LOAD TEST OF 0.5HP AC INDUCTION MOTOR USING COUPLING SYSTEM

by

TING SIU HUI

Report submitted in partial fulfillment
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SCHOOL OF ELECTRICAL SYSTEMS ENGINEERING UNIVERSITY MALAYSIA PERLIS

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DECLARATION SHEET

I hereby declare that my Final Year Project Thesis is the result of my research work under supervision of ANAYET KARIM. All literature sources used for the writing of this thesis have been adequately referenced.

Name	:	**TING SIU HUI**
Candidate number	:	**071091278**
Supervisor	:	**ANAYET KARIM**
Title of thesis	:	**LOAD TEST OF 0.5HP AC INDUCTION MOTOR USING COUPLING SYSTEM**

Candidate's signature: …………………. . Supervisor signature: …………………

Date: ………………………….. Date: …..………………………

APPROVAL AND DECLARATION SHEET

This project report titled Load Test of 0.5HP AC Induction Motor Using Coupling System was prepared and submitted by Ting Siu Hui (Matrix Number: 071091278) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Electrical Systems Engineering) in Universiti Malaysia Perlis (UniMAP).

Checked and Approved by

____

(ANAYET KARIM)
Project Supervisor

School of Electrical Systems Engineering
Universiti Malaysia Perlis

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UJIAN BEBAN PENJANA MOTOR
DENGAN MENGGUNAKAN SISTEM SINAPSIS

ABSTRAK

Penjana motor digunakan di seluruh dunia sebagai pekerja dalam aplikasi industri seperti kipas, pam, peralatan mesin, lif dan alat pengangkutan. Penjana motor mempunyai ciri-ciri yang ringkas dan pelbagai, mudah diservis, mempunyai kecekapan yang tinggi dan harganya adalah berpatutan. Ciri-ciri ini mendorong kepada standardisasi dan perkembangan motor dalam bidang pembuatan dan infrastruktur dan diperkenalkan secara meluas dalam pelbagai bidang. Oleh itu, usaha untuk meningkatkan kecekapan motor akan memberikan kesan yang positif dalam mengurangkan pembaziran tenaga elektrik terutamanya dalam bidang industri. Terdapat pelbagai kaedah yang boleh dipakai untuk menentukan kecekapan penjana motor. Antaranya adalah menjalankan ujian tanpa beban, ujian angkir terkunci, ujian rintangan arus terus dan ujian beban terhadap penjana motor untuk mendapatkan berbagai-bagai nilai yang dikehendaki. Pengiraan akan dijalankan untuk menentukan spesifikasi penjana motor seperti nilai rintangan keseluruhan, kebocoran galangan, kehilangan kuasa, arus dan lain-lain. Akhirnya, kecekapan penjana motor dapat ditentukan.

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ABSTRACT

Induction motors are used worldwide as the workhorse in industrial application such as fan, pumps, machine tools, elevators and conveyors. It offers users simplicity, rugged construction, easy maintenance, relatively high efficiency and cost effective pricing. These factors have promoted standardization and development of a manufacturing infrastructure that has led to a vast installed base of motors. Thus, improvements in the efficiency of the electrical drives would offer significant effects in reducing industrial electrical energy usage. There are various types of method in determining the efficiency of induction motors. Among them are No-Load Test, Blocked Rotor Test, DC Resistance Test and Load Test for rotating machine to get various data on the induction motor. A proper parameter calculation need to be carried on to obtain the range of specification of the induction motor such as the total resistance,the leakage impedances, the losses estimation, stator current, rotor current and so on. Finally, the efficiency of the AC Induction Motor is determined.

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LIST OF SYMBOLS, ABBREVIATIONS OR NOMENCLATURE

EMF	Electromagnetic Force
ƞ	Efficiency
NEMA	National Electrical Manufacturers Association
I_1	Stator Current
PF	Power Factor
S	Slip
Hp	Horsepower
$P_{F\&W}$	Friction and Windage Losses
n_s	Synchronous Speed
kVAR	Kilo Volt-Amperes-Reactive
kW	Kilowatt
kVA	Kilovolts-Amperes
I_L	Line Current
V_{L-L}	Line-to-Line Voltage
I_X	Reactive Component
I_P	Load Component current
θ	Electrical Angle
P_{in}	Input Power
P_{out}	Output Power
P_{rot}	Rotational Losses
P_{mech}	Mechanical Power
P_{AG}	Air Gap power
R_2	Rotor Resistance
P_{core}	Core Losses
P_{NL}	No-Load Power
I_{NL}	No-Load Current
R_{NL}	No-Load Resistance

Z_{NL}	No-Load Impedance
R_1	Stator Resistance
X_1	Stator Leakage Reactance
X_2	Rotor Leakage Reactance
X_m	Magnetizing Reactance
P_{BR}	Blocked Rotor Power
I_{BR}	Blocked Rotor Current
R_{BR}	Blocked Rotor Resistance
Z_{BR}	Blocked Rotor Impedance
X_{BR}	Blocked Rotor Reactance
V_{dc}	DC Voltage
I_{dc}	DC Current
I_c	Per-Phase Stator Core Loss Current
I_m	Magnetizing Current
R_c	Per-Phase Stator Core Loss Resistance
L_m	Per-Phase Stator Magnetizing Inductance
V_p	Phase Voltage
P_{core}	Core Losses
P_{SCL}	Stator Copper Losses
P_{RCL}	Rotor Copper Losses
f_t	Frequency of the Blocked-Rotor Test Voltage
f_B	Rated Frequency
$P_{stray\,(IEEE)}$	Stray Load Losses Based On IEEE 112-B Standard
P	True Power
Q	Reactive Power
S	Apparent Power
n_{slip}	Slip Speed
n_m	Mechanical Shaft Speed
w_{sync}	Synchronous Angular Velocity
w_m	Mechanical Angular velocity