Contact Information

Email: ysuh@jbnu.ac.kr
Tel: 82-63-270-3381
Address:
Dept. of Electrical Eng., Jeonbuk National University,
567 Baekje-Rd, Deokjin-gu, Jeonju, 54896, Korea

Education

Ph.D. Electrical Engineering (9/1998 ~ 3/2004)
University of Wisconsin-Madison, USA
Advisor: Professor Thomas A. Lipo
Thesis: *Analysis and control of three phase ac/dc pwm converter under unbalanced operating conditions*

M.S. Electrical Engineering (3/1991 ~ 2/1993)
Yonsei University in Seoul, Korea
Advisor: Professor Taekuk Ko
Thesis: *A study on the normal-zone propagation velocity in a superconducting coil*

B.S. Electrical Engineering (3/1987 ~ 2/1991)
Yonsei University in Seoul, Korea

Professional Employment Experience

Professor (4/2008 ~ present)
Jeonbuk National University, Korea *Department of Electrical Engineering*

Senior Engineer (4/2004 ~ 4/2008)
ABB Switzerland *Power Electronics & Large Drives, Turgi, Switzerland*

Summer Internship Engineer (6/2003 ~ 8/2003)
Otis Elevator, USA *Drives Group, Engineering Center at Farmington in Connecticut*

System Application Engineer (2/1993 ~ 7/1998)
Samsung Electronics, Korea *Semiconductor Division, Power Electronics Group*

Honors & Activities

- IEEE Senior Member in IAS, PELS, IES
  (9/2007 ~ present)
- Associate Editor in Journal of Power Electronics of KIPE
  (1/2009 ~ 12/2014)
- Associate Editor in IEEE Transactions on Industry Applications

(10/2014 ~ present)

- Special Activities Chair of Industrial Power Converters Committee of IEEE IAS
  (10/2017 ~ 12/2019)
- Secretary of Industrial Power Converters Committee of IEEE IAS
  (1/2020 ~ present)
- Chair of ECCE-Asia Coordination Committee of IEEE PELS
  (6/2019 ~ present)
- Advisory Professor of IEEE PELS & IAS Student Chapter at the Jeonbuk Nat'l Univ.
  (12/2017 ~ present)
- Topic chair of Technical Program Committee of ECCE 2014, 2015, 2018, 2019
- Vice chair of Technical Program Committee of ECCE 2020
- Treasurer of Organizing Committee of ICPE 2019 – ECCE Asia
- Board Member of the Korean Institute of Power Electronics (KIPE)
  (1/2013 ~ present)
- Best Paper Award of the Korean Institute of Power Electronics (KIPE, 2013)
- Visiting Research Professor in University of Wisconsin-Madison, USA
  (1/2016 ~ 1/2017)
- Chair of Department of Electrical Engineering, Jeonbuk National University
  (1/2017 ~ 1/2019)

Lecture topic 1: High-power converter design & control for plasma and arc applications

- Recently, power electronics technologies have been actively introduced in the plasma and arc application industry. Typically, electric arc furnaces, plasma torches, RF plasma system in semiconductor manufacturing processes are increasingly adopting the latest technology of power electronics. Compared to conventional practices, these plasma and arc energy conversion systems employing power electronic technologies have a number of benefits such as improved efficiency, reduced volume, increased power density, and enlarged manufacturing yield.

  This lecture covers latest development of power electronics technology in plasma and arc application industry. Particularly, electric arc furnaces, plasma torch, and RF plasma system in semiconductor manufacturing processes are treated in detail. These systems are usually characterized by a relatively large size of power conversion capacity ranging from a few MW up to hundred MW. Therefore special design approaches should be taken into consideration with respect to the selection of power converter topology, power semiconductor switches, and eligible control techniques.

Lecture topic 2: Medium-voltage drive topology design & control

- Medium voltage converters are becoming more important on the market due to high power density, excellent efficiency and high reliability. Today there is a large and still growing application field for adjustable speed drives in medium voltage range such as pumps, fans, rolling mills, wind parks, and energy storage systems. In addition, the electrification of energy conversion units in transportation systems of a few tens MW tends to adopt this medium voltage drive technology. Because of a relatively large power handling capacity and severe process reliability requirement, these medium-voltage drive systems are characterized by unique and sophisticated power converter topologies and control features as compared to general-purpose low power drive systems.

  This lecture covers latest development of medium-voltage drive topology design & control techniques. The various technologies available in the market from different global manufacturers are introduced. The selection of optimal topology and its eligible power semiconductor switches are treated in detail along with its unique switching modulation and control scheme.

Lecture topic 3: Control of grid-connected converters for renewable energy sources under grid imbalance

- The growing penetration of renewable energy sources into the present power grid requires that renewable energy sources provide the similar electrical characteristics as those of classical thermal power plants. In order to meet this requirement, active front-end converters; grid-side converters of renewable energy sources have been evolving to offer various control features to properly regulate the active and reactive output power. Recently,

grid codes about LVRT and operation under unbalanced grid become very strict. In general, unbalanced current is caused by unbalanced grid conditions, and it leads to unbalanced voltage at PCC (Point of Common Coupling). These unbalanced voltage conditions generate a significant ripple and distortion of dc-link and ac input current of grid-side converters which eventually undermine various control features of grid side converter.

This lecture covers the latest requirements on the grid-side converter of renewable energy sources particularly under grid imbalance. The impact of grid imbalance on the operation of grid-side converters is analyzed based on the positive and negative sequential component theory of unbalanced electrical network. The various control techniques to properly compensate for the generation of harmonics are introduced. These control techniques are aimed to enhance the grid-friendly electrical characteristics of renewable energy sources. As a result, these control techniques are expected to play a positive role in growing penetration of renewable energy sources into the present power grid.