Peningkatan Kinerja Pengendalian Kolom Distilasi Linier Menggunakan Fuzzy Self-Tuning PI Controller = Improvement of Linear Distillation Column Control Performance Using Fuzzy Self-Tuning PI Controller

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Abstrak

Untuk meningkatkan kinerja pengendali PI, maka pengendali PI dibuat adaptif dengan menambahkan pengendali fuzzy. Pengendali fuzzy akan menghitung nilai Kp dan Ki, sehingga nilai Kp dan Ki di pengendali PI akan terus diperbaharui seiring dengan masukan error di pengendali fuzzy maupun PI. Dengan potensi tersebut, pengendali ini akan diterapkan pada salah satu sistem multivariabel yang ada di proses industri kimia, yaitu kolom distilasi. Model kolom distilasi yang digunakan dalam simulasi ini adalah model kolom distilasi linier 2 × 2 McAvoy dan Weischedel seperti yang ditunjukkan dalam Marlin. Simulasi akan dilakukan dengan piranti MATLAB/Simulink dengan bahasa pemrograman C (C MEX S-function). Parameter kinerja pengendali yang digunakan adalah overshoot, settling time, dan IAE (integral absolute error). Berdasarkan hasil pengujian perubahan set point dan gangguan, pengendali fuzzy-PI berhasil meningkatkan kinerja pengendali yang berupa penurunan nilai IAE. Hal ini disebabkan karena Kp dan Ki yang berubah sesuai kondisi sistem, walaupun perubahan yang terlihat tidak signifikan karena penyetelan parameter Kp dan Ki awal yang sudah agresif.
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To improve the PI controller performance, the PI controller is made to be adaptive by adding a fuzzy controller. The fuzzy controller will calculate the values of Kp and Ki, so that the values of Kp and Ki in the PI controller will always be updated based on the error input in both PI and fuzzy controller. With these potentials, this controller will be implemented in one of the multivariable systems in chemical processes, which is distillation column. The distillation column model used in this simulation is linear distillation column 2 × 2 by McAvoy and Weischedel as mentioned in Marlin. The simulation will be done with the MATLAB/Simulink software and the program routines are made with C (C MEX S-function). Verification of the control performance improvement will be reviewed from three parameters, which are overshoot, settling time, and IAE (integral absolute error). Based on the set point and disturbance change test, the fuzzy-PI controller succeeded in improving the control performance, which can be seen by the lower values of IAE. This is due to the change in the values of Kp and Ki based on the systems condition, even though the change did not seem to be significant because of the initial values of Kp and Ki used is already aggressive enough.<i/>