 52(66), Fascicola 8, pp. 43-48, ISSN 1224-6077;
9. Flori, M., Stoica, D.C., *Steel's hardenability assessment criterion*, Xth Edition Timisoara Academic Days, International Symposium Engineering Materials New Horizons and Processing Techniques, Scientific Bulletin of the Politehnica University of Timisoara, Tome 52(66), 2007, pp. 119-124, (ISSN 1224-6077);
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11. Kiss, I., *Research upon the durability in exploitation of the hot rolling mill cylinders from prism of the laboratory experiment*, Machine Design – Monograph of FTS, Novi Sad, 2007, Serbia, pp. 288-291, ISBN 978-86-7892-038-7;
12. Kiss I., *Laboratory experiments regarding the durability in exploitation of the hot rolling mill cylinders*, Metalurgia International, No. 9/2007, Bucuresti, pp. 20-27, ISSN 1582-2214;
13. Kiss I., Maksay St., *The cast iron cylinders between the quality assurance and the mathematical interpretations*, Metalurgia International, No. 10 / 2007, Bucuresti, pp. 11-18, ISSN 1582-2214;
14. Kiss I., Maksay St., *Technical interpretations of the dependency between the hardness of iron cast rolls and their chemical compositions of the nodular irons*, Annals of Faculty of Engineering Hunedoara, 2007, Tome V, Fascicule 1, pp 135-142, ISSN 1584-2665;
15. Kiss I., *Some research regarding the ductile irons elaborated in electric arc furnaces*, Annals of Faculty of Engineering Hunedoara, 2007, Tome V, Fascicule 3, pp. 234-237, ISSN 1584-2673;
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17. Kiss I., *Environments ecology by recovering the ferrous powdery wastes stored in the ponds*, Erdei Ferenc IV-ik Tudományos Konferencia, Kecskeméti Főiskola Kertészeti Főiskolai Kar, Kecskemét, Hungary, 2007, Conf. Paper, ISBN 963-7294-48-1;
18. Popa I., Popa G.N., Deaconu S., Nekula F., *Analysis of Some Wind Power Stations*, 7th National Conference "Professor Dorin Pavel – Romanian hydrotechnique founder", Science and Engineering, vol.XI, Sebeş, AGIR House , ISBN 978-973-720-122-5, pp. 245-250;
19. Popa I., Popa G.N., Deaconu S.- *Optimizing of Mining Extraction Equipments Productivity with Trapezoidal Tachograms*, 8th International Conference on Accomplishments of Electrical, Mechanical and Informatic Engineering, section Mechanics, DEMI 2007, Banjaluka, ISBN 978-99938-39-15-6, pp. 45-50;
20. Popa I., Popa G.N., Deaconu S.- *Electronic Time Relays With Different Functions With T.T.L. Integrated Circuits*, Annals of the University of Petrosani, Vol. 9 (XXXVI), Universitas Publishing House, Petrosani, 2007, ISSN 1454-8518, pp. 77-82;
21. Vasiu, T., Budiul-Berghian, A., *Kinetic and Static Analysis at Unloaded Running on Laboratory Model of Mechanism of Parallel Gang Shears' Type Assigned for Cutting the Metallurgical Products*, Annals of Faculty of Engineering Hunedoara, Tom V(2007), Fascicole 3, ISSN 1584-2673, pp. 208-213;
22. Vasiu, T., Budiul-Berghian, A., The *RCM perspective on maintenance*, Annals of Faculty of Engineering Hunedoara, Tome V, 2007, Fascicule 1, ISSN 1584-2665, pp. 189-194;
23. Vasiu, T., Budiul-Berghian, A., *Study on a race car availability*, Annals of Faculty of Engineering Hunedoara, Tome V, 2007, Fascicule 3, ISSN 1584-2665, pp. 46-48;
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25. Vasiu, T., Stoica, D., *Methods to Determine the Preventive Maintenance Cycles of Rolling Mills*, Metalurgia International, vol XII, 2007, no. 7, pp. 27-34
26. Vasiu, T., Stoica, D., *Mathematical Model of Preventive Maintenance Based on Cost Minimization*, Machines, Techonologies, Materials International Journal, Issue 2-3/2007, ISSN 1313-0226, pp. 32 – 34;
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29. Cioată, V. G., *Computer aided design of clamping mechanisms with articulated arms*,

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32. Deaconu, S., Popa, G.N., Popa, I., *Power Factor Improving and Superior Harmonic Generating by Arc Three-Phase Electric Furnance with SVC Systems*, 7th National Conference "Professor Dorin Pavel – Romanian hydrotechnique founder", Science and Engineering, vol.XI, Sebeş, AGIR House, ISBN 978-973-720-122-5, ISBN 978-973-720-122-5, pp. 209-212;
33. Deaconu, S., Egyed, F., Popa, G.N., Popa, I., Kaitar, R., *Otimizing the Operation of an Urban District Heating System by Means Variable Speed Drives*, National Conference and Power System Exhibition, CNEE 2007, Sinaia, Vol. 2, Editura SIER, ISSN 1843-6005, pp. 545-548;
34. Deaconu, S., Popa, G.N., Popa, I., Rodean, I., *Modern System for Monitoring and Diagnosis of the Mechanical and Electrical Defects for High Capacity Induction Motors*, Annals of the University of Petrosani, Vol. 9 (XXXVI), ISSN 1454-8518, Universitas Publishing House, Petrosani, 2007, pp. 107-111;
35. Deaconu, S., Popa, G.N., Popa, I., *Study of Pumps and Turbines Transitory Mode During Switching from Static Frequency Converter Connection to Direct Connection to the Main Supply*, 8th International Conference on Accomplishments of Electrical, Mechanical and Informatic Engineering, section Automation, DEMI 2007, Banjaluka, 2007, ISBN 978-99938-39-15-6, pp. 665-668;
36. Deaconu, S., Popa, G.N., Popa, I., *Induction Generator with Rotor Winding and Static Frequency Converter for Micro-Hydroelectric Power Plants or Wind Power Station with Variable Speed*, 6th International Conference on Electromechanical and Power Systems, vol.II, SIELMEN 2007, Chişinău, Moldova, Annals of the University of Craiova, Serries: Electrical Engineering, Year 31, no. 31, vol. 2/2007, Craiova Universitaria House, ISSN 1842-4805, pp. 233-236;
37. Ardelean, E., Hepuţ, T., Ardelean, M., *Research concerning the obtaining from industrial wastes of a cover powder used in steel continuous casting*, Advanced Materials Research, vol.23: Materials and Technologies, 2007, pp. 329-332, ISSN: 1022-6680;
38. Ardelean E., Ardelean M., Socalici A., Hepuţ T., *Simulation of continuous cast steel product solidification*, Revista de Metalurgia, Madrid, Spania, Volumen 43, Nr.3, pp. 181-187, 2007, ISSN 0034-8570;
39. Hepuţ T., Ardelean E**.,** Socalici A., Maksay S., Gavănescu A., *Steel desulphurization with synthetic slag*, Revista de Metalurgia, Madrid, Spania, Volumen 43, Nr.1, pp. 42-49, 2007, ISSN 0034-8570;
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PERSPECTIVES, INTERESTS, STRATEGIC PRIORITIES

- Development of applications on programmable logic controller used in industry;
- Estabilish the electrical performances of inverter power sources and fluorescent lamps with electronic ballast
- Researches regarding the quality assurance of the rolling mills cast-iron cylinders (new approaches);
- Researches regarding the durability in exploitation of the rolling cast-iron cylinders (new approaches);
- Researches regarding the materials destined to the rolling mills cast-iron cylinders (new approaches);
- Researches regarding mathematical modeling of the manufacturing process of the rolling mills cast-iron cylinders (new approaches);
- Development of some electronic time relaies made with integrated circuits
- State of stress, deformations and vibrations analysis on deformation mechanics systems constrained on static and dynamic strain;
- Mechanics systems computational analysis with applications in automotive engineering;
- Advanced control and pollution reduction systems produced from automotives in urban traffic;
- Urban transport, noises and vibrations ecology;
- Vibro-acoustic phenomena analysis in tire-railroad contact in traffic;
- Kinematic-dynamic behavior modeling and simulation in complex mechanisms with articulated bars used in electric railway traction
- Theoretical and experimental researches regarding the die-forging of the metallic alloys in semisolid state
- Theoretical and experimental researches regarding the prediction of workpiece machining error
- Development of mathematical models for evaluation workpiece machining error due to fixture-workpiece compliance and fixture-workpiece geometric default
- The study of the reactive homopolar synchronous machines with statoric excitation for micro-hydroelectric power plants or wind power station;
- Automatization systems improving for asynchronous generator operation from micro-hydroelectric power plants or wind power station with variable speed
- The assimilation into manufacturing of some new technologies of elaboration and casting of carbon and allied steels
- Perfecting the technologies of elaboration and casting of carbon and allied steels in the way of improving the physical, mechanical and technological characteristics
- The reduction of the electric and thermic energy consumption, raw and auxiliary materials, refractory materials, specific metal consumption
- Reintroducing into the economic circuit of some metallic scraps with iron content, came from different industrial branches (siderurgical industry, energetical industry, mining industry, mechanical engineering, chemical industry, etc.)
- Reducing the degree of pollution in the siderurgic, energetic and mining industry
- Improving the parameters of the continuous casting technology of the steels and the extension of the continuous casting to a various range of tipodimensions of semi-finished products

- The numerical simulation of the hot rolling process for analyze the durability in exploitation of the mill rolls
- Development of some numerical methods and algorithms for hydrodynamic stability studies using computer simulations of steady flows and swirling flows
- Studies upon thermic field and dynamic field distribution in jets and boundary layer
- Modelling and control of industrial processes using Fuzzy logic
- The management of the process of secondary cooling for steel continuous casting
- Simulation and data acquisition using the LABView software
- Research concerning electromagnetic compatibility of industrial frequency crucible induction furnaces (designing an harmonics filters installation for industrial frequency crucible induction furnaces, in such way to be satisfied the EMC European norms).
- Development of some mathematical models 2D and 3D based on FMD, and of some simulating programs, able to allow numerical control of induction heating for pieces with complex shape
- Modelling and control of industrial processes using fuzzy logic
- Researches upon the hierarchical control of a conveyor belt system from the sintering plants
- Simulation and data acquisition using the LABView software
- Development of an interactive software for teaching differential, analytics and projective geometry
- The expansion of the NetLogo models, used at the implementation of the asynchronous techniques to allow the agents to operate with multiple variables.
- The introduction of the new problems for the analysis of the asynchronous techniques, problems which are called "binary random problems", which allow the more exact study of the asynchronous techniques behavior
- Development of 3D, time domain mathematical models based on FDM and FEM, and of simulation programs able to allow numerical control and/or design of microwave ovens
- Development of some mathematical models for electric arc for simulating the electric installation of the EAF in order to reduce the electromagnetic pollution and power consumption.
- Analyze and measure the electromagnetic polution level caused by mobiles and wireless electronic equipments
- Analysis of adaptive filters
- Thermodynamics and heat transfer analysis
- Strength of materials, elasticity and plasticity
- Contributions on modelling and simulation of the disperse systems of magnetic nanoparticles behavior in dynamics fields by implementation into a distributed calculation system of some simulation stochastic models of of the systems disperse of magnetic nanoparticles behavior in dynamics fields
- The software instrument realized on base of these models that should not need expensive calculation resources, because utilize the existing network resources by mean of distributed calculus alghoritms
- Study of the decrease between cylinder
- Study the flexure of the bars rolling to the exit among cylinders
- Perfecting the experimental assessment method of the pressures of contacts, farlow the graphic representation, the diagram of casting and the pressure from zone of thing
- Comparation falled across the laboratory with one from practice
- Research about thermic shocks in warm rolling cylinders
- Identification ,control and optimization of metallurgical pocesses

RESEARCH TEAMS

1. **Analysis of Some Programmable Logic Controller Used in Industrial Applications**
   - Lecturer dr.eng. Gabriel Nicolae Popa
   - Assoc. prof. dr. eng. Iosif Popa
   - Assoc. prof. dr. eng. Sorin Deaconu
2. **Analysis of Modern Inverter Welding Power Sources**
   - Lecturer dr.eng. Gabriel Nicolae Popa
   - Assoc. prof. dr. eng. Iosif Popa
   - Assoc. prof. dr. eng. Sorin Deaconu
3. **Analysis of Electronic Time Relais with Different Configurations**
   - Assoc. prof. dr. eng. Iosif Popa
   - Lecturer dr.eng. Gabriel Nicolae Popa
   - Assoc. prof. dr. eng. Sorin Deaconu
4. **Optimizing of Mining Extraction Equipments**
   - Assoc. prof. dr. eng. Iosif Popa
   - Lecturer dr.eng. Gabriel Nicolae Popa
   - Assoc. prof. dr. eng. Sorin Deaconu
5. **Increasing the life span of industrial equipment**
   - Assoc.prof.dr.eng. Teodor Vasiu
   - Assist.dr. eng. Adina Budiul Berghian
   - Assist. Diana Stoica
6. **State of stress, deformations and vibrations analysis on deformation mechanics systems constrained on static and dynamic strain**
   - Assoc. prof. dr. eng. Carmen Alic
   - Assoc. prof. dr. eng. Imre Miklos
   - Lecturer dr. eng. Vasile George Cioată
   - Lecturer dr. eng. Zsolt Miklos

- Assist. eng. Cristina Miklos

7. Theoretical and experimental researches regarding the prediction of workpiece machining error
- Lect. dr. eng. Cioată Vasile George
- Lect. dr. eng. Kiss Imre
- Lect. dr. eng. Miklos Imre Zsolt

8. Theoretical and experimental researches regarding the die-forging of the metallic alloys in semisolid state
- Lect. dr. eng. Cioată Vasile George
- Prof. dr. eng. Hepuţ Teodor
- Lect. dr. eng. Kiss Imre
- Lect. dr. eng. Alexa Vasile

9. Regenerating energy and reduced energetic consumption
- Assoc. prof. dr. eng. Sorin Deaconu
- Lect. dr. eng. Gabriel Nicolae Popa
- Assoc. prof. dr. eng. Iosif Popa
- Lect. dr. eng. Corina Diniş
- Lect. dr. eng. Angela Iagăr
- Assist. eng. Cristian Abrudean

10. Analysis of the moulding – casting technology of the rolling mill cylinders
- Lect. dr. eng. Josan Ana
- Lect. dr. eng. Putan Vasile
- Lect. dr. eng. Petre Doina

11. Numerical modeling of multidimensional data in variate problems and algorithms development in computer fluid dynamics.
- Prof dr. Ştefan Maksay
- Lect. dr. Dan L. Lemle
- Assist. math. Diana A. Bistrian
- Assist. math. Diana M. Stoica

12. EMI tests
- Lect. dr. eng. Angela Iagăr
- Assoc. prof. dr. eng. Caius Pănoiu
- Assoc. prof. dr. eng. Sorin Deaconu
- Lect. dr. eng. Popa Gabriel
- Assist. eng. Cristian Abrudean
- Lect. dr. eng. Diniş Corina
- Lect. dr. eng. Cunţan Corina
- Lect. drd. eng. Baciu Ioan

13. Numerical modeling and control of the induction heating electro-technology
- Lect. dr. eng. Angela Iagăr
- Assoc. prof. dr. eng. Caius Pănoiu
- Assoc. prof. dr. eng. Nicolae Rusu
- Assoc. prof. dr. eng. Sorin Deaconu
- Assist. eng. Cristian Abrudean

14. Numerical modeling and control of the induction heating electro-technology
- Lect. dr. eng. Popa Horia Emil
- Assoc. prof. dr. eng. Manuela Pănoiu
- Assist. eng. Cristian Abrudean

6. Study of the electromagnetic pollution cause by nonlinear loads and wireless equipments
- Assoc. prof. dr. eng. Manuela Pănoiu
- Assoc. prof. dr. eng. Caius Pănoiu
- Lect. dr. Mihaela Osaci
- Lect. Dr. eng. Angela Iagăr
- Teaching assistant dr. Ionel Muscalagiu

7. Processing in semi-solid status of metallic alloys
- Prof. dr. eng. Ioan Ilca
- Lect. dr. eng. George Vasile Cioată
- Lect. dr. eng. Vasile Alexa
- Assist. dr. eng. Imre Kiss
- Assist. Daniela Stoica (cas. Milostean)

8. Analysis of adaptive filters
- Assoc. prof. dr. eng. Caius Pănoiu
- Assoc. prof. dr. eng. Manuela Pănoiu
- Lect. Dr. eng. Angela Iagăr
- Teaching assistant dr. Ionel Muscalagiu
- Teaching assistant eng. Raluca Rob

9. Numerical modeling and control of the induction heating electro-technology
- Lect. dr. Mihaela Osaci
- Assoc. prof. dr. eng. Manuela Pănoiu
- Lect. dr. Muscalagiu Ionel
- Assist. drd. Eng. Adela Berdie
- Assist. drd. eng. Cristian Abrudean

10. Optimization of the thermal regime of steel on the direction of furnace – secondary treatment unit – continuous casting installation
- Lect. dr. eng. Erika Ardelean
- Lect. dr. eng. Ana Socalici
- Lect. dr. eng. Marius Ardelean
- Lect. Dr.eng. Corina Cunţan
- Assist. eng. Erika Popa
- Assist. eng. Cristian Abrudean

11. Refractories with complex functions used in the steel industry, made by modern technologies
- Prof.dr.eng. Teodor Hepuţ
- Lect. dr. eng. Erika Ardelean
- Lect. dr. eng. Ana Socalici
- Lect. dr. eng. Marius Ardelean
- Lect. dr. eng. Laura Benea
- Lect. Dr.eng. Ana Josan
- Prof.dr. Ştefan Maksay
- Assist. Adrian Bleoca

12. Integrated technology used to obtain some non-conventional energy technological sources, used as raw materials for steel making
- Prof.dr.eng. Teodor Hepuţ
- Lect. dr. eng. Erika Ardelean
- Lect. dr. eng. Ana Socalici
- Lect. dr. eng. Marius Ardelean
- Lect. dr. eng. Caius Pănoiu
- Asist.dr.eng. Adrian Găvănescu

- Lect. dr. eng. Mihaela Osaci
- Lect. dr. eng. Vasile Puţan

13. Advanced technology direction of pieces case-hardening industrial process in induced current
- Prof.dr.eng. Teodor Hepuţ
- Lect. dr. eng. Erika Ardelean
- Lect. dr. eng. Ana Socalici
- Lect. dr. eng. Marius Ardelean
- Assoc.prof.dr.eng. Caius Pănoiu
- Assoc.prof.dr.eng. Manuela Pănoiu
- Lect. dr. eng. Vasile Puţan
- Lect. dr. eng. Gabriela Mihuţ
- Lect. dr. eng. Doina Petre

14. Assimilating, making, casting of iron, steel and non-ferrous alloys
- Lect. dr. eng. Virginia Socalici
- Lect. dr. eng. Erika Ardelean
- Lect. dr. eng. Marius Ardelean
- Lect.dr.eng. Camelia Pinca-Bretotean
- Assist. eng. Erika Popa

15. Prevention and fighting pollution in the steel making, energetic and mining industrial areas through the recycling of small-size and powdering wastes
- Prof.dr.eng. Teodor Hepuţ
- Lect. dr. eng. Erika Ardelean
- Lect. dr. eng. Ana Socalici
- Lect. dr. eng. Marius Ardelean
- Assoc.prof.dr.eng. Caius Pănoiu
- Assoc.prof.dr.eng. Manuela Pănoiu
- Lect. dr. eng. Vasile Puţan
- Lect. dr. eng. Ana Josan

16. Numerical modeling and control of the induction heating electro-technology
- Lect. dr. eng. Imre KISS
- Lect. dr. eng. Vasile ALEXA
- Lect. dr. eng. Vasile George CIOATA
- Assist. drd. eng. Erika Monika POPA
- Assist. drd. eng. Ovidiu Gelu TIRIAN

17. Optimization the process of bimetals lamination and the tables plating, using the asymmetrical rolling
- Lect. dr. eng. Vasile ALEXA
- Lect. dr. eng. Imre KISS
- Lect. dr. eng. Vasile George CIOATA
- Lect. dr. eng. Sorin RAŢIU
- Assist. drd. eng. Adina BUDIUL

18. The analyses of the effects of the thermal fatigue upon the hot rolling mill cylinders
- Assoc. prof. dr. eng. Vîlceanu Lucia
- Assist.eng. Tirian Gelu Ovidiu
- Assist.eng. Dascăl Amalia
- Lector.dr.ing. Ana Josan

19. Numerical modeling and control of the induction heating electro-technology
- Assoc. prof. dr. eng. Nicolae Rusu
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