

**STUDY OF THE EFFECT OF TIME CONSTANT TO THE FLOW AND
TEMPERATURE CONTROLLABILITY**

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ABSTRACT

This research project is to study on the effect of time constant on the flow and temperature controllability. This can be achieved by doing an open loop test, followed by the performance test using three different tuning rules, which are Ziegler-Nicholes, Cohen Coon and Takahashi. From the tuning method, value of the P – I – D is obtained. Thus, performance test such as load disturbance test and set point test is done to see which method gives the best performance. Tangent analysis is a conventional method used to analyzed an open loop step reponse curve. It is done by drawing a tangent line at the steepest point of the step response curve. In this research project, numerical analysis is used as it is much faster in obtaining data compared to tangent analysis. The process dynamics such as dead time and response rate can be obtained from the analysis. Meanwhile, values of the response rate, RR, and the dead time, T_d , differs comparing flow and temperature, which in turn, resulted in different values of P's and I's of different tuning method (Ishak & Ahmad, 2002). In this research paper, the time constant and settling time is observed to see which tuning rules gives the best performance based on the time constant as time constant affects the settling time.

TABLE OF CONTENTS

DECLARATION	iii
SUPERVISOR's CERTIFICATION	iv
ACKNOWLEDGEMENT	vi
ABSTRACT.....	vii
TABLE OF CONTENTS.....	viii
LIST OF ABBREVIATIONS	xiii

CHAPTER 1 : INTRODUCTION

1.1 Background Study.....	1
1.2 Objectives	2
1.3 Problem Statement	2
1.4 Scope of Research.....	2

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction to Process Control	3
2.1.1 Importance of Process Control.....	3
2.1.2 Methods of Control	4
2.2 Flow, Temperature and Pressure Controllability	5
2.2 PID Controller.....	6
2.2.1 Tuning Method in PID Control.....	7
2.3 Open Loop Test (Graphical Analysis)	9
2.3.1 Tangent method	9
2.3.2 Reformulated Tangent method	12
2.4 Open Loop Test (Numerical Analysis).....	13
2.4.1 Discrete Tangent Method.....	13
2.5 Application of Process Control in Industry	14
2.5.1 Modelling, Simulation, and Control of Flow Tank System.....	14

CHAPTER 1

INTRODUCTION

1.1 Background Study

Process engineers are always accountable for the operation of chemical processes. As these processes become larger scale or more complex, the role of process automation becomes more and more important.

Process control refers to the ways methods that are used to regulate process variables when manufacturing a product. For example, factors such as the proportion of one components to another, the temperature of the materials, how well-mixed the ingredients are, and also the pressure under which the materials are held can considerably effect the quality of an end product (Krisztian, 2006).

The accurate design of plant equipment is crucial for control to be possible and for control to provide virtuous dynamic performance. Suitable capacity of the process equipment and the equipment must have a large enough maximum volume to respond to all expected disturbances and changes in the desired values. The sensors must respond rapidly so that the control action can be occupied in real time (Ali, 2002).

Control systems are automated, which require that the key functions of sensing, calculating, and manipulating be performed by equipment and that each element communicate with other elements in the control system. Most automatic control is applied using electronic equipment which uses levels of current or voltages to characterize values to be connected (Ali, 2002).

In general terms, the time constant, T_c , describes how fast the PV moves in response to a change in the PV. The time constant must be positive and it must have units of time. For controllers used on processes involved of gases, liquids, powders, slurries and melts, T_c most often has units of minutes or seconds.

One of the most common conventional method used in open loop process identification is the tangent method. This method provides two most dynamic information used to calculate the optimum PID values which are namely, the process dead time and the process