Dynamic braking of a voltage supplied for single phase induction motor

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ABSTRACT

DC injection braking systems provide a simple, rapid and reliable solution as they are incorporated within the control function and utilize the existing motor drive. The main purpose of this paper is to design a DC injection braking system for a single – phase induction motor drive. First, the single phase induction was designed through finite element method. Simulation results, including flux lines, flux density and magnetic field distribution. The designed DC injection braking modules utilize Programmable logic controller, transformer, rectifier and magnetic contacts to switch the injected DC current into the motor windings. DC injection braking can provide the motor braking force during stop when AC power is removed from the motor. DC magnetic field introduced into the stator will create a powerful braking force on the spinning rotor. This DC injection current may be increased to provide more braking torque from the single induction motor. Experimental results show that the DC injection is an effective braking method for the single-phase induction motor can also be applicable in the case of the three -phase induction motor.

Keywords : dynamic braking

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REFERENCES

[1]H. Huang, E. F. Fuchs and J. C. White,“ Optimal placement of the runcapacitor in single-phase induction motor designs,” IEEE Trans.Energy Conversion, Vol.3, No.3, Sept, 1988, pp.647-652.

[2]E. Vassent, G. Meunier, J. C. Sabonnadiere,“ Simulation of InductionMachine Operation Using Complex Magnetodynamic Finite Elements,” IEEE Trans. Magnetics, Vol.25, No.4, July 1989, pp.3064-3066.

[3]Edward Randolph Collins,“ Torque and Slip Behavior of Single-PhaseInduction Motor Driven from Variable-Frequency Supplies,” IEEE Trans. on Industry Applications, Vol. 32, No. 3, 1992, pp. 710-715.

[4]E. Muljadi and T. A. Lipo,“ Adjustable AC capacitor for a single-phase induction motor,” Industry Applications Society Annual Meeting, Vol. 29, No. 3, 1993, pp. 479-485.

[5]H. L. Baek, K. G. Oh, K. M. Sung, Y. S. Lim, I. S. Cha and H. A.Park, ”Starting Characteristic by Auxiliary Winding Sequence Control for a Single-Phase Induction Motor,” IEEE Industrial Electronics, Control, and Instrumentation, Vol. 2, 1996, pp.1222-1227.

[6]H. Bonnett,“ Reliability Comparsion Between Standard Energy Efficient Motor,” IEEE Tran. on Industry Applications, Vol. 33, No. 1,1997, pp. 135-142.

[7]Jose F. M. de Almeida,“ Fuzzy Logic Based Maximum TorqueControl for a Single-Phase Induction Motor,” IEEE Industrial Electronics Society, Vol.2 , 1999, pp. 619-624.

[8]J. Faiz, M. Ojaghi and A. Keyhani,“ PSPECE simulation of single-phase induction motors, ” IEEE Trans. Energy Conversion, Vol.14, No. 1, March 1999, pp. 86-92.
[9]M. Enokizono and T. Miyazaki,“ Study on torque improvement of single-phase induction motor by using FEM, ” IEEE Trans. Magnetics,Vol. 35, No. 5, Sept. 1999. pp. 3703-3705.
[10]Baermann, M., 1973, "Eddy-Current and Hyteresis Brake for Track Bound Vehicles," United States Patent, No. 3,723,795.
[11]Orthwein, W. C., 1986, "Clutches and Brakes," Marcel Dekker, Inc.
[12]Pedu, J. C., 1993, "Hysteresis Brakes and Clutches," United States Patent,No. 5,238,095.
[13]Jolda, J. and Klaucke, R., 1996, "Permanent Magnet Brakes and Clutches," Wire, vol. 46, no. 5, pp. 324-327.
[14]Kim, H. K. and Jung, H. K., 1998, "Finite Element Analysis of Hysteresis Motor Using the Vector Magnetization-Dependent Model," IEEE Transactions on Magnetics, vol. 34, no. 5, pp. 3495-3498.
[15]王培仁， 1997, "高速鐵路列車煞車系統研究"，交通部高速鐵路工程局。
[16]楊紹經，1998，“渦電流煞車系統動態控制研究。”清華大學動力機械系碩士論文。
[17]歐武超，2008，“單相感應電動機運行電容對效率的影響，”和春技術學院電機工程系碩士論文。
[18]陳昇華，2003，“單相感應電動機之PSpice模型與模擬分析，”高雄應用科技大學電能與控制工程研究所碩士論文。
[19]蔡孟諺，2005，“田口法應用於感應馬達特性分析之研究，”臺灣科技大學機械工程系碩士論文。
[20]DC injection barke EMB 4000。
[21]Solbark Electronic Brakes (DC Injection)8-580A，220-690V。
[22]梁賢達，黃慧容，2009，“電工機械II”台科大出版社。