CHAPTER FOUR

SIMULATION RESULTS

4.1 Introduction

The purpose of this research study is to maintain the proper temperature of the water or gas heater in less time potential in industrial scope by using Fuzzy PD controller as an alternative of PD controller. As mentioned in Chapter onefuzzy logic technique optimizes the PD controller performance.

This chapter demonstrates the benefit of fuzzy PD controller in heaters over the PD controller by comparing the obtained results of both PD and Fuzzy PD controllers. By the aid of MATLAB Simulink.

4.2 Final Results

4.2.1 MATLAB Simulation of Heater Using PD Controller

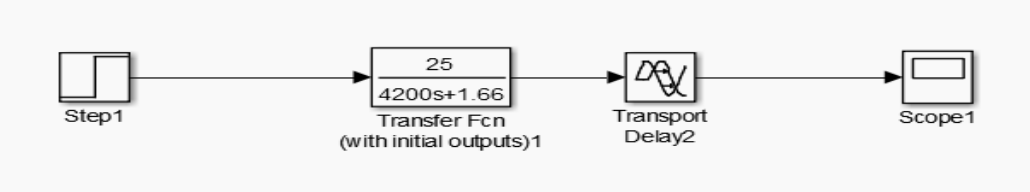

Figure 4-1: simulation circuit of open loop system

Figure 4-2 below shows heater temperature response obtained from module circuit shown in figure 4-1 with specific set point in different intervals in open loop circuit.

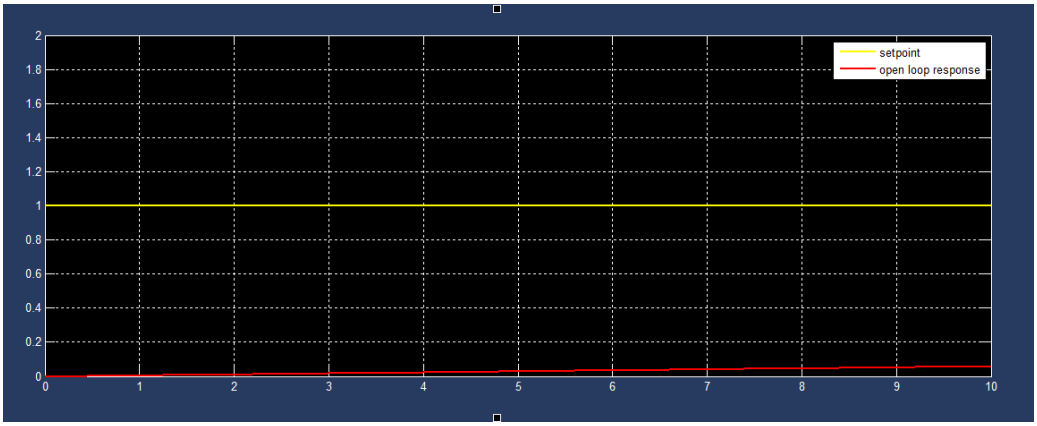

Figure 4-2: dynamic response of open loop system

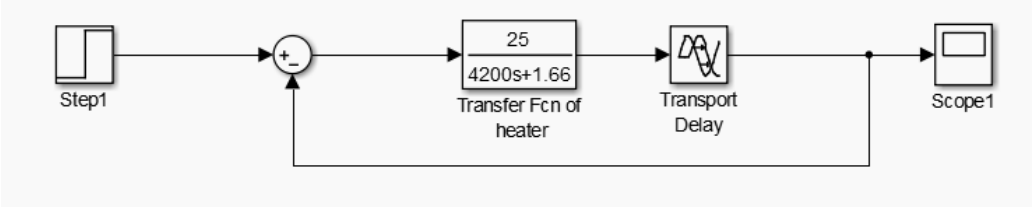

Figure 4-3: simulation circuit of closed loop system

Figure 4-4 below shows heater temperature response obtained from module circuit shown in figure 4-3 with specific set point in different intervals, with unity feedback. This gives better response than the open loop response, but doesn't give a desired one.

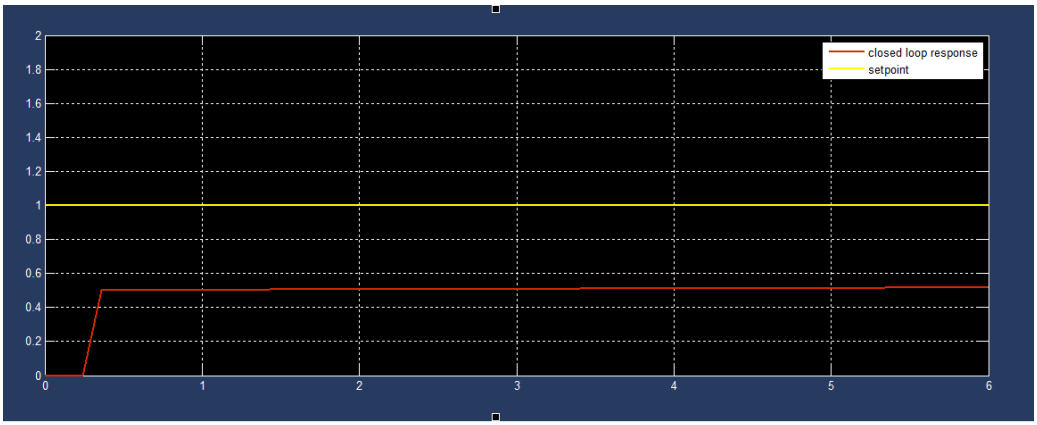

Figure 4-4: dynamic response of closed loop system

Figure 4-5 below shows PD controller it works like simple conventional proportional, derivative controller.

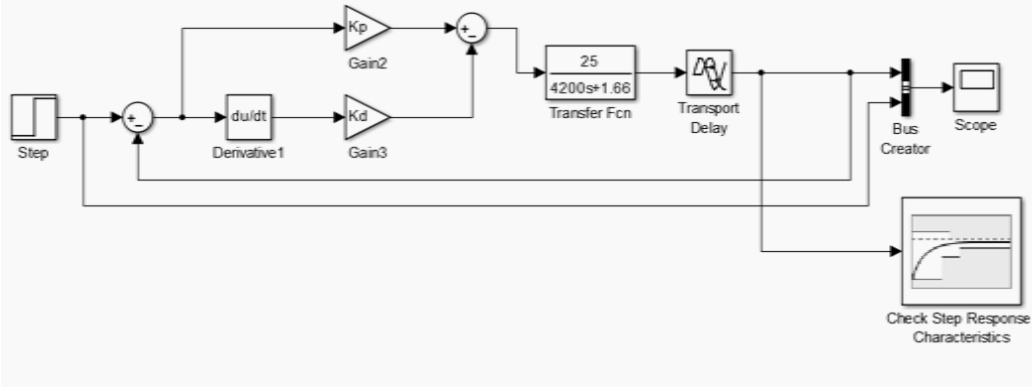

Figure 4-5: simulation circuit of temperature control using PD controller

Figure 4-6 below shows heater temperature response with specific set point in different intervals, using PD controller, and this gives better response than the closed loop response.

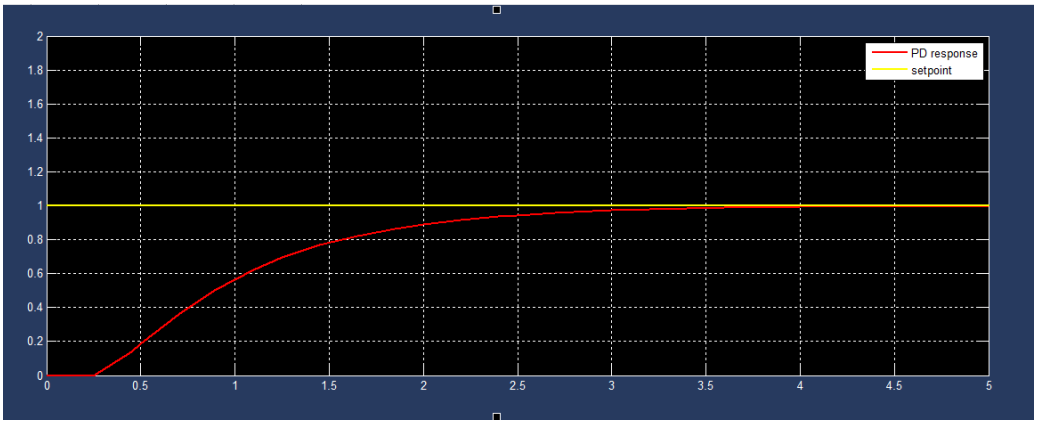

Figure 4-6: dynamic response of PD controller

1.2.2 MATLAB Simulation of Heater using fuzzy PD Controller

Figure 4-7 shows the module circuit of fuzzy PD controller

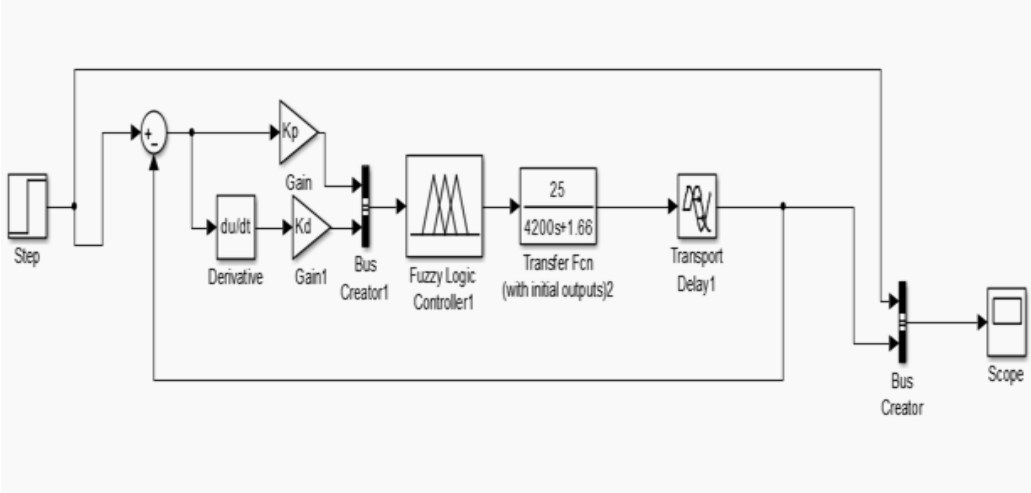

Figure 4-7: dynamic response of fuzzy PD controller

Figure 4-8 below shows heater temperature response with specific set point in different interval, using fuzzy PD controller.

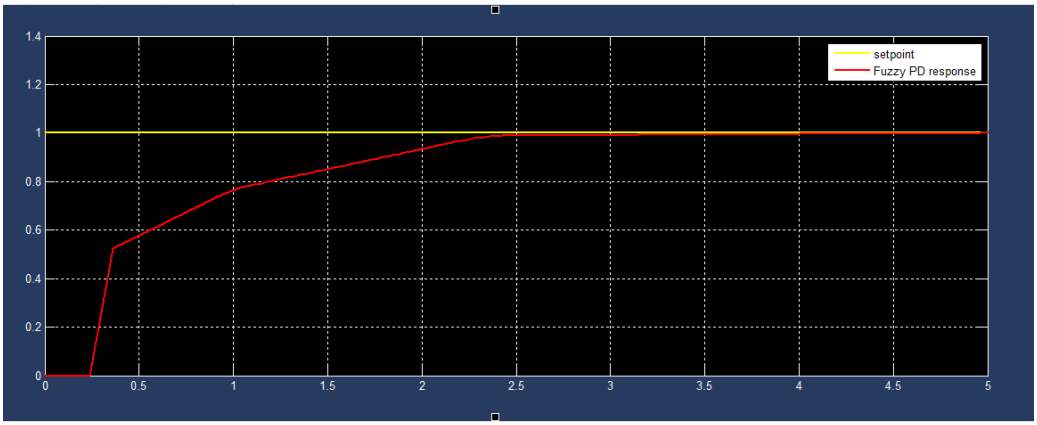

Figure 4.8: dynamic response of Fuzzy PD response

4.2.3 Comparing the results of PD controller and Fuzzy PD controller Dynamic responses

Figure 4-9 below shows that in case of fuzzy PD controller, the rise time and the settling time reduces to 0.125, 0.9141 respectively. On

the other hand, there is no overshoot and undershoot in the case of fuzzy PD and PD controllers.

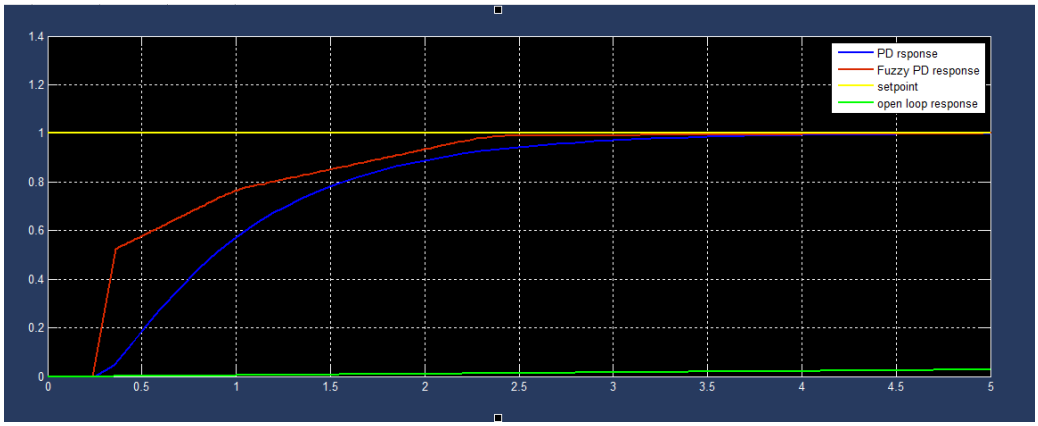

Figure 4-9: dynamic response of open loop, PD and Fuzzy PD responses

The dynamic response of figure 4-9 is summarized in table 4-1. And that proves the robustness of fuzzy PD controller.

Table 04-1: Comparison of dynamic response of two controllers

Response	Rise time	Settling time	overshoot
PD tuned	1.6819	3.2531	0
fuzzy PD tuned	1.5569	2.3390	0