Optimization of PID Tuning Using Genetic Algorithm

Tengku Ahmad Faris Ku Yusoff[1], Mohd Farid Atan[2], Nazeri Abdul Rahman[3], Shanti Faridah Salleh[4] and Noraziah Abdul Wahab[5]
[1,2,3,4,5]*Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak, Kuching, Sarawak, Malaysia.*
[1]*Email: tgfaris@live.com,* [2]*Email: amfarid@unimas.my,*
[3]*Email: arnazeri@unimas.my,* [4]*Email: sshanti@unimas.my,*
[5]*Email: anoraziah@unimas.my*

Abstract

Controller tuning is one of the important aspect in industry. With a good tuning method, it can ensure the quality of the process and product produce. Apart from that, it can protect the environment and help the company to reduce the cost. Genetic algorithm is one of the tuning method that increase usage and awareness in industry. Thus, the objective of this research is to compare the performance of the conventional tuning method with the performance of tuning method by using genetic algorithm can be seen. Optimization was done on stripping section of distillation column by using genetic algorithm with population size of 20, 40, 60 and 80 and comparing the result with previous optimization using Ziegler-Nichols method. The result obtain showed large improvement in the process response especially on rise time from 1.33 s to 1.31s and settling time from 4.56 to 4.46. Finally, population size of 40 deliver the fastest rise time and settling time.

Keywords*: tuning method, genetic algorithm*

1. Introduction

Proportional, Integral and Derivative (PID) controller is a common form of feedback (Astrom, 2002). It has been widely used in process industries due to their simple structure which can be easily understood and implemented in practice (Awouda, 2010). A good PID controller can ensure the process to work efficiently and help the industries to reduce the environmental issues while maintaining the quality of the product that being process. For PID controller to work properly, it has to be tuned. Genetic algorithm is a modern optimization technique that being studied by most researchers in searching the optimal PID parameters. It is inspired by Darwin's theory of evolution which states that the survival of an organism is affected by rule "the strongest species that survives" (Hermawento, 2013). Genetic algorithm can provide solutions for highly complex search space and perform well approximately solution for all types of problems because they do not make any assumption about the underlying fitness landscape (Zvirgzdina & Tolujevs, 2013).

The objective of this project is to understand and investigate the efficiency of genetic algorithm in PID tuning. In PID tuning, it is important to obtain the best solution so that the

Manuscript History:
Received 4 August, 2015, Revised 9 September, 2015, Accepted 10 September, 2015, Published 30 September, 2015

e-ISSN 2289-7771