

## RESEARCH AND CONTRIBUTIONS IN THE FIELD OF USING AND PRODUCTION OF ELECTRICITY

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### Abstract

The habilitation thesis contains the following chapters: motivation, research directions, achievements, the scientific, professional and academic development plan, and finally the bibliography chapter. The first chapter, motivation, summarizes the didactic and research activity, the results obtained the cooperation with other universities and the expressed desire to continue the research in the field of electrical engineering at a higher level by obtaining the certificate of habilitation. In the second chapter the main directions of research are presented: industrial applications of AC electric drives, compensation of reactive energy and superior harmonics to strongly deforming electric consumers, axial electric drive systems for hybrid and electric vehicles, and energy conversion for adjustable wind or hydro applications. For each of the research directions listed, the main achievements are presented. The chapter of scientific, professional and academic achievements presents the activities carried out within each research direction and the main results obtained in a more detailed fashion.

The Research Direction on Industrial Applications of Variable Speed AC Drives is divided into four subchapters which present concerns regarding the reduction of the active electric energy consumption by using the variable speed, the controlled start of the electric drive systems, the production of electric power with variable asynchronous generators and the artificial load testing of the rotating electric machines. Among the great energy consumers we find the pumping and ventilation systems. Automating these systems and increasing their energy efficiency can be done with PLCs, static frequency converters, communication and data transmission systems. Applying different solutions in practice is a challenge for an engineer but also for a researcher in the field of machine systems and electric drives. Proposed and practiced applications are presented, but some of them are applied even after a long time because of the important investment effort required.

Another direction of research, detailed in six subchapters, is represented by axial synchronous machines (with an stator, two permanent magnets rotors and a single inverter for vector control of the both rotors speed) intended for electric hybrids or pure electric



vehicle applications. Constructive topology, circuit model, optimal design, control methods, and quasi 3D-FEM analysis were presented for validation of analytical data on machine torque developed. A new family of electric machines is proposed to improve the radial and axial dimensions, with high torque density and high efficiency. The torque capability of the machine with concentrated fractional stator windings and surface permanent magnets has been demonstrated. The last research direction approached in the habilitation thesis has as theme the theoretical and experimental study of the adjustable electric generators for wind or hydro applications.

Fifteen subchapters were presented for the homopolar and homo-heteropolar reactive synchronous generators with stator excitation and for the dual stator windings induction generator with the cage rotor.

The full thesis at:

[http://www.upt.ro/img/files/2018-2019/doctorat/abilitare/Deaconu-Sorin/Rezumat\\_abilitare\\_Sorin\\_Deaconu\\_en.pdf](http://www.upt.ro/img/files/2018-2019/doctorat/abilitare/Deaconu-Sorin/Rezumat_abilitare_Sorin_Deaconu_en.pdf)

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