

## 液位系統之識別與控制

### Model Identification and Control for Level System

許地申

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#### 摘 要

本文係在探討液位系統之設計、識別及控制。首先設計介面電路及數位控制器，並將系統安裝完成。其次，先將本系統近似為一階帶靜時系統（FOPDT）經由數位控制理論，推導出液位與控制閥之關係，並利用最小平方法去估算出相關之參數，即可識別並建立本液位系統之動態模式，其次以 Ziegler 和 Nichols 所提出之四分之一衰退比響應（即圈環法），對 PID 控制器作線上調諧，根據實驗結果發現其是調諧規則簡單實用性很高及韌性很強的液位控制系統。再利用 Matlab 軟體將液位控制系統之數學模式與 PID 控制器作模擬分析，發現具有很好的響應結果。最後，以 LabVIEW 軟體設計圖控程式，以達到電腦監控系統操作之目的。

關鍵字：識別、一階帶靜時、韌性。

#### ABSTRACT

The purpose of this paper is to introduce the design, identification and control of level system. First, we should design the interface circuit and digital PID controller, then install whole system. Next, this system can be approximated by a first order plus dead time (FOPDT) system. The relation between level and control valve can be derived by the digital control theory. The dynamic model of level control system could be identified via the least square fit to estimated the relational parameter. We can make use of the quarter decay ratio response what were presented by the Ziegler and Nichols to tune the PID controller. The analysis is obtained by taking simulated results via Matlab software. Also we can use LabVIEW software to design supervisor control system. Hence, from the experimental results, it is a very simple tuning, high performance and robust level control system.

Keywords: Identification、FOPDT、Robust

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