STUDY ON THE OPTIMUM PRESSURE CONTROLLABILITY OF PID TUNING BY USING DIFFERENT TUNING RULES

SITI NORHANA FATEHAH BINTI ZOLKAPALI

This report is submitted in partial fulfilment of the requirements needed for the award of Bachelor in Chemical Engineering (Hons)

FACULTY OF CHEMICAL ENGINEERING
UNIVERISITI TEKNOLOGI MARA
SHAH ALAM

JULY 2017

ACKNOWLEDGEMENT

First and foremost, I am very thankful to Allah s.w.t as for the completion of this research project. I place on record, my genuine gratitude to Principal of Universiti Teknologi Mara (UITM) for giving me with all the necessary facilities such as machines, tools and many more.

I would like to express my sincere appreciations to Dean of Faculty of Chemical Engineering for letting me took this course in order for me to complete my Bachelor in this university and his/her constant encouragement.

Next, I wish to express my deep sense of gratitude to my research project supervisor, Mr. Abdul Aziz bin Ishak for his guidance and encouragement for me to carrying out this research project. His suggestion and a very constructive criticism have contributed immensely to the evolution of my ideas on the research project.

I also sincerely thank the Pilot Plant laboratory technician, Mr. Nazri who rendered his help during the period of my laboratory work. Last but not least, I would like to thank to my family and friends for your endless support and encouragement in order for me to complete my research project.

ABSTRACT

This study is carried out to determine the optimum pressure controllability by using various tuning rule hence identify the best tuning rule for pressure controllability. Delta V Emerson system is used on Gas Pressure Control Plant (PIC92). There are several analyses conducted in this study which are open loop analysis and closed loop analysis. The outcome of the open loop analysis is the process response of response rate (RR), dead time (T_d) and time constant (T_c) and applied in various tuning rule. The method used for open loop test is Reformulated Tangent Method. Next, closed loop analysis is carried out by performing performance tests and fine tuning. This performance tests are conducted to observe and investigate the best and efficient tuning rule when the set point and load disturbance is changes. Then, the settling criteria of process response is determined for the settling time (T_s), percentage overshoot (%OV) and set point error (e). The controller that has minimum settling time and peak overshoot and less error will be considered as the best controller. Thus, in this study, the Cohen-Coon method is work well on a pressure controllability because it has minimum settling time and peak overshoot and also less set point error compared to the other tuning rule.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Research Background

Nowadays, without computer-based process control systems it would be impossible to operate modern plants safely and profitably while satisfying product quality and environmental requirements. Thus, it is important for chemical engineers to have an understanding of both the theory and practice of process control. On the other hand, the main objective of process control is to maintain a process at the desired operating conditions, safely and efficiently, while sustaining environmental and product quality requirements. The subject of process control is concerned with how to achieve these objectives. For example, in large-scale, integrated processing plants such as oil refineries or ethylene plants, thousands of process variables such as compositions, temperatures, and pressures are measured and must be controlled (Seborg, 2011).

Generally, PI controllers are used with a small integral action with large time integral, τ_I. However, it is a remarkable that the majority of processes in the chemical industries can be controlled using proportional (P) or proportional-integral (PI) feedback. Luyben. L (1989) has listed default settings for flow, level, pressure, and temperature control loops which represent good initial values of the controller settings. Measurement of level, temperature, pressure and flow parameters are very important in process industries.

A combination of a few transducers with a controller, that forms a closed loop system will leads to a stable and effective process. Regarding to that, well-designed conventional proportional, integral and derivative (PID) controllers are used widely in the chemical process industries because of their simplicity, robustness and successful practical applications. In this study, the gas pressure control is used to obtain optimum pressure controllability. In gas pressure control, if the gas is in equilibrium with a