

TABLE OF CONTENTS

ABSTRACT	i
<i>ABSTRAK</i>	ii
PREFACE	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	vii
LIST OF TABLES	ix
LIST OF APPENDIX	x
GLOSSARY	xi
CHAPTER I INTRODUCTION	1
I. 1 Research Background	1
I. 2 Problem Statement	3
I. 3 Research Objective	3
I. 4 Boundaries	4
I. 5 Benefit of Research	4
I. 6 Writing Systematic	5
CHAPTER II LITERATURE REVIEW	7
II. 1 Water Treatment Process	7
II. 2 Water Distribution System	8
II. 3 Automation System	9
II. 4 Automation Components	11
II.4.1 Input	11
II.4.2 Controller	12
II.4.3 Output	12
II. 5 Programmable Logic Controller (PLC)	13
II.5.1 Description of Programmable Logic Controller (PLC)	13
II.5.2 Components of PLC	14
II.5.3 Type of PLC	15
II.5.4 Programmable Logic Controller (PLC) Programming	16
II. 6 Supervisory Control and Data Acquisition (SCADA)	16
II. 7 Database	18

II. 8	TIA PORTAL V12	18
II. 9	Wonderware InTouch	19
II. 10	Microsoft SQL Server	20
II. 11	Calculation of Required Capacity	20
II. 12	Calculation of Water Treatment Plant	21
II. 13	Previews Research	24
CHAPTER III RESEARCH METHOD		26
III. 1	Conceptual Model	26
III. 2	Problem Solving Systematics	28
III.2.1	Problem Identification	30
III.2.2	Problems Formulation	31
III.2.3	Determination of research Objectives	31
III.2.4	Literatures Study	31
III.2.5	Data Collection	32
III.2.6	Data processing	32
III.2.7	Identification of System Requirements	32
III.2.8	System Design	33
III.2.9	Design of Plant	33
III.2.10	Design of PLC program	34
III.2.11	Design of HMI	34
III.2.12	Design of Database	34
III.2.13	Overall System Simulation	34
III.2.14	Analysis of Simulation Result	35
III.2.15	Conclusion and Suggestion	35
CHAPTER IV DATA COLLECTION AND PROCESSING		36
IV.1	Analysis of Existing System	36
IV.1.1	Description of Existing System	36
IV.1.2	Weakness Identification of Existing System	40
IV.2	Data Collection	40
IV.2.1	Needs of Clean Water	40
IV.2.2	Calculation of Water Shelter Needed	41
IV.2.3	Standard of Water Treatment	44

IV.2.4	The Needs of PAC Dosage	45
IV.2.5	The Need of Chlorine Dosage.....	47
IV.3	Design of Proposed System.....	47
IV.4.1	Design of Water Treatment Plant.....	48
IV.4.2	Design of Distribution Plant.....	57
IV.4.3	Design of Water Treatment Process Scenarios	59
IV.4.4	Design of Distribution Process Scenarios	64
IV.4.5	System Requirement Identification.....	65
IV.4.6	Design of PLC Program	68
IV.4.7	Design of Human Machine Interface	69
IV.4.8	HMI and PLC Communication	72
IV.4.9	Design of Database	74
IV.4	Testing Scenario of the Systems	76
IV.5.1	Testing Scenario of PLC Programs.....	78
IV.5.2	Testing Scenario of HMI.....	78
IV.5.3	Testing Scenario of Database.....	80
CHAPTER V	RESULT AND SYSTEM ANALYSIS	81
V.1	Analysis System Design Result.....	81
V.2	Analysis of PLC Program.....	82
V.2.1	Analysis of PLC Program for Water Treatment Process	82
V.2.2	Analysis of PLC Program for Distribution Process	87
V.3	Analysis of HMI.....	89
V.4	Analysis of Database	93
V.5	Analysis of Testing Scenario.....	93
V.5.1	Testing of PLC Program for Water Treatment	93
V.5.2	Testing of PLC Program for Distribution	95
V.5.3	Scenario of HMI.....	96
V.5.4	Scenario of Database.....	98
CHAPTER VI	CONCLUSIONS AND SUGGESTIONS	99
VI.1	Conclusions	99
VI.2	Suggestions.....	99
REFERENCES	100