

IMPLEMENTATION OF SENSORLESS SPEED CONTROL FOR TWO-PHASE INDUCTION MOTOR DRIVE USING ISFOC STRATEGY*

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Abstract— This paper presents a new technique based on model reference adaptive system (MRAS) observer for sensorless speed control of Two-Phase Induction Motor (TPIM). The MRAS identification is performed by means of comparison of stator fluxes obtained from both stator and rotor equations with stator voltage and current measurements. Simulation and experimental results for a 1.1 kW TPIM set-up are presented and analysed using a dSpace system with a DS1104 controller board based on digital signal processor (DSP) TMS320F240. Simulation and experimental results at nominal, low and zero speeds confirm the effectiveness of the proposed sensorless speed controlled TPIM drive.

Keywords— Two-phase induction motor (TPIM), indirect stator-field-oriented control (ISFOC), model reference adaptive system (MRAS)

1. INTRODUCTION

Two-Phase Induction Motor (TPIM) is widely used in several industrial and domestic applications. In those applications the motor runs at constant frequency and is fed directly from the ac grid without any type of control strategy. The TPIM is found in air conditioners, washers, dryers, industrial machinery, fans, compressors, tools, blowers, vacuum cleaners, household appliances and many other applications. The reduction in the cost of the power electronic circuitry provides economically justifiable applications for adjustable speed Two-Phase Induction Motor Drives (TPIMD). In recent years, several methods that use inverters for the variable speed control of TPIM have been proposed [1]-[15]. An alternative approach is to use a 6 switch three phase Voltage-Source Inverter (VSI) bridge, connecting the two windings of the motor as an unbalanced load between the phases, as shown in Fig. 3. This is a more cost effective solution [1], [2], [9], [11], [16]. Recently, Stator Field Oriented Control (SFOC) of TPIMD has been gaining wide attention in literature [1]-[3]. In vector control, the flux linkage magnitude and the electromagnetic torque are controlled independently [14]-[15]. The SFOC represents a better solution to satisfy the industrial requirements. The field orientation is relatively straightforward in all operating conditions if the rotor speed is accurately known, which traditionally necessitates a sensor on the shaft of the motor. However, there are several reasons for preferring a system without the sensor. The cost of the speed sensor, at least for machines with ratings less than 10 kW, is in the same range as the cost of the motor itself. The

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Implementation Of Sensorless Speed Control For Induction:

Neural and Fuzzy Logic Control of Drives and Power Systems Marcian Cirstea, Andrei Dinu, Malcolm McCormick, Jeen Ghee Khor, 2002-07-01 The authors guide readers quickly and concisely through the complex topics of neural networks fuzzy logic mathematical modelling of electrical machines power systems control and VHDL design Unlike the academic monographs that have previously been published on each of these subjects this book combines them and is based round case studies of systems analysis control strategies design simulation and implementation The result is a guide to applied control systems design that will appeal equally to students and professional design engineers The book can also be used as a unique VHDL design aid based on real world power engineering applications Introduces cutting edge control systems to a wide readership of engineers and students The first book on neuro fuzzy control systems to take a practical applications based approach backed up with worked examples and case studies Learn to use VHDL in real world applications *Smart Intelligent Computing and Applications* Suresh Chandra Satapathy, Vikrant Bhateja, Swagatam Das, 2018-11-04 The proceedings covers advanced and multi disciplinary research on design of smart computing and informatics The theme of the book broadly focuses on various innovation paradigms in system knowledge intelligence and sustainability that may be applied to provide realistic solution to varied problems in society environment and industries The volume publishes quality work pertaining to the scope of the conference which is extended towards deployment of emerging computational and knowledge transfer approaches optimizing solutions in varied disciplines of science technology and healthcare

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