Penyetelan ulang pengendali proportional-integral untuk meningkatkan kinerja pengendali pada proses produksi formaldehida di PT X = Returning PI controller to improve the controller performance in formaldehyde production process at PT X

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Abstrak

ABSTRAK
Penyetelan ulang pengendali proporsional-integral dilakukan pada proses produksi formaldehida di PT X. Penyetelan ulang dilakukan untuk meningkatkan kinerja controller, karena penyetelan pengendali PI pada pabrik seringkali masih menggunakan metode ziegler-nichols close-loop yang kurang optimal. Model proses akan diestimasi dengan first order plus dead time model (FOPDT), dan kemudian parameter pengendali disetel ulang menggunakan Ziegler-Nichols (PRC), Wahid-Rudi-Victor (WRV), Cohen-Coon, autotuning, dan fine tuning. Kinerja pengendali diuji menggunakan set point (SP) tracking dan disturbance rejection. Integral of square error (ISE) akan digunakan sebagai indikator kinerja. Ada tiga pengendali yang diuji, yaitu, pengendali laju alir steam (FIC-102), pengendali temperatur udara (TIC-101), dan pengendali level tangki (LIC-102). Metode fine tuning memberikan kinerja pengendali yang paling baik untuk FIC-102 dan TIC-101, sedangkan metode autotuning memberikan kinerja pengendali yang lebih baik untuk LIC-102 dibandingkan dengan setelan di lapangan. Peningkatan kinerja untuk set point (SP) tracking adalah 81,59% (FIC-102), 94,11% (TIC-101), dan 85,61% (LIC-102). Sedangkan peningkatan kinerja untuk disturbance rejection adalah 95,5% (FIC-102), 94,53% (TIC-101), dan 93,16% (LIC-102). Pengujian penurunan kapasitas produksi sebesar 12,5% juga dilakukan, dan didapatkan bahwa controller masih mampu mencapai SP. Dengan demikian, penyetelan ulang pengendali PI berfungsi dengan baik.
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ABSTRACT
A proportional-integral controller retuning is performed on formaldehyde production process at PT X. Retuning is carried out to improve the control performance, because PI controller in the factory often still uses ziegler-nichols close-loop tuning method which is not optimal. The process model is estimated by a first order plus dead time model (FOPDT), and then the controller parameters is tuned using the Ziegler-Nichols (PRC), Wahid-Rudi-Victor (WRV), Cohen-Coon, autotuning, and fine tuning. The control performance is tested using set point (SP) tracking and disturbance rejection with integral of square error (ISE) as performance indicator. There are three controllers that are tested, i.e., the steam flow controller (FIC-102), air temperature controller (TIC-101), and tank level controller (LIC-102). Fine tuning method give the better control performance for FIC - 102 and TIC-101, while autotuning method gives the better control performance for LIC-102 compared to the previous settings in the field. Performance improvement for set point (SP) tracking are 81.59% (FIC-102), 94.11% (TIC-101), and 85.61% (LIC-102). While performance improvement for the disturbance rejection are 95.5% (FIC-102), 94.53% (TIC-101), 93.16% (LIC-102). A test using reduction in production capacity of 12.5% was also carried out, and it was found that the controller was still able to reach SP. Thus, retuning PI controllers work well.