

Chemical Engineering

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Development of fluid flow control system

Tae Won Kang

Kongju National University, Korea

Automatic control systems have been evolving over the past 150 years. These systems began as simple mechanical feedback devices and have evolved into complex electronic and computer controlled systems. The purpose of this study consists of completing an apparatus that demonstrates the automatic flow control of water. Developed flow control system is composed of software and hardware. The flow rate is measured by orifice meter when water supplied from pump flows through pipes. Measured flow rate by orifice meter is converted into digital signals by pressure transmitter, then, sent to personal computer by data acquisition system. Afterwards, manipulated electric signal was calculated by LabVIEW control algorithm is sent to the control valve and converted to pneumatic signal to operate the control valve. Computer program for the data acquisition and control was prepared with LabVIEW of National Instruments. The electric signal and flow rates received from data acquisition board are monitored through two graphic windows. LabVIEW algorithm calculates errors comparing flow rate signals and set point, then, generates the manipulated variable values, which are needed to operate the control valve. For the determination of PID design parameters ultimate gain and ultimate period were investigated by increasing the proportional gain only from low value to high value, then, three control parameters were calculated by Ziegler-Nichols tuning method. When control performances were investigated for not only set point changes but also disturbance changes, the developed system showed good performances for both cases. Developed control system will be used as a tool for the education control theory, and also will be applied to industry.

Biography

Tae Won Kang has completed his PhD from Oklahoma State University in 1989 and Post-doctoral studies from Western Research Institute. He is the Professor of Chemical Engineering department at Kongju National University in Korea. He has been interested in the area of control system design and chemical reaction with microwave energy. He has published more than 20 papers in reputed journals.

twkang@kongju.ac.kr

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