

# Simulasi sistem kendali temperatur dan ketinggian air pada proses thermal mixing sistem multi input multi output menggunakan PID dan fuzzy logic controller = Simulation of temperature and water level control system in the thermal mixing process with a multi output multi output system using PID and fuzzy logic controller

Aristia Reyhan Rafandi Betha, author

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## Abstrak

Beragam kebutuhan industri, membuat jenis-jenis proses pada industri pengolahan menjadi beragam dengan beberapa parameter *input* dan *output*, salah satunya adalah proses *thermal mixing* yang menggunakan sistem *multi input multi output*. *Thermal mixing* atau *continuous stirred-tank reactor* mengendalikan 2 aliran dengan temperatur berbeda kedalam tanki pencampur sehingga mendapat temperatur dan ketinggian tangki sesuai yang diinginkan. pada penelitian ini telah dirancang sistem pengendali berbasis logika *fuzzy* pada pengendalian temperatur dan *level*. Penelitian ini sistem logika *fuzzy* menggunakan 2 *input* dan 1 *output* untuk masing-masing parameter pengendalian. 2 *input fuzzy set* menggunakan nilai *error* dan *change of error*. Setiap *fuzzy set* menggunakan 7 *membership function* yaitu *negative big* (NB), *negative medium* (NM), *negative small* (NS), *zero* (Z), *positive small* (PS), *positive medium* (PM), dan *positive big* (PB). Sistem dapat melakukan pengendalian temperatur dan *level* sesuai yang diinginkan. Sistem ini menggunakan simulasi berbasis aplikasi MATLAB Simulink. Berdasarkan hasil simulasi, dapat disimpulkan bahwa pengendalian menggunakan *fuzzy logic controller* lebih baik dibandingkan pengendalian PID. Hasil pengendalian *fuzzy* memiliki rata-rata *rise time* dan *settling time* yang lebih cepat dan tidak memiliki *overshoot*.

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A variety of industrial needs, making the types of processes in the processing industry to be diverse with several input and output parameters, one of which is a thermal mixing process that uses a multi-input multi output system. Thermal mixing or continuous stirred-tank reactor controls 2 streams with different temperatures into the mixing tank so that the temperature and height of the tank are as desired. In this research a fuzzy logic based controller system has been designed for controlling temperature and level. This study uses a fuzzy logic system using 2 inputs and 1 output for each control parameter. 2 fuzzy input sets use error and change of error values. Each fuzzy set uses 7 membership functions, namely negative big (NB), negative medium (NM), negative small (NS), zero (Z), positive small (PS), positive medium (PM), and positive big (PB). The system can control the temperature and level as desired. This system uses a simulation based on the MATLAB Simulink application. Based on the simulation results, it can be concluded that the control using fuzzy logic controller is better than PID control. Fuzzy control results have a faster average rise time and settling time and do not have overshoot.