

الآية الكريمة

قال تعالى:

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ
وَسَتُرَدُّونَ إِلَىٰ عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُم بِمَا كُنتُمْ
تَعْمَلُونَ﴾

صدق الله العظيم

سورة التوبة آية رقم (105)

DEDICATION

To

Endless love

Our mothers

To

Man who teach me to be man

Our fathers

To

Our teacher & our colleagues

AKNOWLEDGMENT

First we need to thank fully our god (Allah) that without his blessing this work will not complete.

Then all thank for our supervisor U. Jalal to his patience with us and countless hours and valuable efforts to guide and advise us to complete the work in his fair way.

And until not forget the deep thank for Eng. Jalal Abdu AL Fatah Mohammed to their main participate in success this work.

Lastly we need to thank our teachers in electrical and nuclear engineering school to their efforts in helping and support.

Abstract

The aims of this project are control power transformer, and so to the content of these adapters importance in the energy systems of voltages regulation as it is considered an essential component without which power systems are not working properly.

Control Circuit Designed of automatic control using special techniques of control which programmed logic controller to monitor the performance of the converter and give the desired results.

found that the system gives a high response characteristic where reduced maintenance costs, and the logical controller programmed to deal with a different environment and thus result in better control conditions.

المستخلص

يهدف هذا المشروع لعمل تحكم ألي لمحولات القدرة ، وذلك لما تحتويه هذه المحولات من أهمية في منظومات الطاقة من تنظيم للجهود حيث أنها تعتبر من المكونات الأساسية التي بدونها أنظمة الطاقة لا تعمل بالشكل المطلوب .

تم تصميم دائرة تحكم ألي بإستخدام تقنية خاصة من تقنيات التحكم وهي المتحكم المنطقي المبرمج لمراقبة أداء المحول وإعطاء النتائج المطلوبة .

وجد أن النظام يعطي استجابة عالية وخصائص أفضل حيث قللت من تكاليف الصيانة ، كما أن المتحكم المنطقي المبرمج يتعامل مع ظروف بيئة مختلفة وبالتالي ينتج عنه سيطرة أفضل.

TABLE OF CONTENTS

| TITLE | Page |
|--|------|
| الاية | I |
| DEDICATION | ii |
| ACKNOWLEDGEMENT | iii |
| ABSTRACT | iv |
| مستخلص | V |
| TABLE OF CONTENTS | Vi |
| LIST OF FIGURES | Viii |
| LIST OF TABLES | ix |
| LIST OF ABBREVIATION | Xii |
| CHAPTER ONE | |
| INTRODUCTION | |
| 1.1 INTRODUCTION | 1 |
| 1.2 Problem Statement | 3 |
| 1.3 Objectives | 3 |
| 1.4 Methodology | 3 |
| 1.5 Layout | 3 |
| CHAPTER TWO | |
| GENERAL INFORMATION | |
| 2.1 Introduction | 5 |
| 2.2 Transformer | 5 |
| 2.2.1 Transformer Construction | 5 |
| 2.2.2 Working Principle of a Transformer | 6 |
| 2.2.3 Type of transformer | 7 |

| | |
|--|----|
| 2.2.3.1 Terms of cooling | 7 |
| 2.2.3.2 Terms of connection | 8 |
| 2.2.3.3 Term of insulating | 11 |
| 2.2.3.4 Term of use | 11 |
| 2.3 Control | 12 |
| 2.3.1 Type of control | 13 |
| 2.3.1.1 Open-loop and closed-loop control | 13 |
| 2.3.1.2 Logic control | 13 |
| 2.3.1.3 PID control | 13 |
| 2.3.1.4 Fuzzy logic | 14 |
| 2.3.2 Elements | 14 |
| 2.3.2.1 The characteristic or condition to be controlled | 14 |
| 2.3.2.2 The sensor | 14 |
| 2.3.2.3 The comparator | 14 |
| 2.3.3 Process | 15 |
| 2.4 Programmable logic controller (P.L.C) | 15 |
| 2.4.1 Historical background | 15 |
| 2.4.2 PLC Components | 16 |
| 2.4.2.1 Central Processing Unit (CPU) | 16 |
| 2.4.2.2 System Busses | 16 |
| 2.4.2.3 Memory | 16 |
| 2.4.2.4 I/O Sections | 17 |
| 2.4.2.5 Power Supply | 17 |
| 2.4.2.6 Programming Device | 17 |
| 2.4.3 PLC Languages | 18 |

| | |
|--|----|
| 2.4.3.1 Ladder Logic | 18 |
| 2.4.3.2 Mnemonic Instruction | 18 |
| 2.4.3.3 Sequential Function Charts (SFC) | 18 |
| 2.4.3.4 Structured Text (ST) | 18 |
| 2.4.3.5 Function Block Diagram (FBD) | 19 |
| 2.5 Sensor | 19 |
| 2.5.1 Different types of Sensors | 19 |
| CHAPTER THREE DESIGN OF CIRCUIT | |
| 3.1 Introduction | 22 |
| 3.2 Components of Circuit | 22 |
| 3.2.1 Transformer | 22 |
| 3.2.2 Oil / Winding Temperature Sensor | 23 |
| 3.3.3 Buchholz Relay (Gas) | 24 |
| 3.3.4 Oil Level Monitor Device | 26 |
| 3.3.5 Pressure Relay | 26 |
| 3.3.6 current transformer (C.T) | 27 |
| 3.3.7 Circuit breaker (CB) | 29 |
| 3.3.8 Earthing Switches | 30 |
| 3.3.9 Tap changer | 30 |
| 3.2.10 PLC XC Series | 31 |
| 3.4 Block Diagram | 31 |
| CHAPTER FOUR IMPLEMENTATION OF DESIGN | |
| 4.1 Introduction | 33 |
| 4.2 Simulation | 33 |
| 4.3 Every Soft Unit of PLC XC3 Series | 36 |

| | |
|--|----|
| 4.3.1 Input (X) and output (Y) Relay | 36 |
| 4.3.2 Auxiliary relay (M) | 36 |
| 4.3.3 Status (S) | 37 |
| 4.3.4 Timer(T) | 37 |
| 4.3.5 Counter(C) | 37 |
| 4.3.6 Data register(D) | 38 |
| 4.3.7 Contactor's Compare Instructions | 38 |
| 4.4 How system run | 39 |
| CHAPTER FIVE CONCLUSION AND RECOMMENDATIONS | |
| 5.1 Conclusion | 41 |
| 5.2 Recommendations | 41 |
| REFERENCES | |
| Appendix A (simulation) | |
| Appendix B (contents of transformer) | |

LIST OF FIGURES

| Figure No. | Title | Page No. |
|------------|----------------------------------|----------|
| 1.1 | Electrical Power System | 2 |
| 2.1 | Transformer Construction | 6 |
| 2.2 | Working Principle Of Transformer | 7 |
| 2.3 | Core Type And Shell Type | 9 |
| 2.4 | PLC Component | 17 |
| 3.1 | Oil/Winding Temperature | 24 |
| 3.2 | Buchholz (Gas) Relay | 25 |
| 3.3 | Oil Level Monitor Device | 26 |
| 3.4 | Pressure Relay | 26 |
| 3.5 | Current Transformer | 26 |
| 3.6 | Circuit Breaker | 30 |
| 3.7 | Tap Changer | 31 |
| 3.8 | In put/out put of PLC | 32 |
| 4.1 | Logic AND | 32 |
| 4.2 | Logic AND With NOT | 34 |
| 4.3 | Logic OR | 35 |
| 4.4 | Industrial STOP/START | 35 |
| 4.5 | Program of companies instruction | 39 |

LIST OF TABLE

| Table NO. | Title | Page NO. |
|-----------|---------------------------|----------|
| 3.1 | Transformer Specification | 23 |
| 3.2 | PLC Specification | 31 |
| 4.1 | Devic's ID list | 38 |
| 4.2 | Instruction and function | 39 |

LIST OF ABBREVIATIONS

| | |
|---------|---|
| PLC | Programmable Logic Controller |
| A.N | Air Natural |
| O.N.A.N | Oil Natural Air Natural |
| O.F.A.F | Oil Forced Air Forced |
| O.F.W.F | Oil Forced water Forced |
| MW | Mega Watt |
| SF6 | Sulphur Hexa Fluoride |
| KV | Kilo volt |
| MVA | Mega Volt Ampere |
| V.T | Voltage Transformer (Potential) |
| C.T | Current Transformer |
| PID | Proportional Integral Derivative |
| CPU | Central Processor Unit |
| ROM | Read Only Memory |
| RAM | Random Assesse Memory |
| EPROM | Erasable Programmable Read Only Memory |
| EEPROM | Electrically Erasable Programmable Read Only Memory |
| VAC | Volt of Alternating Current |
| SFC | Sequential Function Charts |
| ST | Structured Text |
| FBD | Function Block Diagram |
| LCD | Liquid Crystal Display |
| HZ | Hertz |
| PIR | Passive Information Sensor |
| IC | Integrated Circuit |
| CB | Circuit Breaker |
| IEC | International Electro technical Commission |
| HV | High Voltage |
| LV | Low Voltage |
| KG | Kilo Gram |
| OTI | Oil Temperature Indicator |
| AC | Alternating Current |
| QTY | Quantity |
| DI | Digital Input |
| DO | Digital Output |
| COM | Communication |

| | |
|-----|------------------------------|
| I/O | Input and Output |
| NC | Normal Close |
| NO | Normal Open |
| MS | Mellie Second |
| D | Data |
| T | Timer |
| C | Counter |
| S | Status |
| M | Auxiliary Rely |
| LD | Ladder Diagram |
| AVR | Automatic Voltage Regulators |