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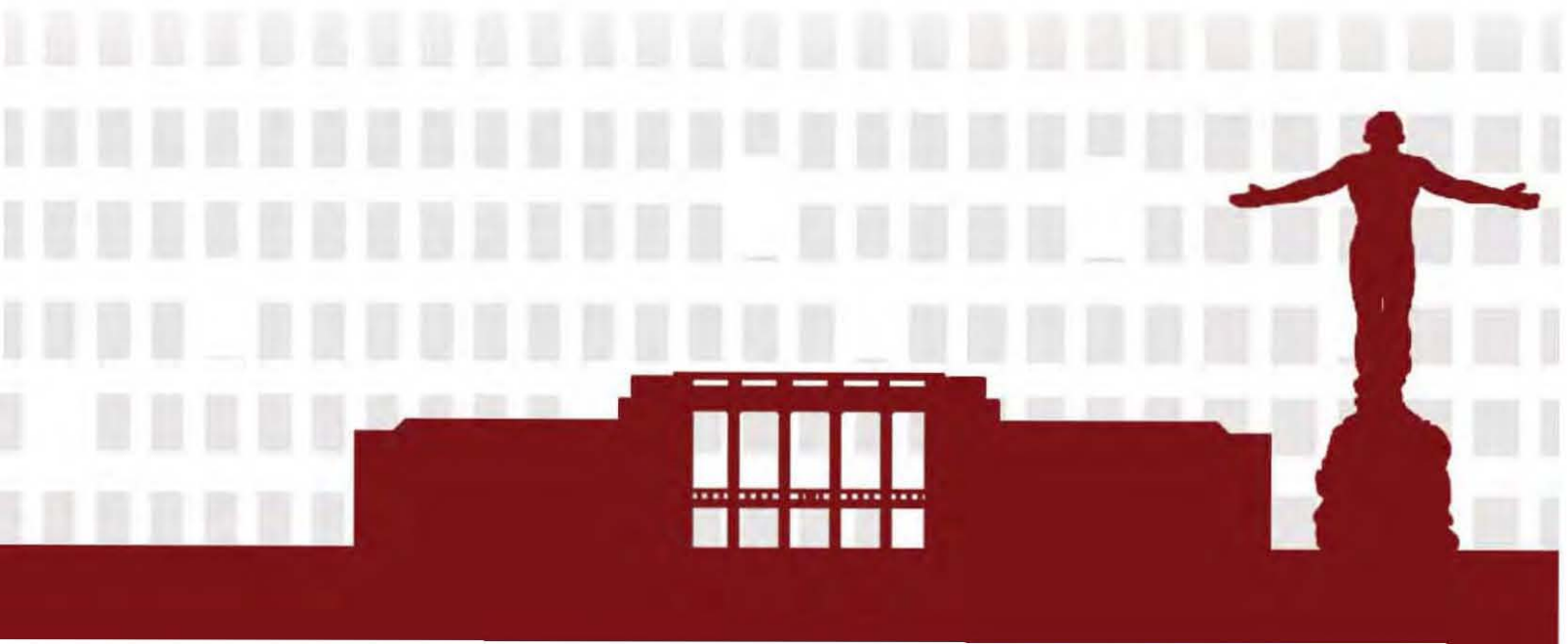

Proceedings of the 8th AUN/SEED-Net RCEEE 2015 and 11th ERDT Conference
on Semiconductor and Electronics, Information and Communications Technology, and Energy

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ISBN: 978-616-406-075-3

Published by: ASEAN University Network / Southeast Asia Engineering Education Development Network (AUN/SEED-Net) JICA Project
Faculty of Engineering, Bldg. 2
Chulalongkorn University, Bangkok
Thailand 10330

Printed in the Philippines by: ERZALAN PRINTING PRESS
45 Cotabato Street, Luzviminda Village, Batasan Hills, Quezon City, Philippines

8th AUN/SEED-Net Regional Conference
on Electrical and Electronics Engineering 2015

co-located with

11th ERDT Conference
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Published by: ASEAN University Network / Southeast Asia Engineering Education Development Network (AUN/SEED-Net) in partnership with Engineering Research and Development for Technology (ERDT) and University of the Philippines Diliman.

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CAPACITOR SIZING OF SELF-EXCITED THREE-PHASE INDUCTION GENERATOR FOR SINGLE-PHASE OPERATION USING PARTICLE SWARM OPTIMIZATION METHOD

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ABSTRACT

Squirrel-cage induction machine is widely used as workhorse motor in industrial due to its simple and rugged construction. Special application such in micro-hydro power generation employs squirrel-cage induction machine as generator in self-excited operation called Self-Excited Induction Generator (SEIG). Often micro-hydro power generation in remote area operates as single phase supply since simple loads e.g. lighting, TV set and other household appliances are used. Single phase operation of three phase machine causes derating on the machine capacity due to stator current unbalance. This paper shows optimal sizing of excitation capacitor for three phase SEIG operated in single phase load. Sizing is aimed to maximize generator capacity by considering stator winding current capability and voltage across windings. Size of excitation capacitor is optimized using particle swarm optimization (PSO). Results are verified through simulation and experimental on a three phase squirrel cage induction machine of 0.75 kW, 380 V. Simulation and experimental results show that optimization is able to increase power transfer capability of SEIG from 33.33% to 44.35% of rated machine. Simulation and experimental results are shown in Figures below.

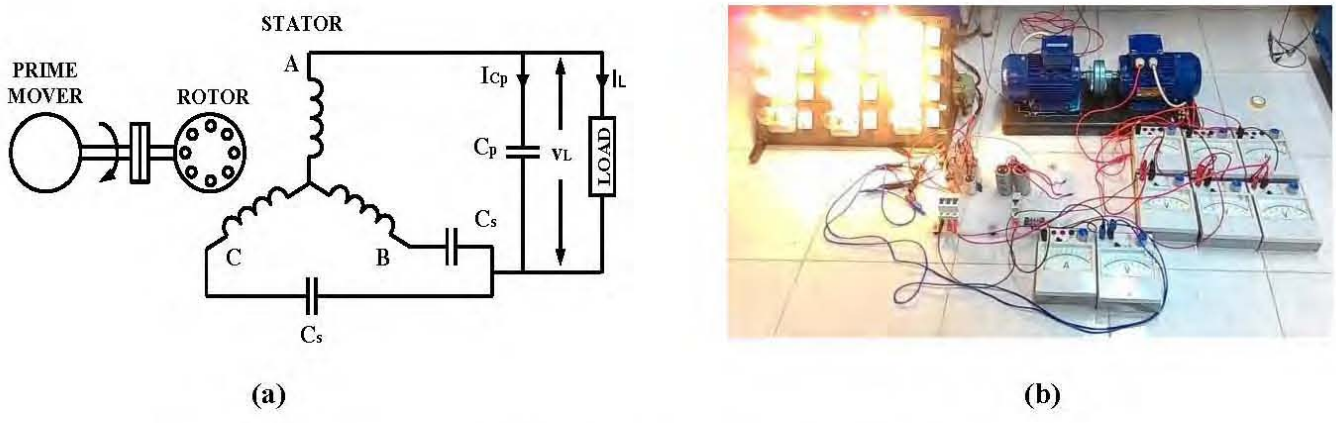

Figure 1. Single phase operation of three-phase SEIG (a) scheme (b) experimental setup.

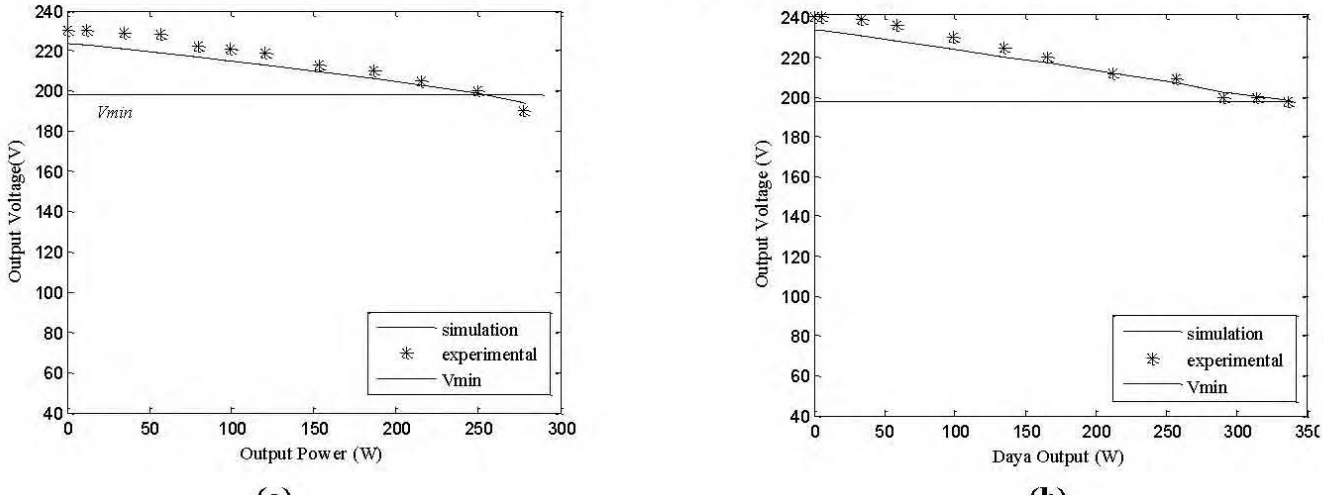

Figure 2. Capacity of SEIG (a) before optimization (b) after optimization.

Keywords: Self-Excited Induction Generator, Capacitor Sizing, Particle Swarm Optimization.

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