Peningkatan Pengendalian Proses Non-Linear pada Proses Produksi Formaldehida dengan Menggunakan Penyetelan MMPC pada Proses Linear = Increasing Non-Linear Process Control in Formaldehyde Production Processes Using MMPC Tuning for Linear Process

Raihan Abdan Syakuran, author

Abstrak

Formaldehida merupakan bahan kimia yang memiliki banyak kegunaan seperti bahan baku dalam pembuatan resin, disinfektan, serta pengawet. Pada proses produksi di pabrik, salah satu aspek yang memiliki peran penting adalah aspek pengendalian. Saat ini PT. X masih menggunakan pengendali Proportional-Integral (PI) yang masih memiliki sejumlah kekurangan. Dalam rangka mengatasi kekurangan yang dimiliki oleh pengendali PI, pengaplikasian pengendali MMPC dengan model gangguan dinilai mampu menghasilkan performa pengendalian yang lebih baik. Model empiris pada penelitian ini didapatkan dari penelitian sebelumnya yang telah dilakukan oleh Wahid dan Fauzi (2021), sedangkan model gangguan dibuat dengan bantuan process reaction curve dan perhitungan parameter First Order Plus Dead Time (FOPDT). Dalam memperoleh kinerja pengendalian yang optimal dilakukan proses tuning menggunakan metode Shridhar dan Cooper dan dioptimalkan dengan metode fine tuning. Kinerja pengendali MMPC dengan model gangguan diuji dengan perubahan Set Point (SP) dan ketahanan atas gangguan (disturbance rejection) dan diukur melalui perhitungan Integral Absolute Error (IAE) dan Integral Square Error (ISE). Pada uji perubahan Set Point (SP), pengendali MMPC berbasis model gangguan menghasilkan peningkatan kinerja dimana IAE mengalami penurunan yang berkisar dari 14,04-95,88% dan ISE mengalami penurunan yang berkisar dari 11,27-99,81%.

..... Formaldehyde is a compound that has many functions such as raw material of resin, disinfectant, and preservative. In the process production at the factory, one aspect that has significant role is controlling aspect. Currently PT X still uses Proportional-Integral controller which still has a few disadvantages. In order to overcome several disadvantages of PI controller, application of MMPC controller with disturbance model is considered to be able to achieve better control performance. Empirical model in this study was obtained from previous research conducted by Wahid and Fauzi (2021), while the disturbance model was made with the help of process reaction curve and First Order Plus Dead Time (FOPDT) parameters. In order to obtain optimal control performance, the tuning process is carried out using Shridhar and Cooper method and optimized by fine tuning method. The performance of the MMPC controller based on disturbance model was tested by changing the Set Point (SP) and the resistance to disturbance (disturbance rejection) and measured by calculating the Integral Absolute Error (IAE) and Integral Square Error (ISE). In the Set Point (SP) change test, the MMPC controller with the disturbance model result in increased performance, where IAE decreased about 14.04-95.88% and ISE decreased about 11.27-99.81%.