



Shen, Jianxin

IEEE Senior Member, IET Fellow, CES Senior Member, CIGRE WG A1.53 Member

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1. Experience

2004-present: Professor, Zhejiang University, China

2016: Visiting Professor, EPFL, Switzerland

2002-2004: Research Engineer, IMRA Europe SAS, UK Research Centre, UK

1999-2002: Research Associate, Sheffield University, UK

1997-1999: Post-Doctoral Fellow, Nanyang Technological University, Singapore

1994-1997: PhD, Zhejiang University, China

1987-1994: BEng & MSc, Xi'an Jiaotong University, China

2. Research Interests

Topologies, control and applications of electrical machines, especially of high speed permanent magnet machines and high efficiency synchronous reluctance motors.

3. Creativity

- 269 technical papers published on international and Chinese journals and conferences, receiving
 - 1 Prize Paper Award from IEEE Industry Applications Society
 - 8 Best Paper / Excellent Presentation Awards from international conferences
- 44 Chinese patents
- PI of high speed PM motor projects, ranging from hundreds of Watts to hundreds of kilo Watts
- PI of high efficiency (IE5) synchronous reluctance motor series, ranging from 1.5 to 200 kW

4. Repute

- The 5th Nagamori Award, September 2019, with recognition of "an outstanding scholar in permanent magnet electrical machines and high speed electrical machines for design, control and applications"
- 2 ministerial and provincial-level science and technology awards in China
- 9 international paper awards
- IEEE VTS Distinguished Lecturer (2018-2020)
- IEEE Nikola Tesla Award Committee member (2018-2021)
- IEEE IAS Member-at-Large (2019-2020)
- Roles and times for international conferences: General chairman (3), Technical Program Committee chairman (2), International Steering Committee co-chair / member (9), Other committee member (39), Session chair and Special Session organizer (20+4)
- Referee of research foundation and technical awards: international (4), Chinese (14)
- Associate editor / deputy editor-in-chief / editor of journals: international (9), Chinese (4)
- Reviewer of journals: international (35), Chinese (23)

5. Lectures and Students Supervision

- 8 annual courses in total at Zhejiang University since 2005 (note, 3 were transferred to other staff)
- Academic / research supervision: 20+ PhD, 70+ MSc / MPhil / MEng, 200+ undergraduate
- Advisor of IEEE IAS Student Branch Chapter at Zhejiang University

6. Seminars, and Keynote Speeches for Conferences and Symposiums

- 23 seminars for universities, institutes and industries
- 7 keynote / plenary / invited speeches for international conferences
- 22 keynote speeches for national conferences / symposiums

Lectures by Prof. Jianxin SHEN for the IAS Distinguished Lecturer Program 2021-2022

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1. High-Speed Permanent Magnet Electrical Machines - Design, Control and Applications

Abstract:

Structures of high-speed electrical machines will be categorized. Key issues of motor design will be presented, including bearings selection, rotor dynamics analysis and design, stress analysis and protection, thermal analysis and design, and losses analysis and reduction. Sensorless control strategies, comparison of sine-wave and square-wave drive modes will be introduced, and vector control with a low carrier ratio of inverter will be specifically addressed. Application examples will be given. The lecturer is mainly based on the speaker's R&D achievements in the last 2 decades.

2. Synchronous Reluctance Machines (SynRM) and Control Methods

Abstract:

This lecture is to present the SynRM operation mechanism and various topologies, as well as the speaker's own research findings. Methods of motor design and performance analysis will be addressed, with the rotor ruggedness and manufacturing requirement and imperfectness being considered. Various configurations of PM assistance, such as using hybrid PM materials, radial and axial assistance structures, will be detailed. Performance under controls of maximum torque per ampere, maximum power factor, and maximum efficiency will be discussed, so that the control strategies can be easily understood.

3. Permanent Magnet AC Machine Topologies

Abstract:

This lecture will, based on the electromagnetic torque equation, review the permanent magnet electrical machine topologies, including the SPM machine, IPM machine, PM-assisted SynRM, and even the magnetless SynRM. Some novel machine topologies will also be presented, such as the flux switching machine, vernier machine, magnetic-gear machine with field-modulation, and their relation will be discussed from the point of view of electromagnetic structure and torque mechanism. The lecture is to help the audience better understand the PM machine topologies.

4. Sensorless Control Strategies of Permanent Magnet Brushless Machines

Abstracts:

This lecture is based on the speaker's 28-year research on various sensorless control strategies of the PM brushless machines, which can be categorized as square-wave BLDC motor and sine-wave PMSM. For the BLDC motors, sensorless control methods using the back EMF zero-crossings, the free-wheel diode conduction, as well as phase locked loop and EMF reconstruction will be presented. For the PMSM, methods using high frequency injection for rotor saliency or saturation, and rotor flux observer will be talked about, whilst some special considerations will be addressed.