International Journal of Power Electronics and Drive System (IJPEDS)
Vol. 11, No. 2, June 2020, pp. 618~624
ISSN: 2088-8694, DOI: 10.11591/ijpeds.v11.i2.pp618-624

Loss minimization DTC electric motor drive system based on adaptive ANN strategy

Sim Sy Yi[1], Wahyu Mulyo Utomo[2], Goh Hui Hwang[3], Chien Siong Kai[4], Alvin John Lim Meng Siang[5], Nor Aira Zambri[6], Yonis M. Y. Buswig[7], Kah Haw Law[8], Sim Gia Yi[9]
[1,4,6] Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia, Malaysia
[2,9] Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia
[3]School of Electrical Engineering, Guangxi University, Malaysia
[5] Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia, Malaysia
[7] Faculty of Engineering, Universiti Malaysia Sarawak, Malaysia
[8] Department of Electrical and computer Engineering, Curtin University Malaysia, Malaysia

Article Info

Article history:

Received Oct 27, 2019
Revised Dec 28, 2019
Accepted Feb 3, 2020

Keywords:

Adaptive flux control
Efficiency optimization
Loss minimization
Motor drive system
Online ann

ABSTRACT

Electric motor drive systems (EMDS) have been recognized as one of the most promising motor systems recently due to their low energy consumption and reduced emissions. With only some exceptions, EMDS are the main source for the provision of mechanical energy in industry and accounts for about 60% of global industrial electricity consumption. Large energy efficiency potentials have been identified in EMDS with very short payback time and high-cost effectiveness. Typical, during operation at rated mode, the motor drive able to hold its good efficiencies. However, a motor usually operates out from rated mode in many applications, especially while under light load, it reduced the motor's efficiency severely. Hence, it is necessary that a conventional drive system to embed with loss minimization strategy to optimize the drive system efficiency over all operation range. Conventionally, the flux value is keeping constantly over the range of operation, where it should be highlighted that for any operating point, the losses could be minimize with the proper adjustment of the flux level to a suitable value at that point. Hence, with the intention to generate an adaptive flux level corresponding to any operating point, especially at light load condition, an online learning Artificial Neural Network (ANN) controller was proposed in this study, to minimize the system losses. The entire proposed strategic drive system would be verified under the MATLAB/Simulink software environment. It is expected that with the proposed online learning Artificial Neural Network controller efficiency optimization algorithm can achieve better energy saving compared with traditional blended strategies.

Corresponding Author:

Sim Sy Yi,
Department of Electrical Engineering Technology,
Faculty of Engineering Technology,
Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, Malaysia.
Email: sysim@uthm.edu.my

1. INTRODUCTION

In an effort moving towards new era of mechanization, realization of more precision and accuracy work can be attain by replaced the human with machines [1]. Electric drives have been getting popular and