E-LEARNING ON THREE PHASE AC INDUCTION MOTOR

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MAY 2009

"I hereby declare that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Industrial Power)"

Signature : .....

Name of Supervisor : AZHAR BIN AHMAD

Date : 08 MAY 2009

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A report submitted in partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering (Industrial Power)

Faculty Of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2009

I declare that this report entitle "*E-Learning On Three Phase AC Induction Motor*" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : ZURAIDAH BT YAHYA

Date : 08 MAY 2009

To my beloved mother and father

Yahya Bin Ibrahim

Fatimah Bt Wan Mamat

And my beloved family

Thank you

ACKNOWLEDGEMENT

Alhamdulillah. I am greatly indebted to Allah on His mercy and blessing for making this project successful.

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Next, I would like express my thankful to all my lecturers and entire staffs in Universiti Teknikal Malaysia Melaka (UTem) for their assistance at various occasions. Their views, comments and tips are very helpful in completing this project.

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ABSTRACT

Lesson and learning system very important in produce quality of student who capable of receiving learning outcome effectively. In live technological progress by today, E-Learning's system has reach one important level in development of the country's education or countries outside. E-learning services have evolved since computers were first used in education. E-Learning lessons are generally designed to guide students through information or to help students perform in specific tasks. Three Phase AC Induction Motor learning's project objective based on this E-Learning's system would be to facilitate students cottoned on to Three Phase AC Induction Motor with easier to understand. E-Learning's module which operate in this project is had used Macromedia Flash's software 8.0. By using that software, system based on concepts interactive can produce and have one colourful design at making student have been interesting to use this module. Generally, this module is divided by several chapters to facilitate students understanding of each chapter effectively.

ABSTRAK

Sistem pengajaran dan pembelajaran amat penting dalam melahirkan seorang pelajar yang berkualiti iaitu seseorang yang mampu menerima hasil pembelajaran secara berkesan. Dalam kemajuan teknologi yang wujud pada hari ini, sistem E-Pembelajaran telah mencapai satu tahap yang penting dalam perkembangan pendidikan negara mahupun negara-negara luar. Sistem E-Pembelajaran telah berkembang semenjak pertama kali komputer digunakan dalam sistem pendidikan. Pengajaran dalam sistem E-Pembelajaran dihasilkan adalah untuk membimbing pelajar melalui maklumat atau untuk membantu pelajar dalam kaedah-kaedah tertentu seperti kaedah interaktif. Tujuan projek pembelajaran Motor Arus Ulang Alik Tiga Fasa berasaskan sistem E-Pembelajaran ini adalah untuk memudahkan pelajar-pelajar memahami tentang motor arus ulang alik tiga fasa dengan lebih mudah untuk difahami. Modul E-Pembelajaran yang dijalankan dalam projek ini telah menggunakan perisian Macromedia Flash 8.0. Dengan menggunakan perisian tersebut, sistem yang berkonsepkan interaktif dapat dihasilkan dan mempunyai satu reka bentuk berwarna-warni untuk membuat pelajar menjadi menarik untuk menggunakan modul ini. Secara umumnya, pengisian di dalam modul ini dibahagikan kepada beberapa tajuk untuk memudahkan pelajar-pelajar memahami setiap tajuk dengan lebih mendalam.

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AC	-	Alternating Current
S	-	Slip
n_s	-	Stator rotating magnetic field speed
n_m	-	Rotor speed
rpm	-	Rotation per minute
f	-	Frequency of supply voltage
fr	-	Frequency of rotor
p	-	Pole
P_{cu}	-	The rotor Cu Loss
I	-	Current
R	-	Resistance
N-S	-	North-South
IT	-	Information Technology

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Project Background

The main purpose of this project is to fulfill the requirement for the Final Year Project (BEKU 4973).Its rationale is to increase the knowledge and expertise of the undergraduate students of Universiti Teknikal Malaysia Melaka (UTem) in solving the problems through knowledge based research in order to produce the competent and productive technologist. This project focuses in one of important component in industry that is Three Phase AC Induction Motor.

1.2 Problem Statement.

Majority of students is difficult to understand the overall basic of three phase ac induction motor by manual learning. This is because students could not see movement or effect of motion of the three phase ac induction motor. Therefore, students can't understand clearly about construction, operation, characteristics, speed and applications of the three phase ac induction motor. This is because; speech problems may include stuttering or dissiliency, articulation disorders, or unusual voice quality. Malaysia is still lacking with educational module, especially for students.

1.2 Objective of the Research Project

There are three objectives of this project, which is stated in the following texts:

1. To design and develop an E-learning module on concept and principle of three phase ac induction motor.
2. To explain and demonstrate interatively, clearly and correctly the concept and principle operation of three phase ac induction motor.
3. Teach problem solving, decision making and conflict resolution.

1.3 Scope of the Research Project

In order to achieve this project objective, the following scopes will be covered:

1. Divided into 2 main parts
    i. Three phase ac motor scope
        a. Introduction
        b. Magnetism
        c. Construction
        d. Operation
        e. Basic concept
        f. Equivalent circuit
        g. Power stage
        h. Speed

1.4 E-learning module scope

1. Elements of Three Phase AC Induction Motor that have important.
2. The second part is on E-learning module scope, this module have an interesting and attractive element.
3. The user interface has a colourful design to make the student become interesting to use this module.

1.5 Project Report Outline

Generally this project report is divided into six chapters, where it consists:

Chapter 1: Introduction
Chapter 2: Literature Review
Chapter 3: Methodology
Chapter 4: Results and Discussions
Chapter 5: Conclusion and Recommendation

Chapter 1 is an overview of the research project in whole, the problem statement; objective and scope of research project are defined. The research project that will be done are based on the objectives and scopes that been stated earlier.

Chapter 2 presents the literature review discussed about what people said about the main subject of my project. The source that I take is from website and books. In this chapter the scope of my module will be explained. Literature review helps in understanding the fundamental of three phase ac induction motor.

Chapter 5 will be discussed the result of the project work where the module of e-learning will be performed. The final section from this chapter is the discussion for the gathered result will be explained.

Chapter 6 will conclude all the works and had been presented in previous chapter and all the results of the project. This is followed by recommendations for the future study work.

CHAPTER 2

LITERATURE REVIEW

2.1 History of Induction Motor

The induction motor with a wrapped rotor was invented by Nikola Tesla in 1882 in France but the initial patent was issued in 1888 after Tesla had moved to the United States. In his scientific work, Tesla laid the foundations for understanding the way the motor operates. The induction motor with a cage was invented by Mikhail Dolivo-Dobrovolsky about a year later in Europe. Technological development in the field has improved to where a 100 hp (73.6 kW) motor from 1976 takes the same volume as a 7.5 hp (5.5 kW) motor did in 1897. Currently, the most common induction motor is the cage rotor motor.

2.2 Introduction of Three Phase AC Induction Motor

AC motors are used worldwide in many applications to transform electrical energy into mechanical energy. There are many types of AC motors, such as synchronous motor and induction motor but this course focuses on three phase AC induction motors, the most common type of motor used in industrial applications. An AC motor of this type may be part of a pump or fan or connected to some other form of mechanical equipment such as a winder, conveyor, or mixer.

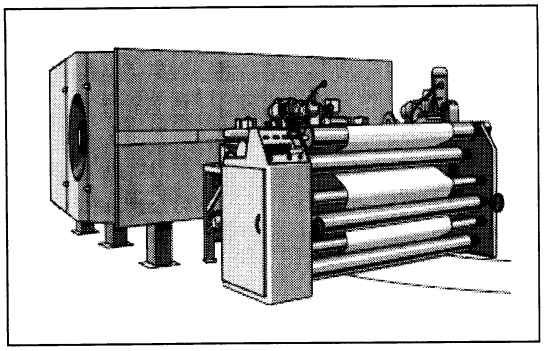

Figure 2.1: Winder

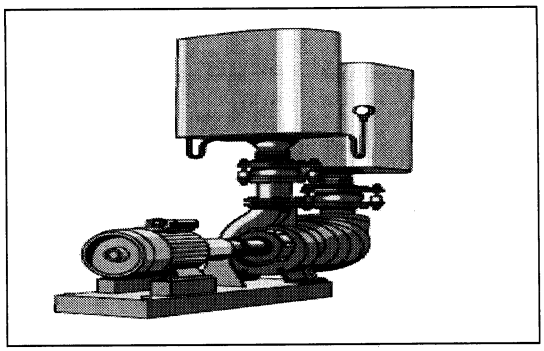

Figure 2.2: Pump

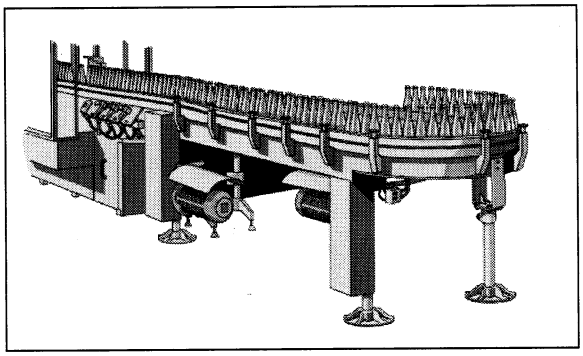

Figure 2.3: Conveyor

The advantage of three phase induction motor;

1. It has very simple and extremely rugged, almost unbreakable construction (especially squirrel-cage type).
2. Its cost is very low and is very reliable.
3. It has sufficiently high efficiency. It has a reasonable good power factor.
4. It starts up from rest and needs no extra starting motor and has not to be synchronized. Its starting arrangement is simple, especially for squirrel-cage type rotor.

Disadvantages of three phase induction motor;

1. Its speed can't be varied without sacrificing some of its efficiency.

2. Just like a DC shunt motor, its speed decreases some what with increases in load.

3. Its starting torque is somewhat inferior to that of a DC shunt motor.

2.3 Magnetism

The principles of magnetism play an important role in the operation of an AC motor. Therefore, in order to understand motors, you must understand magnets.

2.3.1 Left-Hand Rule for Conductors

The left-hand rule for conductors demonstrates the relationship between the flow of electrons and the direction of the magnetic field created by this current. If a current carrying conductor is grasped with the left hand with the thumb pointing in the direction of electron flow, the fingers point in the direction of the magnetic lines of flux.

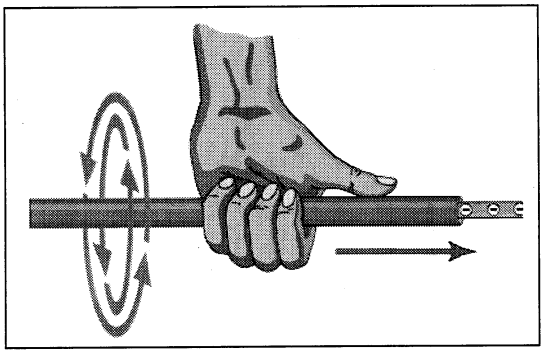

Figure 2.4: Left-hand Rule for Conductors

The following illustration shows that, when the electron flow is away from the viewer (as indicated by the plus sign), the lines of flux flow in a counterclockwise direction around the conductor. When the electron flow reverses and current flow is towards the viewer (as indicated by the dot), the lines of flux flow in a clockwise direction.

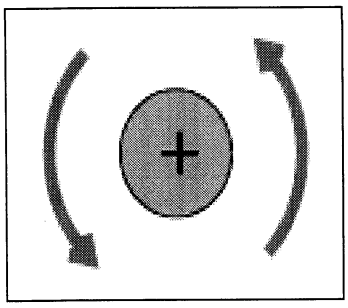

Figure 2.5: Electron Flow Away From You Causes Counterclockwise Magnetic Flux

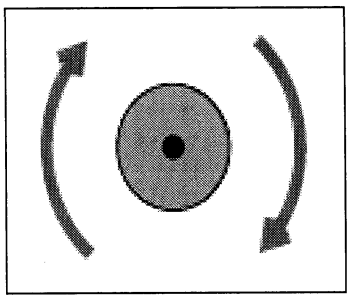

Figure 2.6: Electron Flow Towards You Causes Clockwise Magnetic Flux

2.3.2 Number of Turns

The strength of the magnetic field created by the electromagnet can be increased further by increasing the number of turns in the coil. The greater number of turns the stronger the magnetic field for the same level of current.

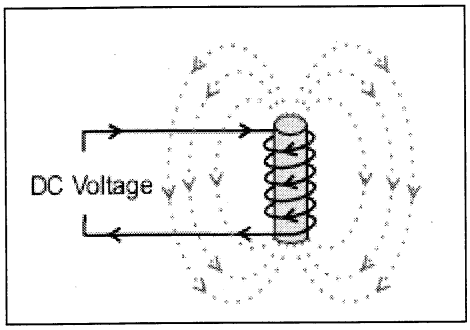

Figure 2.7: 5 Turns of Coil

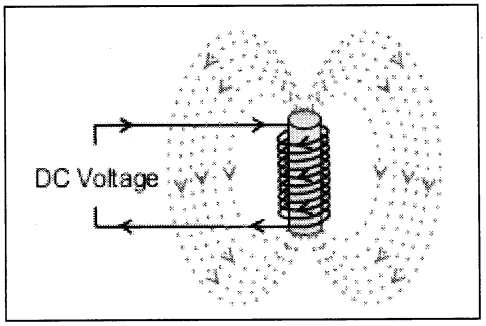

Figure 2.8: 10 Turns of Coil

2.3.3 Induced Voltage

In the previous examples, the coil was directly connected to a power supply. However, a voltage can be induced across a conductor by merely moving it through a magnetic field. This same effect is caused when a stationary conductor encounters a changing magnetic field. This electrical principle is critical to the operation of AC induction motors. In the following illustration, an electromagnet is connected to an AC