

## Method for Tuning Level Control Loops Based on Internal Model Control and Closed Loop Step Test Data

**Authors :** Arnaud Nougues

**Abstract :** This paper describes a two-stage methodology derived from internal model control (IMC) for tuning a proportional-integral-derivative (PID) controller for levels or other integrating processes in an industrial environment. Focus is the ease of use and implementation speed which are critical for an industrial application. Tuning can be done with minimum effort and without the need for time-consuming open-loop step tests on the plant. The first stage of the method applies to levels only: the vessel residence time is calculated from equipment dimensions and used to derive a set of preliminary proportional-integral (PI) settings with IMC. The second stage, re-tuning in closed-loop, applies to levels as well as other integrating processes: a tuning correction mechanism has been developed based on a series of closed-loop simulations with model errors. The tuning correction is done from a simple closed-loop step test and the application of a generic correlation between observed overshoot and integral time correction. A spin-off of the method is that an estimate of the vessel residence time (levels) or open-loop process gain (other integrating process) is obtained from the closed-loop data.

**Keywords :** closed-loop model identification, IMC-PID tuning method, integrating process control, on-line PID tuning adaptation

**Conference Title :** ICPIDCT 2021 : International Conference on PID Control and Tuning

**Conference Location :** Amsterdam, Netherlands

**Conference Dates :** September 16-17, 2021