Pengendalian Proses Separasi Awal Gas Bumi di Lapangan X Menggunakan Pengendali PI Berbasis System Re-Identification (PI-SRI) = Initial Control of Natural Gas Processing in the Field X Using the System Re-Identification PI-Based (PI-SRI) Control

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Abstrak

Pengembangan lapangan gas bumi baru setelah ditemukan memerlukan desain pabrik pengolahan gas bumi, termasuk di Lapangan X. Selain desain proses, desain kontrol proses juga sangat penting. Untuk itu, pada pemisahan awal gas bumi yang akan diproses lebih lanjut, dirancang pengendalian proses menggunakan pengontrol proporsional-integral berbasis sistem identifikasi ulang (PI-SRI). Terdapat tiga sumur (Alpha, Betha, dan Charlie), separator dan cooler pada proses pemisahan awal dan terdapat tiga jenis kontroler (tekanan [PC], level [LC] dan temperatur [TC]). Untuk menentukan parameter kontroler PI yang optimal, dilakukan tiga kali identifikasi sistem untuk menghasilkan tiga model first-order plus dead-time (FOPDT). Ketiga model tersebut dimasukkan dalam persamaan tuning untuk metode Ziegler-Nichlos sehingga dihasilkan tiga parameter kontroler PI. Untuk menguji kinerja kendali yang optimal digunakan perubahan set point (SP) pada PC, LC dan TC, serta gangguan berupa perubahan laju aliran gas bumi yang berasal dari ketiga sumur tersebut. Indikator kinerja pengendalian yang digunakan adalah overshoot dan settling time. Hasil penelitian menunjukkan bahwa model FOPDT untuk proses pemisahan awal produksi gas bumi berdasarkan tiga variabel terkontrol memiliki =1,614, =0,24 dan =0,01 untuk PC; =0.882, =0.2295 dan =0.2385 untuk LC dan =0.063, =1.5075 dan =0.0425 untuk TC. Harga parameter kontroler PI yang memberikan performansi kontrol optimum (overshoot dan settling time) adalah =13,383, =0,033 untuk PC; =132.6, =0.483 untuk LC, dan =506.7, =0.142 untuk TC.

.....The development of a new natural gas field after being discovered requires the design of a natural gas processing plant, including in Field X. In addition to process design, process control design is also very important. For this reason, at the initial separation of natural gas which will be further processed, process control is designed using a proportional-integral controller based on a re-identification system (PI-SRI). There are three wells (Alpha, Betha, and Charlie), separator and cooler in the initial separation process and there are three types of controllers (pressure [PC], level [LC] and temperature [TC]). To determine the optimal PI controller parameters, three system identifications were carried out to produce three first-order plus dead-time (FOPDT) models. The three models are included in the tuning equation for the Ziegler-Nichlos method so that three PI controller parameters are produced. To test the optimal control performance, changes in the set point (SP) of the PC, LC and TC are used, as well as disturbances in the form of changes in the flow rate of natural gas originating from the three wells. The control performance indicators used are overshoot and settling time. The results showed that the FOPDT model for the initial separation process of natural gas production based on three controlled variables had =1.614, =0.24 and =0.01 for PC; =0.882, =0.2295 and =0.2385 for LC and =0.063, =1.5075 and =0.0425 for TC. The parameter values for the PI controller that provide optimum control performance (overshoot and settling time) are =13,383, =0.033 for PC; =132.6, =0.483 for LC, and =506.7, =0.142 for TC.