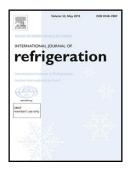
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# ACCEPTED MANUSCRIPT

## Dynamic modulation of voltage excitation angle to optimize energy consumption of refrigerator

Ho-Chiao Chuang<sup>1</sup>\*, Kuan-Lin Wu<sup>1</sup>, Wei-Bin Weng<sup>2</sup>, Chen-Ta Lee<sup>2</sup>

<sup>1</sup>Department of Mechanical Engineering, National Taipei University of Technology, Taipei, 10608, Taiwan.

Email:hchuang@mail.ntut.edu.tw

Tel.: +886 2 27712171 ext. 2076, Fax: +886 2 27317191

<sup>2</sup>Ya De Li Technology Co., Ltd. Taipei, 10453, Taiwan (aka Power Asia Technology Co., Ltd. Taiwan)

Tel.: +886 2 25872582, Fax: +886 2 25872570

\*Corresponding Author: Ho-Chiao Chuang (Professor)

E-mail: <u>hchuang@mail.ntut.edu.tw</u>

Tel.: +886-2-2771-2171 ext. 2076

Fax: +886-2-2731-7191

Address: Department of Mechanical Engineering

National Taipei University of Technology

No. 1, Sec. 3, Chung-Hsiao E. Rd.

Taipei 10608

Taiwan

### Abstract

This study presents a dynamic modulation of voltage excitation angle technology, applied to a refrigerator so that the refrigerator operates at an optimum energy consumption. This technique utilizes a semiconductor element, Tri-electrode AC switch (TRIAC), as a regulatory element for modulating the voltage excitation angle and the sensing current is taken as the feedback signal to determine the voltage modulation range. Thus, a novel energy saving controller (NESC) was successfully developed. We validated the feasibility of the proposed NESC; tests were performed where the door is closed for one hour and a dynamic simulation of normal use where the door is opened and closed periodically in one hour. The energy-saving rates obtained were 20.48% and 12.88%, respectively. In addition, a long period of one day tests on refrigerator was also conducted w/o NESC, and the best power consumption was measured at 6.597kWh 24h-1. An energy-saving rate of 22.41% was achieved.

Keywords: Refrigerator, voltage excitation angle, TRIAC, energy consumption, energy saving

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